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Serbian Academy of Sciences and Arts

International Scientific Conference

THE 5TH CONGRESS OF SLAVIC GEOGRAPHERS AND ETHNOGRAPHERS

Book of Abstracts and Contributed Papers

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THE 5TH CONGRESS OF SLAVIC GEOGRAPHERS AND ETHNOGRAPHERS

October 23–25, 2024

Belgrade, Serbia

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Foreword

During 2024, two significant jubilees will be celebrated—100 years since the First Congress of Slavic Geographers and Ethnographers in Prague and the publication of the first volume of the monograph "Geomorphology" by renowned Serbian geographer Jovan Cvijić (1865–1927), one of the Congress initiators. Subsequent Congresses were held in Poland (1927), the Kingdom of Yugoslavia (1930), and the Kingdom of Bulgaria (1936). In order to honour these significant anniversaries, the Geographical Institute "Jovan Cvijić" SASA from Belgrade, with support of the Cultural Centre "Vuk Karadžić" from Loznica, Ministry of Science, Technological Development and Innovation and Ministry of Culture of the Republic of Serbia started the initiative to organize the 5th Congress of Slavic Geographers and Ethnographers with the aim of gathering eminent foreign and domestic scientists from the field of geography and related disciplines.

Today, exactly 110 years after the initial idea, 100 years after the first Congress, and 88 years after the last, Serbia proudly hosted the 5th Congress of Slavic Geographers and Ethnographers, which was held in Belgrade from October 23 to 25, 2024. In this way, the Geographical Institute "Jovan Cvijić" SASA wanted to continue the tradition of connecting the Slavic peoples, as well as cooperation with the broader international scientific community in the sphere of contemporary scientific achievements.

In this publication, through 20 articles and 81 abstracts, over 170 eminent scientists from 18 countries represented their views regarding geographical and ethnological issues. Therefore, this publication offers to the readers various interpretations of different topics, including contemporary theoretical and methodological approaches in geography, physical-geographical processes and their effects on the population, environmental protection, population, economical, historical, and political geography, spatial planning, and ethnology.

The Congress organizers would like to thank all the participants who contributed to the creation of this publication through their submissions. Through the works in this publication, the authors present current scientific knowledge, open new geographical and ethnological topics, and encourage future research and collaborations.

With this Congress, as well as the accompanying publication, Jovan Cvijić's vision is being realized, with the aim of continuing the tradition of organizing these scholarly gatherings in the future.

Editors

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THE 100th ANNIVERSARY SINCE THE FIRST CONGRESS
1924
100 ГОДИНИ ОД ОДРЖАВАЊА ПРВОТ КОНГРЕС
2024

Physical-geographical processes and their effects on the population

Abstract

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A GEOGRAPHICAL PERSPECTIVE ON THE PAST, PRESENT, AND FUTURE OF THE ANTHROPOCENE

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The Anthropocene has been much in the news recently as geologists have taken the decision not to formally declare it as a new geological epoch. So, where does this leave us? Is the Anthropocene real? Here, I use examples from China and elsewhere to reflect on the nature and scale of human impact on the global environment and consider the extent to which these have left a universal footprint. This footprint expresses itself in many ways, but I focus here on climate and geomorphology as indicators of the nature and scale of human impact on the Earth system. Moreover, the recent past—and immediate future—is characterized by changes in the frequency and magnitude of hazards that amplify our exposure to environmental risk and increasingly threaten lives and livelihoods. I argue that, irrespective of any scientifically authorized view, the Anthropocene is here, and it is here to stay. Given the ongoing scale of human impact on the Earth's environment, the term is a valuable symbol of the need for action to save our precious life-support system. Geographers have embraced the concept (even if the Geologists have not) and need to play an important role in addressing the challenges the Anthropocene presents.

Keywords: Anthropocene; human impact; global environment

Abstract

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THE INFLUENCE OF PROF. JOVAN CVIJIĆ'S RESEARCH IN GEOMORPHOLOGY IN FRANCE AND THE BALKANS: WHICH LEGACY?

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Jovan Cvijić (1865–1927) was a physical geographer, which is only one aspect of his field of endeavor but the one I will focus on in this presentation. As such, he played a role in the development of this discipline at national and international levels.

His personal qualities were crucial to this recognition, but the intellectual background of the second half of the 19th century and the transnational context of the Austro-Hungarian Empire facilitated this threefold development. With his thesis entitled Das "Karstphänomen" ("The Karst phenomena"), defended in Vienna in 1883, he succeeded in providing synthetic knowledge about the Karst and establishing a vocabulary and concepts (such as doline, *uvala*, *polje*) that have endured to this day.

In Vienna, in contact with his professors, starting with Penck, he fully embraced a modern geography based on field observations as opposed to a cabinet geography, a geography that needed to be illustrated by drawing or photography. His physical geography hypotheses needed to be supported by solid naturalist and physical knowledge. It was in this spirit that he carried out his successive responsibilities in Serbia, both at the University of Belgrade and at the Geographical Society, and that he subsequently extended his research to other areas of physical geography: climatology, hydrology, impact of last glaciation, fluvial erosion, limnology, etc.

His knowledge of the French, German and Serbian languages enabled him to exchange ideas with his peers throughout Europe (Penck, Tomaschek, Martel, De Martonne, De la Blache, etc.) and to develop his hypotheses in line with these exchanges. He also shared his work through courses abroad, most notably in Paris in 1917 and 1918, and through publications in international journals. Thus, he strengthened his academic authority at national and international levels.

It is in the field of karstology that Cvijic's work remains most up-to-date, and his approach to field work, his constant exchanges with his peers, his concern for international issues and the practice of open geography are the foundations of modern physical geography.

Keywords: Cvijić; physical geography; karstology; geomorphology; epistemology

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Abstract

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ARCTIC: RECENT ADVANCES AND FUTURE OUTLOOK FOR RUSSIAN GEOGRAPHERS

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The Arctic region is one of the least developed regions of the planet. With an area of 8.7% of the Earth's surface, only 0.07% of the world's population lives here. A significant territory of the Arctic is located within the Russian Federation. The importance of this region is determined by two main reasons. Firstly, the Arctic zone of the Russian Federation has huge reserves of natural resources: about 90% of gas and 17% of oil in Russia is produced in the Arctic. In addition, the region has large deposits of diamonds, gold, and other non-ferrous metals. Secondly, the coastal waters of the Arctic are a strategic transport corridor—the Northern Sea Route, which reduces the time of transporting goods from Europe to Asia by almost two times.

At the same time, northern ecosystems are characterized by high vulnerability to changes in external conditions and anthropogenic impact. The increase in air temperature recorded in recent decades is three times higher in the Arctic than the global average. Climate warming leads to a radical transformation of the natural environment, primarily warming and thawing of permafrost, activation of exogenous processes, changes in the terrestrial hydrological regime, and the invasion of southern species of flora and fauna northward. The observed changes affect not only ecosystems, but also the life quality of the population.

In this regard, Russian geographers conduct broad studies to assess the current and predicted rates of transformation of natural environment, as well as to find solutions and approaches to mitigate negative environmental and economic consequences to the Arctic territories. Recent studies have been organized for calculation of economic damage to populated areas from thawing permafrost, quantitative assessments of the current dynamics of the Arctic coastal zone. Besides, extensive oceanographic and geophysical measurements have been carried out in the waters of the Arctic seas and the Russian sector of the Arctic Ocean. The socio-economic model for the development of Arctic territories has been developed and proposed for governmental implementation. Russian ethnographers have done a lot of work to inventory the intangible heritage of the indigenous peoples of the North. The ongoing research in the Arctic demonstrates the state's great interest in these territories, not only from the point of view of economic benefits, but also in the context of the sustainable development of these remote, isolated, and sparsely populated territories.

Keywords: Arctic; Arctic Ocean; permafrost; climate change; polar environment

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Abstract

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THE PROBLEMS OF RECONSTRUCTING TRADITIONAL LANDSCAPES—THE EXAMPLE OF THE POLISH CARPATHIANS

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Landscape changes are an inevitable process. However, the dynamics and magnitude of these changes have increased worldwide since the 19th century, accelerating after the Second World War. As a result, many traditional landscapes have deteriorated rapidly.

While in intensively used areas traditional landscapes have been completely wiped out, in extensively used areas they gradually evolve into afforested, restored, or semi-natural ones. This stems from progressive land abandonment that in temperate zone results in reforestation, and usually in the loss of some natural and cultural values. This, in turn, contributes actions designed to protect traditional landscapes. The basis for these protection activities should be reconstructing traditional landscapes' historical state, based on different data sources. The sources of this knowledge are mainly archival cartographical materials. What is more, some elements of traditional elements have been preserved until the present and could also be a source of knowledge on past landscapes and historical land use.

In this study, the problems of traditional landscape reconstruction will be discussed based on studies conducted in the Polish Carpathians. In this area, the disappearance of the traditional landscape of the seasonal mountain economy is observed mainly as a consequence of land abandonment and is connected with a "forest transition" typical of mountain areas in many developed countries.

Although it is usually necessary to establish the current and historical state for effective landscape protection, determining the historical range and features of the traditional landscape of seasonal mountain economy in the Polish Carpathians is subject to a large degree of uncertainty. The various modern and archival cartographical materials available for this area could provide different results, which are often incomplete. There is only fragmentary information about the landscape in some of the time periods for which archival materials have preserved, and what was in between is only a matter of the researcher's interpretation. Therefore, knowledge on the historical landscape state is only residual, and the interpretation of available materials gives only a certain idea of the past, meaning it is impossible to determine how close this idea is to its true historical state.

Keywords: traditional landscape; land abandonment; landscape reconstruction; archival maps; retrogressive method

Abstract

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LOESS OF SERBIA—FROM PALEOCLIMATE TO WINEYARDS

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Loess is a buff colored, clastic sedimentary rocky of eolian origin without stratification and laminations where the silt particles predominates (beside clay and sand). Gentle lithification with carbonate bonds makes them highly sensitive to water impacts which dissolute this rock. Its vertical breaking made steep slopes. Loess in the sedimentary record deposits are not homogenous sediments, but most contain paleosols or sand horizons which we denominated loess series or loess-paleosol sequences.

In Serbia loess series are the most widespread eolian sediments on which the high quality chernozem-like soils are formed. It qualifies as parent rock the premium arable land and wineyards. According to the relief characteristics in the landscape we can distinguish plain loess and slope loess. Based on $CaCO_3$ content the most of Serbian series belongs to the classic loess series while in the Morava valley at a few places we can found a non-carbonated loess series. Only at Stari Slankamen (Koševac) we can found Lower Pleistocene loess at the other places the young part of Middle Pleistocene or just the Upper Plesitocene loess series are preserved in the sedimentary record.

Loess series serve as a record of past climates and environmental conditions. Key aspects of loess and paleoclimate studies include stratigraphy and cyclicity deposits often show distinct layering that corresponds to different climatic periods. Within loess series, paleosols can provide additional information about past climates. The timing of loess deposition often correlates with glacial and interglacial cycles. Loess series can contain various proxies for past climates, such as mollusks, which provides information about past biotope proxies. Analysis of loess can help reconstruct past wind patterns and dust transport routes, offering insights into changes in atmospheric circulation and climate systems over time.

The importance of loess studies help reconstruct past environments dynamics and climate conditions, providing a context for understanding past climate variability and change. Data from loess deposits can improve climate models by providing empirical evidence of past climate conditions, which helps refine predictions about future climate changes. Loess deposits have influenced human history by shaping agricultural practices and settlement patterns.

Keywords: loess series; paleosols; paleoclimate; Serbia

Abstract

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SCIENTIFIC RESEARCH ON ADAPTATION TO CLIMATE CHANGE IN CHINA

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Climate change is a common challenge for all humanity. Research on understanding the patterns of climate change and identifying its impacts is crucial for adapting to and mitigating climate change, as well as for developing appropriate policy measures to address it. The Chinese government places great importance on scientific research related to climate change. Since 2007, China has released four national climate change assessment reports and two national strategies for adapting to climate change. China has also launched special scientific and technological innovation plans related to climate change, including projects under the national science and technology programs in the field of social development, the National Natural Science Foundation projects, and key research and development projects. A comprehensive deployment of scientific work to adapt to climate change has been carried out, continuously conducting fundamental scientific research on climate change to support subsequent project funding. This has led to the establishment of China's technical system for assessing the impacts and risks of climate change. These efforts provide scientific support for raising public awareness of climate change, enhancing international scientific cooperation, and laying the foundation for building a fair, reasonable, and cooperative global climate governance system that benefits all parties.

Keywords: climate change; adaptation; research; project

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Abstract

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THE IMPACT OF CLIMATE AND WEATHER-RELATED DISASTERS ON AGRICULTURE IN BULGARIA

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In recent years, various regions worldwide have experienced an increase in the frequency and severity of extreme weather events, including cold and heat waves, floods, droughts, forest fires, and storms. Climate models predict that many areas, particularly in Southern Europe, including Bulgaria, will face heightened drought and longer dry periods, along with higher temperatures. Climate change and weather-related disasters profoundly impact agriculture, one of the most important sectors of Bulgaria's economy.

This study provides an overview of regional climate change trends in Bulgaria, focusing on extreme weather events such as frost occurrences, hailstorms, thunderstorms, heat waves, and droughts. Increased temperatures and altered precipitation patterns lead to stress on crops such as wheat, maize, and sunflowers, which are critical to Bulgaria's agriculture. The survey results among Bulgarian farmers show that Bulgarian agriculture is increasingly vulnerable to droughts and climate variability. In addition to drought, Bulgarian farmers report an increase in extreme weather events such as hailstorms, irregular precipitation patterns, and reduced snow cover during winter. Furthermore, the distinction between the four seasons has become less pronounced, with a notably shorter spring season.

This research includes a detailed case study on the impact of extreme drought on major crops in Bulgaria. This impact was assessed using a correlation analysis between the Standardised Precipitation Evapotranspiration Index (SPEI), a key drought indicator, and average crop yields. The analysis focused on crops that are highly dependent on moisture availability, such as maize and sunflower, in addition to Bulgaria's primary cereal crop, wheat. The findings indicate that droughts significantly reduce crop yields, especially in regions reliant on rain-fed agriculture.

Bulgarian farms are implementing adaptive measures such as adjusting sowing dates and cultivating drought-resistant crop varieties. However, these strategies are not always sufficient to address the challenges posed by climate change, as it remains difficult to predict the alternating patterns of dry and wet years. The results of the study emphasize the importance of continued research, policy support, and investment in adaptation strategies to ensure the resilience of the agricultural sector.

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Keywords: extreme drought, Standardized Precipitation Evapotranspiration Index, agriculture, Bulgaria

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Abstract

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CLIMATE TRENDS AND RISKS IN BOSNIA AND HERZEGOVINA

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Climate changes are the drivers of the biggest risks and disasters in Bosnia and Herzegovina in the past two decades. The paper will present climate trends for key climate elements and indices for the period 1961–2023 and their impact on the sectors most vulnerable to climate change. Research indicates that the temperature rise in the largest urban centers has exceeded the threshold of 2°C, and that the rainfall regime has changed to a large extent. Clear trends of increasing dry days (without precipitation) as well as days with intense precipitation can be observed on an annual basis. Such trends are triggers for the occurrence of extreme droughts and floods during the same years. The sectors most threatened by climate change in Bosnia and Herzegovina are: agriculture, water management, forestry, human health, tourism, and biodiversity, while the greatest risks are from floods, droughts, forest fires, and stormy winds. Climatic models and projections until the end of the 21st century indicate a rapid increase in air temperature, a major change in the precipitation regime with an increase in intense precipitation, which conditions fluvial, urban, and torrential floods, but also the number of days without precipitation that affect the occurrence of droughts and forest fires. The paper will present the results of climate projections in Bosnia and Herzegovina, and accordingly indicate the possible directions of adaptation to climate change and the need to integrate them into planning and strategic documents as well as development policies.

Keywords: climate change; climate trends and risks; Republika Srpska; Bosnia and Herzegovina

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STONE MONUMENT ENSEMBLES AND THE CLIMATE CHANGE IMPACT—RISK AND VULNERABILITY ASSESSMENT BASED ON CLIMATE SCENARIOS (STECCI HORIZON EUROPE PROJECT)

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Climate change, intensified by extreme weather conditions and heightened levels of environmental contaminants, is serving as a significant contributor to the degradation of cultural heritage sites, specifically limestone monuments. This susceptibility is primarily due to the composition of limestone, composed primarily of calcium carbonate, which is notably vulnerable to chemical weathering processes. To safeguard these enduring vestiges of our shared cultural past, it is of paramount importance to devise and implement comprehensive protective measures and policies.

Instances of extreme meteorological activities such as heavy precipitation, floods, and landslides, which are on a marked rise due to climatic alterations, pose a significant danger to geoheritage sites, inclusive of stećak tombstones. These climatic aberrations can substantially accelerate the degradation process of such sacral limestone heritages, even leading to a complete loss of their original characteristics or total extinction. Besides, the recent notification by the Intergovernmental Panel on Climate Change (2018) warns against an impending increase in precipitation extremes and resultant soil saturation due to climate change. Such changes can lead to an upsurge in events like landslides and flooding, which, in turn, can cause erosion or even displacement of these limestone tombstones and other similarly fragile stone structures.

This study presents a methodical vulnerability assessment process, aimed at identifying the explicit dangers that varying climatic scenarios pose to a location. This critical risk assessment should holistically integrate threats posed by climate change and other non-climatic perturbations, such as pollution. The process necessitates a comprehensive understanding of each site, taking into consideration multiple factors including geolocation, landscape characteristics, hydrological patterns, exposure to extreme climatic events, susceptibility to erosion or leaching, and pollution impact. Station data, referring to collected meteorological information from weather stations, can provide detailed local insights into climatic patterns such as precipitation, temperature variations, and more, thereby helping evaluate the site-specific climatic threats and their potential impacts.

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Additionally, the contribution of climate change to biodeterioration is multifaceted due to its overlap with other forms of decay, complicating the attribution of damage to specific biological or climatic factors. Thus, it is crucial to account for the full extent of damage caused by biodeteriogens, given that such biodeterioration often concurs with and exacerbates other physical and chemical destruction processes. Consequently, the process of monument biodeterioration can be categorized broadly into three principal classes of decay: biophysical, biochemical, and aesthetic deterioration. The paper includes case studies of the sites Kopošići, Križevići, Blidinje Dugo polje, Ravanjska vrata, Radimlja, Mramorje Bajina Bašta, Žugića bare Žabljak, and Velika Cista, all of which exhibit unique patterns of decay due to specific climatic and environmental conditions.

Keywords: climate change; limestone; cultural heritage

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Abstract

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DETECTED AND PROJECTED CHANGES IN TEMPERATURE AND PRECIPITATION IN THE TERRITORY OF MONTENEGRO

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Climate change is a current topic, both in science and in public opinion. This paper will analyze changes in temperature and precipitation in Montenegro during the instrumental period and projections until the end of the 21st century. For the purposes of this study, the percentile method was applied to daily temperature and precipitation data. In the study of contemporary climate change, the World Meteorological Organization recommends this method because it uses the same empirical distribution of daily extreme temperatures and precipitation, allowing for comparisons of results from different locations worldwide. The results showed a significant warming trend in Montenegro, as the number of cold days and nights (Tx10p and Tn10p) decreased, while the number of hot days and nights (Tx90p and Tn90p) increased. Regarding precipitation, during the observed 60-year period (1961–2020), the trend in the number of very wet, moderately wet, moderately dry, and very dry days (R95p, R75p, R25p, and R5p) was minor and mostly statistically insignificant. However, despite the negligible changes in precipitation percentile indices, it should be noted that Montenegro has experienced mild aridization over the past 60 years. Regarding temperature projections, data from three Regional Climate Models (ALADIN, REMO, and CCLM4) for the period 2021–2100, according to RCP4.5 and RCP8.5 scenarios, were used. The results indicate that the period 2021–2050 is expected to be even warmer than before, with further warming projected for the period 2051–2100, with the warmest conditions expected towards the end of the 21st century, i.e., in the period 2081–2100. For precipitation, results from ALADIN, HIRHAM, and RACMO projections for Podgorica were used. Predicted changes in the examined precipitation parameters until 2100 are mostly insignificant. In conclusion, the results have shown high model agreement for temperature, while precipitation projections are more complex, with qualitative and quantitative differences visible in modeling future precipitation changes. Overall, significant warming implies increased water evaporation, which, coupled with additional aridization (albeit mild), may pose challenges to the functioning of natural systems, human life, and activities.

Keywords: temperature; precipitation; observed changes; projections; Montenegro

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Abstract

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REVISED THORNTHWAITE CLIMATE CLASSIFICATION FOR MONTENEGRO (1961–2020)

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The main objective of this paper is to perform a bioclimatic delineation of regions with varying degrees of humidity in Montenegro using the Thornthwaite Moisture Index. A dataset spanning 60 years (1961–2020) was utilized, comprising air temperature and precipitation sums from 18 meteorological stations (MS). The homogeneity of the data was examined using the methods MASH v3.02 and MISH v1.02. For determining the climatic classification categories, the 60-year period (1961–2020) was divided into two standard climatic sub-periods: 1961–1990 and 1991–2020, to detect any changes in the spatial distribution of climates. The analysis was conducted on a multi-year monthly level. Calculations were performed using the software package PAST 4.13, and maps were drawn using QGIS 2.8.1. For the mathematical modeling of the cartographic representation of Thornthwaite's climatic classification, the Inverse Distance Weighted (IDW) geostatistical interpolation method was used. The hythergraph method was used for graphical representation of stations as typical representatives of climates in the Thornthwaite classification system. The results obtained for the 60-year period indicate that the Thornthwaite Moisture Index (PE) has values ranging from 631.5 (MS Crkvica), indicating a humid (A) climate with forest and persistent rain, to 95 (MS Pljevlja), indicating a humid (B) climate with forest vegetation. The majority of MS in Montenegro show values of this index that classify them into a humid (A) climate. The average value of the Thornthwaite Moisture Index (PE) at 18 MS for the 60-year period is 198.3, indicating that the climate of Montenegro during this period was humid with forest and persistent rain. According to the Thornthwaite Moisture Index (PE), the lowest effects were detected at stations in the north and northeast of Montenegro (MS Pljevlja, MS Berane, MS Bijelo Polje, MS Rožaje, and MS Plav), as well as at MS Ulcinj and MS Bar, while the highest effects were recorded at stations in the southwest and west of the territory. This can be related to the spatial distribution and precipitation regime in Montenegro. For each MS, Thornthwaite's climatic formula was determined for the 60-year and two 30-year sub-periods, with changes in the climatic formula between the observed periods specifically marked.

Keywords: climate classification; potential evapotranspiration; IDW method; Thornthwaite; Montenegro

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PERMAFROST AND VEGETATION INTERACTION DURING CLIMATE WARMING IN THE ARCTIC: KEY STUDY FROM CHUKOTKA (NORTHEAST RUSSIA)

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Contemporary climate changes are several times more intense in the Arctic than the global average. That is reflected in the rapid change in natural conditions at high latitudes. Vegetation is both a sensitive indicator of changes in external impacts and a factor that determines the conditions of heat exchange between the atmosphere and underlying rocks. Ground covers are as powerful regulator of permafrost conditions as climate change. The observed climate warming leads to a noticeable restructuring of typical and mountain tundra landscapes which occupy vast areas of northeast Russia. The evolution of vegetation manifests on a scale of decades and can provoke both positive and negative feedbacks, which affects in its order the parameters of the seasonally thawed (active) layer of the soils and the state of permafrost.

This study is an analysis of long-term trends in climate change compared with the dynamics of seasonal soil thawing depth and changes in vegetation composition within two key monitoring sites included in the Circumpolar Active Layer Monitoring program (CALM)—R27 Lavrentiya and R41 Lorino. The sites are located in the typical tundra landscapes of the coastal plains of the Chukotka Peninsula (Chukchi Autonomous Okrug, NE Russia). They are squares with an area of 1 hectare and a grid of nodes located every 10 meters (121 nodes in total). Monitoring of seasonal soil thawing was carried out with the method of mechanical soil probing at the peak of maximum development of the active layer (August–September) during 2000 to 2024 period. Vegetation cover was studied by field methods for the period from 2013 to 2024. The projective cover of vegetation was determined at each of the 121 grid points at the peak of the growing season (late July, early August) for the main species, including mosses and lichens (13 species in total). Climatic variations were determined for the period from 2000 to 2024 based on data from the

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nearest weather station in the community of Uelen. Regional climate changes were determined using NCEP/NCAR reanalysis data. Changes in background vegetation around the monitoring sites were determined within the key polygon (172 km^2) with the NDVI index, which was calculated for each peak of the growing season from 2000 to 2024. The obtained results show that at the background of a rapid increase in air temperature (0.72 °C/decade), the thickness of the active layer had been growing at a rate of 0.5–1.5 cm/year. Changes in permafrost-climatic conditions in the northeast of Russia led to changes in vegetation cover, which mainly affected species that are indicators of insufficient or excessive moisture.

Keywords: Arctic; permafrost; climate change; tundra; Chukotka

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Abstract

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AN OVERVIEW OF RECENT RESEARCH ON THE LJUBLJANA HEAT ISLAND

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Research into Ljubljana's urban heat island has gained momentum in recent years. After a preliminary study in winter 2020/2021, the Department of Geography of the Faculty of Arts, University of Ljubljana and its partners conducted a more extensive study in 2021/2022 to compare the intensity of the heat island in the period 1998–2022.

While in 1998 the most intense heat island occurred in December, in 2021/2022 winter is the season with the mildest heat island (4 °C), fall the second strongest (5.1 °C), and summer with the strongest heat island (5.9 °C) in anticyclonic weather. Summer thus maintains similar values, while winter becomes weaker, which is a consequence of climate change and the increasingly green and mild winters in Ljubljana. The measurements have also shown that while the heat island in Ljubljana retains the uniform shape observed in 1998, the secondary peak in the east of the city is becoming stronger. When the heat island is less pronounced, it has the shape of a Y, but when it becomes stronger, it takes on the shape of an X.

Once we determined the basic characteristics of the heat island and its extent, we began mapping the heat island in real time in 2024. The 2020/2021 and 2021/2022 studies were based on a combination of mobile bicycle and car measurements supplemented by stationary measurements. The most recent study is based on a dense network of stationary measurements in the urban area. The main aims of this study are the dynamic mapping of the urban heat island in real time and the identification of hotspots in the city where urban heat island mitigation measures are needed to reduce heat stress during the summer months.

Keywords: urban climate; urban geography; Ljubljana; heat stress; urban land use

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Abstract

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CHANGES IN THE WATER REGIME OF LAKE SKADAR IN THE PERIOD 1948–2021

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Lake Skadar is the largest limnological feature on the Balkan Peninsula, and in Montenegro, it holds the status of a national park and is listed on the Ramsar list as an extremely important wetland area. The aim of the study is to analyze the trend of changes in the water levels of Lake Skadar and determine the possible influence of atmospheric and oceanic oscillations on the hydroclimate of the observed area over the past seven decades. The results obtained have shown a significant trend of decreasing mean monthly water levels of Lake Skadar, consequently affecting its seasonal and annual levels. It has also been determined that in the last 15 years, Lake Skadar has experienced both its highest (2010) and lowest (2017) water levels in the entire instrumental period (since 1948). Therefore, in the long term, the water level is decreasing, while in the short term, the frequency of extreme events is increasing. The reasons for the alarming decrease in the water level of Lake Skadar should be sought in changes in precipitation and temperature in its basin. The research has shown a significant increase in air temperature in the lake's basin, while there are no significant changes in precipitation. There is no doubt that the significant warming has led to increased evaporation of water from the lake and its basin. Furthermore, the results have shown that atmospheric and oceanic oscillations influence the hydroclimate of the observed area (water level, precipitation, and temperature). A statistically significant relationship between the lake's water level, precipitation, and temperature in its basin was found in winter with AO, NAO–slp, NAO–500, MOI–1, MOI–2, WeMO, EAWR, SNAO, and SCAND. Temperature variability in summer and autumn is influenced by AMO, while the influence of EA on this parameter is felt throughout all seasons. No statistical correlation was found with any of the considered parameters with indicators of ENSO phenomenon (NINO3.4 and SOI). Regardless of the possible causes of the variability in Lake Skadar's water levels (climate change or natural cycles), decision-makers need to take measures for sustainable management of its hydrological system.

Keywords: water level trend; teleconnections; Lake Skadar

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Abstract

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ASSESSMENT OF SURFACE WATER QUALITY IN HIGHLY URBANIZED AREAS: A CASE STUDY OF THE VLADAYSKA RIVER, SOFIA

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River water quality is one of the current topics of theoretical and applied hydrology, ecological and urban hydrology, and one of the main problems in the planning and management of water resources. The chemical, physical, and biological characteristics of surface water, based on standards for its use, are related to human health, food production, wetland ecosystems, economic development, and social growth in our communities. The question of the quality of surface water in urban areas, where a combination of point and diffuse sources of pollution is registered, is particularly acute. Both organic pollution and heavy metal contamination remain unsolved problems facing the water resources management sector in Bulgaria. Thus, the objective of the current work is to analyse the quality of surface water in urbanized territories by examining the current hydro-ecological condition of river Vladayska through the application of the CCME Water Quality Index and Principal Component Analysis (PCA). The water quality index of the Vladayska River at two points (before and after the city of Sofia) has been calculated based on monthly measurements of 15 physicochemical parameters for the period 2010–2021. The obtained results establish a strong anthropogenic pressure on the river waters and deteriorated water quality, after Sofia city, regardless of the presence of a water treatment facility. The results show that the main indicators affecting the water quality are the increased concentrations of phosphorus and nitrogen compounds. The main source of phosphorus is most often domestic and industrial wastewater, while the source of nitrogen is pollution from leachate from septic systems and urban runoff. Seasonal differences in pollutant concentration were also found depending on hydrological conditions and changes in the intensity of anthropopressure. The results also indicate that fluctuations in the concentrations of dissolved chemical substances in river waters depend on several hydroclimatic factors. Studying these relationships would provide a better understanding of the dynamics of pollutants and the conditions under which the concentrations of specific dissolved substances are expected to exceed the permissible norms.

Keywords: river pollution; urban territories; water quality assessment; Principal Component Analysis

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Abstract

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ASSESSMENT OF FLOOD LOSS IN ADMINISTRATIVE UNITS BASED ON IMPROVED VULNERABILITY CURVES

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Floods are among the most common natural disasters worldwide and cause significant losses under climate change. Advanced flood loss assessment helps to improve flood prevention and relief systems. The vulnerability curve is one of the main methods for flood loss risk assessment. However, existing vulnerability curves are mostly established on a large spatial scale, ignoring the intraregional difference in vulnerability. This study aims to quantify the spatial heterogeneity of vulnerability within the region and to clarify the impact and changes of vulnerability on flood loss. Choosing Hubei and Hunan Provinces in China as study areas, this study built vulnerability curves using the mixed-effects model. Then, vulnerability curves and flood intensities under different return periods were combined to assess flood losses. The impacts of vulnerability and flood intensity on flood losses were also analyzed. The results show that 1) the mixed-effects model can be employed to construct separate vulnerability curves for smaller-scale administrative units (cities) while assessing the overall vulnerability of the study area, and the results are more accurate, with R^2 values above 0.75, 2) With the increasing return period, the differences in loss rates between cities increase, and 3) Vulnerability difference between cities is the dominant factor influencing flood losses of cities with low return periods. However, with the increasing return period, the difference in hazard intensity between cities exerts a greater impact on city flood losses. This study provides methods and suggestions for systematic flood risk reduction and climate resilience construction path proposal.

Keywords: disaster loss; vulnerability; flood hazard intensity; spatial heterogeneity; mixed-effects model

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Contemporary theoretical and methodological approaches in geography

Abstract

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USING MACHINE LEARNING IN STUDYING THE IMPACT OF SOLAR ACTIVITY ON EARTH

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Solar activity can significantly impact the Earth's atmosphere through variations in electromagnetic radiation and solar energetic particles (SEPs). While the investigation of connections between electromagnetic radiation and Earth's atmosphere has a long history, recently, there has been a growing interest in research on the rapid impact of SEPs on the weather and climate of the Earth. Entering the atmosphere, fast SEPs originating from a coronal mass ejection and coronal holes can increase ionization rates and affect the atmosphere's processes. Although the penetration of SEPs into the magnetosphere in the Earth's polar area is recognized, how exactly they spread and disperse over air masses and move toward the Earth's surface is still unclear. The recent availability of a large amount of satellite data monitoring the processes between the Sun and the Earth and the development of machine learning (ML) algorithms have made it possible to process massive amounts of data and to find precise patterns and trends that are not recognizable using traditional techniques based on known physical laws. Several studies using different ML techniques have been conducted at the Geographical Institute "Jovan Cvijic" (GIJC) SASA to investigate the functional dependence between factors characterizing solar activity and the occurrence of forest fires, hurricanes, and precipitation-induced floods. The underlying premise of these investigations is that Earth's atmosphere is affected by any magnetic field energy and particles ejected from the Sun's geoeffective position. Due to the high risk to people and their property, as well as indications that floods will become more frequent in the future, the investigation of a possible link between solar activity parameters and precipitation-induced floods is of particular interest. In GIJC, floods in the United Kingdom and across Europe have been investigated. Studies used classification ML modeling and took into account the time delay between outbreak SEPs and the effect on the atmosphere. It has been shown that classification ML algorithms are valuable tools for establishing the nonlinear relationship between SEPs and precipitation-induced floods, and they can explain the appearance of the precipitation that may cause floods up to nine days in advance with accuracy between 81% and 91%.

Keywords: solar activity floods; machine learning; modelling

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MODELS OF ADAPTATION OF THE POPULATION OF INTRA-CONTINENTAL MOUNTAINOUS REGIONS OF EURASIA TO CLIMATE-INDUCED ENVIRONMENTAL CHANGES

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Climate change issues are integral part of living for population in intra-continental regions of Eurasia, including highland regions of Altai. Elaboration of effective mechanisms of adaptation of population, and models, reflecting interdependence and mutual influence of climate and human behavior, is based on glaciological measurements and sociological analysis of subjective evaluations and opinions about climate, conducted in 2022–2024 in three regions of the Altai Mountain country (Republic of Tyva, Republic of Altai, and Altai Krai, *n* = 1,345). Comparison of the parameters of nature management, socio-economic indicators, peculiarities of landscape organization, and climatic changes concerning glacier melting allowed to identify seven types of settlements. Further analysis tested hypotheses on interdependence between dominant types of landscapes, climate risks, demographic, socio-economic conditions, perception of climate and weather, and behavioral strategies in the sphere of adaptation towards climate-induced changes in nature and economic life. Based on the results of the study, models of adaptation of the population living in different types of landscape structures of the Altai mountainous country were built by means of structural equation modeling methods. The research mostly covered regions with outsider socio-economic positions, low standards of living, undeveloped social and cultural infrastructure, low availability of labor and social services, high rates of ageing and migration (especially in Altai Krai), alcoholization and crime (Republic of Tyva). The urgency of climate change is more often recognized in the Altai Republic. Residents note significant changes occurring in different seasons, with the amplitude being almost equally high in both cold and warm periods. The population of the internal Altai regions has differentiated ideas about climate, determined by the characteristics of the landscape and proximity to the zone of melting glaciers and permafrost. Some negative phenomena associated with precipitation, floods, changes in temperature regimes, including negative impacts on nature use and public health, are already clearly felt, but not yet perceived as catastrophic. The research articulates a need for developing effective climate adaptation programs taking into account not only landscape features of specific locations, but also public awareness and ethnic peculiarities of population, their social vulnerabilities, and decreasing adaptive resources.

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Keywords: climate change; models; adaptation; Altai Mountain country

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Abstract

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COMPARATIVE ANALYSIS OF TERRAIN PASSABILITY MODELS: EVALUATING HIGH-RESOLUTION AND LOW-RESOLUTION GEOSPATIAL DATA FOR UGV NAVIGATION

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This study investigates the resolution threshold limits of terrain passability maps, determining their applicability for unmanned ground vehicle (UGV) navigation and their usability for larger, human-operated vehicles. The research compares the effectiveness of high-resolution data, including 0.1 m Digital Terrain Models (DTM) derived from LiDAR and photogrammetric point clouds, with medium- to low-resolution satellite imagery and Digital Elevation Models (DEMs). The focus is on identifying the resolution at which passability maps remain effective for UGVs and the point at which lower resolutions become suitable only for larger vehicles due to the loss of necessary details for precise navigation. Additionally, the study explores the impact of environmental variability on passability assessments, considering factors such as seasonal changes and varying weather conditions that can significantly alter the usability of different resolution maps.

By examining the influence of terrain features—such as slope, terrain indices, soil conditions, land cover, hydrological features, and road networks—on vehicle passability, the study aims to establish a clear threshold. This threshold defines the transition between maps suitable for UGVs and those more appropriate for more extensive, human-operated vehicles. The study utilises a multi-criteria decision-making (MCDM) approach, with GIS, CAD software, and Python programming language employed to process and analyse the geospatial data. The results are synthesised into passability maps with varying resolutions, highlighting the advantages and limitations of each. The findings demonstrate that high-resolution data are crucial for producing reliable passability maps for UGVs, while medium- to low-resolution maps may suffice for larger vehicles, particularly on less complex terrains.

This research offers valuable insights for different applications in which the accuracy of terrain passability assessments is critical for operational success. By establishing the resolution limits of passability maps, this study contributes to optimising vehicle navigation across diverse terrains, ensuring the appropriate use of geospatial data based on vehicle type, operational requirements, and environmental conditions.

Keywords: Terrain Passability Thresholds; Multi-Criteria Decision-Making (MCDM); Geospatial Data Resolution; UGV and Human-Operated Vehicle Navigation; High-Resolution Land Cover Modelling

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Abstract

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UAV-BASED GEOSPATIAL MONITORING OF KUKLICA NATURAL MONUMENT (NORTH MACEDONIA)

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This research investigates the deployment of small Unmanned Aerial Vehicles (UAVs) for precise geospatial monitoring of Kuklica, a natural monument located near the town of Kratovo, North Macedonia, renowned for its distinctive earth pyramids. Designated as a natural monument in 2008 for its significant scientific and cultural value, Kuklica's limited area of 0.8 km² poses considerable challenges for conventional monitoring techniques, such as satellite imagery and digital elevation models (DEMs). This study employs small UAV technology to capture high-resolution aerial imagery to address these limitations. A meticulously crafted flight plan, incorporating specific parameters for UAV altitude, camera angles, and imaging intervals was executed to ensure comprehensive data acquisition. Ground control points were strategically placed to enhance the accuracy of the geospatial data. The UAV imagery was processed to generate high-resolution geospatial products, including a 0.1 m precision DEM and orthophoto, combining both in a 3D model. This detailed analysis facilitated the identification of over 100 earth pyramids, with heights ranging from 1 to 8.4 m. A detailed 3D model of the largest pyramids was created, and its accuracy was validated through measurements from the LiDAR module of the iPhone 14 Pro mobile. Additionally, the study assessed erosion rates and identified anthropogenic influences that could contribute to site degradation. The research emphasizes the effectiveness of UAV technology for monitoring and geospatial analysis of geosites and provides a comprehensive framework for ongoing conservation efforts to preserve Kuklica's unique geological and geomorphological features.

Keywords: drone survey; geosites; LiDAR; orthophoto; geospatial monitoring; Kuklica; earth pyramids; DEM; erosion assessment; conservation efforts

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Abstract

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MEASUREMENT OF THE INTENSITY OF SURFACE CARBONATE CORROSION PROCESS USING ROCK TABLET METHOD IN NORTHERN VELEBIT NATIONAL PARK AND NORTH DALMATIAN PLAIN (CROATIA)

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To measure the intensity of surface carbonate corrosion and better understand the formation of karst landscape, rock tablet method has been used since the 1950s. This simple and versatile method can be applied in all karst areas with equal reliability of measurement results. Thus, it was widely accepted among geomorphologists, and consequently, the Commission for Karst Denudation normalized its application during the 7th International Speleological Congress (held in 1977 in Sheffield, UK).

The intensity of surface carbonate corrosion was investigated in three areas (20 locations in total) that differ in their climatic, pedogeographical, and biogeographical characteristics: Northern Velebit National Park, Modrič cave area, and on the North-Dalmatian Plain. Locations of study sites range from sea level (20 m a.s.l.) to the peak zone of Northern Velebit area (1,600 m a.s.l.) and are dominantly made of carbonate rocks: limestone, breccia (Jelar beds), and conglomerate (Promina beds) with a very high proportion of older carbonate rocks, and dolomite.

The measurements were done using "standard" rock tablets and those of local lithologies. "Standard" rock tablets are made of Upper Cretaceous (Senonian) limestone from a quarry near Lipica (Slovenia) having 97.9–98.7% $CaCO_3$. Those rock tablets are 42 mm in diameter, 3–4 mm thick, and have been used worldwide, providing relative weathering rate, and allowing comparison of results with other locations or climates. In order to obtain absolute weathering rates, we used rock tablets made of local lithologies.

Keywords: Northern Velebit National Park; North Dalmatian Plain; carbonate rocks; intensity of carbonate corrosion; denudation; rock tablets

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Abstract

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SMART-MOBILE-BIOMETEOS, A MOBILE BIOMETEOROLOGICAL STATION DESIGNED FOR THE MICROMETEOROLOGICAL MEASUREMENTS

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Bioclimatological research in the Western Balkans (formerly Yugoslavia) dates back to 1962, when Pavle Vujević published *Contributions to the Bioclimatology of the Kopaonik Region*. As one of the founders and participants in the Congress of Slavic Geographers, Vujević's work introduced bioclimatology (medical climatology) as an independent branch within general climatology, combining equivalent temperatures and air cooling simple indices. Over time, this discipline has evolved and gained prominence together with human biometeorology, offering a more detailed understanding of how multiple meteorological factors impact humans simultaneously.

Sixty-two years later, heat waves have emerged as an invisible natural disaster and one of the most significant threats to human health regarding weather and climate. Research in human biometeorology and bioclimatology plays a critical role in understanding the effects of heat stress on people, identifying air temperature, radiation temperature, humidity, and air velocity as four key variables in the human environment that influence the body's response to external conditions. These factors along with metabolic energy from physical activity and the clothing, collectively determine a person's thermal balance with the environment. Based on this concept, several bioclimatic models have been developed in the past three decades to assess thermal comfort and heat stress. Among all the mentioned parameters, longwave and shortwave radiation, summarized as Mean Radiant Temperature (MRT), have the greatest impact on subjective thermal sensation, and are often not represented as data sources in research.

In recent years, increasingly hot summers have resulted in longer, more intense, and frequent heat waves. The challenge of extreme heat exposure, particularly in urban areas, emphasize the need to improve the resilience of the population. This is demonstrated in the concept of "resilient cities," designed to to mitigate the undesirable effects of extreme heat, heat waves, and air pollution. A key requirement for effective heat mitigation measures is the assessment of heat stress. An optimistic approach involves direct monitoring of micrometeorological conditions, which can offer precise spatial data on the distribution of heat stress in urban environments.

This paper aims to present a low-cost smart IoT mini mobile Biometeorological Station named sMaRT-mobile-BioMeteoS, equipped with hardware and software sensor configurations for micrometeorological measurements. The mobile biometeorological station is based on a Raspberry Pi computer which systemically integrates various microcontrollers

with sensors to collect micrometeorological parameters relevant for determining heat stress and air quality assessment parameters. The micrometeorological parameters measured by the sensors include air temperature (Ta), relative humidity (RH), wind speed (v), globe temperature (Tg), and UV radiation intensity, while the air quality parameters are particulate matter PM 2.5 and PM10. The entire system is equipped with a GPS module that provides real-time spatial and temporal data.

Keywords: sMaRT-mobile-BioMeteoS; mobile biometeorological station; heat stress; air quality

Abstract

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REMOTE SENSING DATA ANALYSIS OF DEBRIS FLOWS IN DRAINAGE BASINS IN BULGARIA

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The present study is focused on remote sensing data analysis of the factors for formation and development of debris flows in various mountain drainage basins in Bulgaria. The extent of susceptibility to the formation and development of debris flows in the range of selected mountain key sections of the drainage basins was investigated and a risk assessment was carried out. The relevance of the present study is related to the frequency of adverse hydro-climatic phenomena of natural and anthropogenic origin in the last decade in different parts of Bulgaria—Asparuhovo (2014), Karlovo (2022), Berkovitsa (2023), Tsarevo (2023), etc. Similar events cause lasting damage to infrastructure, economy, and public life, and sometimes lead to human casualties.

The role of geological-geomorphological factors, water runoff, and land cover was studied. A morphometric analysis of the relief was carried out in order to obtain specific values of the morphometric characteristics of the drainage basins and the channel networks. To achieve the goal of the study, an analysis and synthesis of scientific literature on risk, hydro-climatic, and geomorphological phenomena in the studied drainage basins was carried out.

GIS methods were used to calculate morphometric indicators/parameters (such as area, perimeter, length and width of the drainage basin, hypsometric integral, Melton ratio, total length of the river network (km), total number of tributaries (N), circularity ratio, bifurcation ratio, density of the river network (km/km^2), frequency of streams (count/km^2), etc.) and for calculation of the Normalized Difference Vegetation Index (NDVI). Hydrological modeling was carried out in order to extract the channel networks. The channel networks were classified by stream ordering.

GIS analysis is done on the basis of SRTM Digital Elevation Model (DEM), Landsat multispectral satellite images, topographic maps, geological map, etc. Mapping and risk assessment of debris flows has been carried out which is a first step in disaster risk reduction and management.

Keywords: debris flow; morphometric analysis; drainage basin; risk assessment; remote sensing

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Abstract

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IMPORTANCE OF SPECIES DISTRIBUTION MODELLING IN NATURE CONSERVATION: CASE STUDY OF GLACIAL RELICT THREE-TOED WOODPECKER *PICOIDES TRIDACTYLUS*

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Identifying geographic areas with habitats suitable for the presence of priority species is of essential importance in conservation planning. A useful tool to identify these areas is a species distribution modelling (SDM), which is a method that defines statistical relationship between species records and environmental variables in the localities where the species is present. To test the possibility of applying this method in conservation planning, this study focused on the Three-toed Woodpecker *Picoides tridactylus* (Linnaeus, 1758) (Piciformes: Picidae) because it is a glacial relict on the Balkan Peninsula that is distributed only in montane coniferous and mixed forests with significant amounts of dead wood. As a habitat specialist, it is vulnerable to environmental changes, making it a suitable indicator species for forests with natural properties. These forests are threatened by modern forestry which removes the dead wood necessary for the Three-toed Woodpecker's survival, and land-use changes, such as urbanisation of mountains. Moreover, as a glacial relict, this species is threatened by global warming which represents a challenge for its future survival. The results show that highly and moderately suitable habitats (habitat categories essential for specialist species) have the smallest areas in total suitability of the Balkan Peninsula. Along with their limited presence, what makes conservation of these habitats more difficult is the fact that their distribution is mostly fragmented. For these reasons, ensuring their preservation and connectivity of given habitats should become a conservation priority. Geographic areas deemed important by SDM, such as the Dinarides mountain range in our case study, can be used as a focus for further research and field trips, thereby saving both time and resources. Another advantage of this method is that it can be used to assess the impacts of climate change on species distribution by creating future projections using global climate models. Distribution models can also be used to evaluate the effectiveness of protected areas. These examples demonstrate that using SDM can produce the knowledge necessary for conservation, which makes this method useful in nature conservation and planning.

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Keywords: habitat conservation; conservation planning; species distribution modelling; Balkan Peninsula

Environmental protection

Abstract

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ENVIRONMENTAL ISSUES AND GEOGRAPHICAL UNDERSTANDING

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Environmental issues are in focus of many scientific disciplines. An increasing number of academic papers emphasize the significance of geography in the study of environmental problems, which many authors believe has been overlooked. As an analytical framework for the study of the relations between nature (environment) and society (human being), new scientific concepts such as coupled human and natural systems, social-ecological systems, a sociobiophysical systems, human-natural systems, and human-environmental systems, that have attracted scientific attention, are developed in recent decades. These concepts are structured by the appreciation of the interdependence of nature and society. Study of interactions between natural and social systems, which is one of the epistemological principles of geography, is recognized as essential in explaining of two coupled systems dynamics, i.e., understanding of the complex processes between them (feedback mechanisms). Furthermore, existing environmental studies are based on interdisciplinary approach. Precisely, the integrative and interdisciplinary nature of geography distinguishes it as a scientific discipline from others disciplines. All of the above leads to the clarification of the objective of this paper, based on a literature review: to re-emphasize the importance of geography, i.e., to reaffirm geographical (holistic) thinking in the study of the environment.

Keywords: environment; geography; concepts; interdisciplinary approach

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Abstract

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DEVELOPMENT OF LANDSCAPE STUDIES IN BELARUS: TRADITIONS AND MODERNITY

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The initial stage of studying the landscapes of Belarus was marked by the works of the well-known geographer, Professor A. A. Smolich (1925). The foundation and development of landscape research in the country took place at the Belarusian State University at the Department of Physical Geography (1934), which was renamed the Department of Physical Geography of the USSR (1961), and later became the Department of Geographical Ecology (since 1999).

The development of landscape research in Belarus can be divided into several stages: 1) the publication of the first scientific works describing the geomorphological features of natural systems in Belarus (1920s–1930s); 2) the organization of initial research into the morphological structure of landscapes and the development of methods for their mapping (1950s); 3) the identification of patterns in the formation and spatial distribution of landscapes for their classification, and the organization, under the guidance of Professor V.A. Dementyev, of expeditions involving faculty members and students from the geography department, which collected data over 10 years in key areas with diverse landscape conditions (1960s–1970s); 4) the establishment of a scientific school of landscape research (1974); 5) the systematization of collected materials, development of structural-genetic classification of landscapes (1980s), with publication of the first landscape map of Belarus at a scale of 1:600,000, initiation of studies on anthropogenic landscapes, development of methods for their mapping and classification, and publication of scientific monographs "Anthropogenic Landscapes of Belarus and Bulgaria" (1983) and "Landscapes of Belarus" (1989); 6) the formation of anthropogenic landscape studies (1990s); 7) the integration of landscape and environmental research, studying problems related to anthropogenic transformation of landscapes (2000s–2010s); and 8) the enhancement of the environmental and geo-information component of landscape research, including mapping and environmental assessment of urban landscapes of Minsk, several industrial and small towns, conducting large-scale GIS mapping of national parks, and research on the formation characteristics of cultural landscapes in Belarus (2020s).

Keywords: natural landscape; anthropogenic landscape; mapping; classification; environmental assessment

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Abstract

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THE DEVELOPMENT OF ENVIRONMENTAL THOUGHT IN SLOVENIA

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The development of environmental thought in Slovenia has evolved significantly over the past century, shaped by key milestones and socio-political shifts. This paper examines this progression, from early nature conservation efforts to contemporary environmental policies, within global and European contexts. Within the Kingdom of Serbs, Croats, and Slovenes, the initial phase began in 1920 with the nature protection program by the Museum Society, which was based in Ljubljana, a pioneering document on an international level. The 1960s were critical, with growing public awareness in the Western world influencing Slovenian environmental thought within the context of socialist Yugoslavia, spurred by works like Rachel Carson's Silent Spring (1962) and Garrett Hardin's The Tragedy of the Commons (1968). In the early 1970s, environmental concerns gained prominence due to deteriorating conditions and global movements. During the socialist period, environmental issues were often subordinated to rapid industrialization. However, the 1980s saw increased environmental activism in Slovenia, addressing pollution from industrial activities such as the Krupa River contamination and waste disposal of the uranium mine at Žirovski vrh. This era also saw the establishment of the Greens of Slovenia, which gained 8.8% of the vote in the 1990 elections, marking a strong green political presence. A significant shift occurred following Slovenia's independence from Yugoslavia in 1991, with the adoption of the Environmental Protection Act in 1993, incorporating principles of sustainability and preventive action. Slovenia's accession to the European Union in 2004 further solidified its environmental framework, aligning national policies with stringent EU standards and promoting sustainable development and public participation in governance. The 2008 economic crisis posed additional challenges, temporarily sidelining environmental issues as economic concerns took precedence. However, it also underscored the need for sustainable economic models, integrating environmental considerations into recovery efforts. The decade from 2010 to 2020 saw further integration of environmental policies, emphasizing renewable energy and sustainable practices. Public engagement and environmental education became more prominent. The European Green Deal, launched in 2019, plays a crucial role in Slovenia's environmental strategy, aiming to make Europe climate-neutral by 2050. Slovenia has embraced this initiative, focusing on green technologies and sustainable practices, and integrating these principles into national policies.

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Keywords: environmental thought; environmental awareness and behavior; nature protection; pollution; sustainability

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Abstract

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FOREST CARBON PROJECTS: ECONOMIC AND ENVIRONMENTAL DIMENSIONS

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In light of global initiatives on decarbonization, such as the UN 2030 Agenda and the Paris Agreement, Carbon Forests Projects envisaged to play a crucial role in national climate change mitigation strategies. Russia's decarbonization policy is based on the Strategy for Socio-Economic Development of the Russian Federation with Low Greenhouse Gas Emissions until 2050 and the Climate Doctrine of the Russian Federation and focuses to coordinate national legislation to climate goals. Carbon Forest Projects (CFPs) are one of the promising tools aimed at implementing climate change mitigation plans at corporate level.

The possibility to develop CFP as a tool to achieve carbon neutrality on example of the Bystrinsky Mining and Processing Plant (MPP), located in one of the regions of southern Siberia (Zabaikalie) is analyzed in the article. The estimation of forests' ability to absorb greenhouse gas emissions was based on the ROBUL methodology, recognized by the Intergovernmental Panel on Climate Change (IPCC) as the most suitable for assessing CO_2 absorption and accumulation by forests.

Along with the positive environmental impact due to their contribution to climate change mitigation, CFPs contribute to strengthening the image of an environmentally friendly company by receiving a so-called "carbon credits".

The cost-benefit analysis (CBA) of this activity in Zabaikalie shows a significant excess of costs over benefits. The profitability CFPs in Russia is associated with the extension of managed forests, since it will increase the accuracy of the absorption potential estimation. Another important factor is the development of a system of carbon credits and quotas. Reforestation is the least effective type of forest projects in Russia, due to its comparative high cost, and afforestation projects are more effective. The most promising types of CFP in Asian part of Russia are projects reducing the risk of forest fires and increasing the efficiency of forest management.

The identification and comprehensive assessment of the environmental and economic results of CFPs in the context of carbon neutrality will contribute to the transition to a green economy in Russia.

Keywords: decarbonization; reforestation; afforestation; carbon footprint

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Abstract

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PUTTING STRATEGY INTO PRACTICE: TOWARDS A BETTER UNDERSTANDING OF SOLAR POTENTIAL AND A MORE REALISTIC ENERGY TRANSITION FOR SERBIA

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The New Energy Sector Development Strategy of Serbia aims to boost the use of renewable energy sources (RES) by 2040, with wind and solar accounting for a considerable share of overall electricity output. With the adoption of the Law on the Use of RES in 2021, investor interest in wind farms and solar facilities has increased, as indicated by the number of submitted requests for connection to the transmission system, whose installed capacity is 24 GW. Despite high interest and favorable yearly insolation conditions, the total capacity of network-connected solar power plants in Serbia surpassed 100 MW for the first time in May of this year. Ground-mounted photovoltaic power plants (PVPPs) account for half of all installed solar capacity in Serbia. Further development of PVPPs could pose a threat to land, as well as to protected natural and cultural values if their spatial distribution is not properly planned.

This paper examines some of the most important factors for selecting solar PV sites and how they can be integrated into the assessment model. All factors were divided in two main groups: 1) constraints (sloped terrain, densely populated areas, forests, flood zones, protected natural and cultural heritage, etc.), and 2) evaluation factors (solar irradiation, air temperature, terrain slope and aspect, soil, distance from surface waters, and proximity to roads, electricity infrastructure and places of consumption). The novelty of this study is reflected through the incorporation of ecological production values of different soil types into the model. In this way, high-natural-fertility soils can be preserved for agricultural use or agro photovoltaic projects, while others can be utilized for developing PVPPs.

The integration of all these factors in the GIS environment enables the development of a spatial offer that maximizes the efficient utilization of solar energy with minimal conflict with other activities or protected areas. Mapping the optimal locations for PVPPs would not only serve to improve recognition of national and local solar potential, but will also allow for the prioritization of solar projects in order to meet the energy and climate targets on time.

Keywords: renewable energy; solar energy; constraints; evaluation factors; photovoltaic power plant

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Abstract

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IMPLEMENTING PARTICIPATORY GOVERNANCE IN WETLAND MANAGEMENT: THE SEČOVLJE SALINA NATURE PARK, SLOVENIA

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Wetlands are dynamic ecosystems with significant ecological, social, and economic importance, often facing degradation due to human activities. The study introduces the concept of a Wetland Contract, a voluntary agreement aimed at ensuring sustainable wetland management through stakeholder participation. The Sečovlje Salina Nature Park serves as a case study to demonstrate this approach.

The study follows a structured methodology comprising two main stages: preparation and implementation. The preparation stage includes analyzing the regulatory framework, describing the pilot area, and conducting a stakeholder analysis. The implementation stage involves organizing Territorial Labs, scenario planning, and developing the Wetland Contract. The Territorial Labs were public meetings designed to establish participatory governance, adapted to an online format due to the COVID-19 pandemic.

The project targeted around 200 potential stakeholders in the hinterland of Sečovlje Salina Nature Park, with 34 participating in the Territorial Labs and 16 signing the Memorandum of Understanding (MoU). The MoU, a less binding form of the Wetland Contract, focused on systematic cross-sectoral participation to address conflicts between stakeholders with varying interests. The study highlighted the importance of stakeholder education and engagement, revealing that many stakeholders had limited knowledge and experience with inclusive governance processes.

The study encountered challenges such as stakeholder unfamiliarity with the Wetland Contract concept and limited digital access, which excluded some groups from participation. Despite these obstacles, the participatory approach successfully facilitated dialogue and cooperation among stakeholders, demonstrating potential for broader applications in wetland governance.

The study concludes that the Wetland Contract method, implemented through a participatory and inclusive approach, can effectively enhance wetland management. The Sečovlje Salina Nature Park case study illustrates the method's potential to reconcile environmental protection with economic and social interests. The methodology's adaptability to different contexts and its emphasis on stakeholder involvement make it a promising model for wetland governance in various regions.

Keywords: participatory process; stakeholder participation; agreement; memorandum; Piran

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Population geography

Abstract

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SOUTH SLAVIC COUNTRIES AT A DEMOGRAPHIC MILESTONE

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Despite the already notorious concern of the general public about global overpopulation due to the continuous growth of the world's population, the greater part of Eastern and Southeastern Europe makes the first world region to face depopulation in the 21st century. According to numerous forecasts of international agencies, depopulation along with the population aging is expected to accelerate in this region in the coming decades. It seems that South Slavic countries are particularly at risk, above all when it comes to the effects of the reduction and aging of the labour force on the functionality of the labour market and the health and social care systems. The expected increase in the pressure of the inactive on the active in conditions of steady below replacement fertility, net emigration and relatively low economic activity in most of these countries raises the question of the required volume and structure of the labour force in the coming decades. The failure or, at best, the uncertainty of pro-natalist policies in the long term, along with an unfavourable migration balance, point to an increase in economic activity as a possible solution to the expected demographically generated pressure on the labour force in the region. On the other hand, recent trends indicate that the labour markets of South Slavic countries have already turned towards the import of foreign labour as a faster solution. The aim of the work is to assess the demographic effects of possible changes in the patterns of international migration and labour-force participation on the development of future trends of the population and labour force in the region. Prognostic models of demographic development along with the scenario-wise articulated uncertainty of socioeconomic conditions will be used to assess the changes needed in order to reach a turning point in the demographic development of South Slavic countries.

Keywords: population ageing; depopulation; labour-force participation; international migration; population projections

Abstract

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THE ASYLUM MIGRATION CRISIS IN THE BALKANS AND ON THE ROAD TO EUROPE: UNFOLDING THE DRIVERS COMPLEX

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The year 2015 saw a significant increase in the number of refugees and migrants arriving in Europe, mainly from the Middle East, Africa, and South Asia. It was so-called "European refugee (or migration) crisis". Many of these migrants travelled via the Balkan route: After reaching Greece, they crossed the Western Balkans to reach the northern EU countries. Others took the Eastern Mediterranean route, crossing the Aegean Sea, or the Central Mediterranean route from North Africa to Italy. The geopolitical causes of this migration have been extensively analysed, with the Syrian conflict playing a central role as a push factor. The consequences and political context of the crisis—from Chancellor Merkel's *"Wir schaffen das"* ("We can do it") to its role in the UK's Brexit from the EU—have also attracted much attention.

The present paper takes a different stance, looking at the deeper structural and geographical transformations that explain why such an influx of people into Europe was possible in 2015, whereas it had never happened before in similar contexts of violence in the regions of origin. I draw on recent theoretical advances in migration theories that bridge the gap between forced and voluntary migration (push-pull-plus models, aspirations and (cap)abilities theories, etc.).

I propose three long-term factors that have facilitated access to European borders but led to urgent and often dangerous migratory situations for asylum seekers: the "shortening" of distances (Europe is easier to reach), the crisis of containment policies (local help for people on the move is difficult to find), and the geographical asymmetry of rights (migrants enjoy substantial protection once in Europe, but not on route and near their country of origin). I believe that these factors played a central role in 2015 and still explain the current situation of migration to Europe and the new increase in migration observed in 2023. In this context, I interpret the current EU policy of closing borders as an attempt to (re)create a geographical buffer separating refugees from their destinations in the context of the globalisation of asylum issues.

Keywords: migration; asylum; crisis; migration drivers; Europe

Abstract

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REGIONAL ASPECTS OF THE DEMOGRAPHIC CRISIS IN BULGARIA

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The paper analyses the current demographic situation in Bulgaria based on the results of the latest population census conducted in the country (September, 2021), provided by the National Statistical Institute (NSI). All major demographic indicators have been analysed (population number, population density, population dynamics, urban and rural population, as well as some of the basic socio-demographic structures of the population) at national and regional (NUTS 3) level. The focus of the analysis falls on the regional disparities—highest and lowest values of the demographic indicators, and most importantly—on the major factors that contribute to the observed differences. The analysis shows that the loss of population in the decade between the two latest population censuses (2011 and 2021) is the highest in the recorded demographic history of the country in both absolute and relative numbers, while the age structure of the population is at its worst, which are the main features of the demographic crisis in Bulgaria. All demographic aspects, however, exhibit significant disparities at regional level, while at lower regional level (LAU 1) opposite extremes are even observed, resulting in the formation of several "islands of demographic prosperity" across the country, located within a vast territory exhibiting an overall demographic collapse, where some areas can be referred to as a "demographic desert". Last, but not least, the results of a demographic projection of the population as of 2050 have been provided.

Keywords: demographic situation; demographic crisis; regional disparities; population projection

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Abstract

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ETHNIC AND RELIGIOUS STRUCTURE OF MONTENEGRO'S POPULATION

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The population by nationality in Montenegro cannot be tracked in the first half of the 20th century, specifically until the census conducted after World War II. In the censuses of 1921 and 1931, the population was not categorized by nationality, but only by religion, language, and similar characteristics. Additionally, for comparing the population by national groups, the 1961 Census is the most suitable starting point, as it allows tracking the most numerous national groups according to the 2011 Census of population, households, and dwellings. For example, according to the 1953 Census, almost 2% of Montenegro's population identified as Yugoslavs, while there were no inhabitants who identified as Muslims, a significant national group in Montenegro that began to officially declare themselves as such starting from 1961.

The 2011 Census in Montenegro revealed a population of approximately 625,000 people, with 45% identifying as Montenegrins, 28% as Serbs, about 9% as Bosnians, 5% as Albanians, and 1% as Croats. The results indicate that the Montenegrin population is growing, while the number of Serbs has decreased. The largest group is Montenegrins at 45%, while Serbs make up 29%, showing an increase of 2% in those identifying as Montenegrins and a decrease of over 3% in those identifying as Serbs compared to the 2003 census. The proportion of Serbs in Montenegro increased significantly from 3.3% in 1981 to nearly 33% in 2003. In 2011, slightly under 43% of Montenegrin citizens spoke Serbian, whereas nearly 37% spoke Montenegrin. This reflects a 20% decrease in the proportion of citizens listing Serbian as their mother tongue since 2003, alongside a corresponding increase in those speaking Montenegrin. Despite this trend, 6% more citizens still speak Serbian.

The 2023 census results show that 38% of the population identifies as Serbs, and around 52% speak Serbian as their mother tongue. This is a significantly higher percentage compared to the 2011 census. On the other hand, it suggests that the number of those identifying as Montenegrins decreased compared to the 2011 data when 43% of the citizens identified as Montenegrins. By religion, Montenegrin citizens are divided into: 72% Orthodox, 19% Muslim, and 3.5% Catholic. The remaining and atheist individuals each make up a little over one percent.

Keywords: nation; language; church

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Abstract

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CROATIA'S MIGRATION LANDSCAPE: AN OVERVIEW

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The contemporary demographic landscape of Croatia has been significantly shaped by migration, including its directions, intensities, causes, and consequences. The complexity of migration is inseparable from the history of Croatia; therefore, the aim of this paper is to provide a brief overview of different types of migration from the end of World War II to the present. Internal migration is analysed with an emphasis on the migration from rural areas to cities, explaining the effects of these processes on the uneven distribution of the population. Different aspects of emigration and immigration up until Croatia's independence are then analysed. While forced migration primarily shaped the demographic picture of Croatia in the 1990s, economic migration became dominant again at the beginning of the 21st century, significantly intensifying after Croatia's accession to the European Union (EU). Intense emigration exacerbated already unfavourable demographic processes and accelerated labour market disruption, resulting in a labour shortage.

After several decades dominated by emigration, migration in Croatia has diversified in the last ten years. Croatia has evolved into a transit country for migrants as well as an immigration destination, attracting individuals not solely from the former Yugoslav region. Since the 1990s, the majority of immigrants have been Croatian citizens from countries formed after the dissolution of SFR Yugoslavia. Most of the immigrants came from Bosnia and Herzegovina, predominantly ethnic Croats and primarily Croatian citizens, while the number of immigrants from other ethnicities was negligible. However, in recent years, migration patterns have been changing, and today most immigrants are citizens of third countries. Although those from European countries that are not members of the EU (countries formed after the dissolution of SFR Yugoslavia) still dominate among them, there is an increasing number of workers from Asia—Nepal, India, the Philippines, Bangladesh, and others.

Keywords: emigration; immigration; internal migration; demographic change; Croatia

Abstract

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EXPLAINING VOTERS MOBILIZATION IN LOCAL ELECTIONS IN ETHNICALLY DIVIDED SOCIETY—THE CASE OF NORTH MACEDONIA

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North Macedonia is a country in which the variation in local electoral participation belongs to the highest in Europe (coefficient of variance 0.148 in 2013 and 0.200 in 2017, even 0.214 in 2021). This paper tries to explain this variation through series of regression models including several independent variables. In additional to typical factors taken into account in such analysis in earlier studies (population size of local community, competitiveness of elections, and social status of residents) the country specific variable—ethnic composition of population in individual municipalities is taken into account. In individual models dependent variables are: 1) turn-out in local elections, 2) difference between turn-out in national and local elections, and 3) competitiveness of local elections measured by the difference between votes for two major candidates in mayoral elections. In most of North Macedonian municipalities there is a clear domination of one ethnic group (usually either Macedonian or Albanian), but there are also communities in which there is an almost equilibrium with two or more ethnic groups of comparable size. The paper investigates how ethnic composition modifies the model based on "conventional" explanatory variables. Those "ethnically balanced" municipalities are in a special focus of the paper. Empirically the paper investigates turn-out in 2013 and 2021 elections. The reason of including 2013 results in the analyses is related to particular time of voting, very close to national holidays in most of West European countries, which has enabled casting vote by numerous "non-resident citizens" and boosted overall turn-out. Since participation of "non-resident population" may change the ethnic balance in some of North Macedonian municipalities, taking into account timing of elections seems to be very important.

Overall results suggest that the balanced ethnic structure may have some importance for voters' mobilization, however its role is less important than it might be expected. The most important explanatory variables are population size of municipality (similar to factors found in other countries) as well as proportion of ethnic Macedonians (ethnic Macedonians seems to be more attached to state institutions, and their civic activeness is higher than in case of other groups).

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Keywords: local government; citizens' participation; ethnic cleavages; local elections; North Macedonia

Abstract

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SETTLEMENT, SOCIOECONOMIC, AND CULTURAL ASPECTS OF DEPOPULATION IN THE REPUBLIC OF SRPSKA—CHALLENGES AND PROSPECTS

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Overall demographic trends in the Republic of Srpska, including natural population movement, migration directions, and dynamics, have a negative character. The spatial distribution of the population and changes in structural characteristics (age, gender, socioeconomic structure) indicate an accelerated erosion of demographic potential. This negatively affects the settlement, socioeconomic, and cultural characteristics of the Republic of Srpska, as well as its overall spatial-functional organization. Adverse demographic conditions threaten the sustainability of certain geosystems and spatial units. The formation and expansion of problem areas, lacking sufficient population to valorize natural resources and drive economic development, is increasingly dynamic.

The interdependence of demographic processes and the sustainability of the settlement network and systems, as well as economic and infrastructural systems, imply the necessity of a planned approach to population renewal as a strategic resource. Although the overall spatial distribution and structural characteristics of the population are unfavorable, significant differences are evident at local and regional levels. Comparative analysis of demographic potential and the degree of socioeconomic development confirm a high degree of mutual interdependence. Therefore, demographic trends are a significant factor influencing overall developmental processes and disparities.

The paper has both theoretical and practical significance in understanding the genesis of depopulation issues and the expansion of problem areas as developmental peripheries. Objectively assessing the demographic outlook and addressing challenges and potential modalities for demographic renewal simultaneously contribute to measures for the revitalization of the Republic of Srpska. This represents the primary goal of the work.

Keywords: population; depopulation; demographic processes; geosystems; problem areas

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DEMOGRAPHICS AND TRENDS IN HOUSING DEVELOPMENT: THE CASE OF POST-SOCIALIST SERBIA

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Demographic factors such as age, income, household composition, and population growth profoundly impact housing markets, affecting prices, housing provisions, needs, and types. In post-socialist countries, transition processes, historical heritage, socio-cultural, and political factors additionally influenced demographic trends and trends in housing markets. In these countries, depopulation was one of the significant demographic features. However, modern depopulation trends, characteristic of most developed countries, have not directly impacted trends in the number of apartments but rather on their structural features and spatial distribution. This paper analyzes the relationships between demographic factors and trends in housing developments in Serbia, which are characterized by certain specificities.

According to data from the last four Censuses (1991, 2002, 2011, 2022), in the territory of Serbia, in the period from the beginning of the 1990s, a continuous increase in the number of apartments was recorded, while the number of inhabitants was in constant decline. The differences were in their intensity and relationship with population indicators. Trends in housing developments in Serbia are reflected in the increase in the number of apartments, primarily in urban areas, as well as through qualitative characteristics. Changes in the ownership structure of apartments were particularly highlighted. The outlines of the base of apartments in social ownership from the second half of the 20th century were visible until the mid-1990s, while in the following years, they almost completely disappeared. This led to Serbia becoming one of the countries with the smallest share of apartments in public ownership. Regarding this indicator, regional differences within the country are more pronounced compared to the trend of the total number of apartments. They are exceptionally prominent in parts of Serbia, with a specific demographic picture and zones where the secondary sector of the economy is dominant.

Keywords: housing; demographic factors; home ownership; Censuses; Serbia

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Abstract

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THE USE OF MATHEMATICAL-STATISTICAL METHODS IN DEMOGRAPHIC DATA ANALYSES OBTAINED THROUGH SURVEY RESEARCH—THE CASE OF MIGRATION MOTIVES AND ATTITUDES OF PMF STUDENTS IN SKOPJE, NORTH MACEDONIA

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The socio-economic conditions in which people live affect their attitudes about life, habits, and customs. They also play an important role, especially in young people's life and their decision of the place they choose to spend their adult life and even create a family.

Migration, especially emigration is one of the key components of population dynamics which influences the overall development of particular country. Unfortunately, this process mostly includes young people which are the basis for creating sustainable development and therefore, a research of this kind seemed more than necessary.

This research was based on analyses of data collected via survey conducted in May and June of 2022 and March 2024. The survey included a little over 400 respondents, all students of the Faculty of Natural Sciences and Mathematics (PMF) in Skopje, North Macedonia, divided into three categories, i.e., undergraduate students, master students, and PhD students. Given the sample size, and the large share of undergraduates (over 94%), this was the set of data that were processed. In the analyses we compared the attitudes of boys and girls and their socio-economic status.

The aim of the research was to test whether there is any difference regarding motives and attitudes for migration of different gender regarding the following questions:

- The intentions to move,
- The reasons to move,
- Who are you planning to emigrate with?,
- For how long are you planning to stay abroad, and
- What is the main obstacle to emigration?

The data analyses included a correlation between the socio-economic status of the student or his family and their motives and intensions to move, the country they want to move to, and the job they are willing to work in the new place of residence. For the analysis

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of the variance of the means of the two groups, the standard statistical tests were used, while the one-way ANOVA test was used for testing five hypotheses for the equality of the means of the two independent specimens. A chi-squared test of independence of a pair of random variables based on observations was made, for the whole sample. The research and the gained results about the attitudes toward migration of students are expected to contribute to the creation of appropriate economic, social, and demographic policies, which will enable improvement of the demographic situation in the country, which has been quite worrisome for a long time, especially if migration movements are taken into account.

Keywords: migrations; students; survey; North Macedonia

Abstract

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CONTEMPORARY DEMOGRAPHIC CHANGES ON THE TERRITORY OF THE TRSTENIK MUNICIPALITY

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The municipality of Trstenik is situated in the central part of Serbia. The territory of municipality covers the area of 448 km² with the population of 35,875. The average population density is 80 inhabitants per km². The current demographic conditions in the municipality of Trstenik are an expression of demographic changes in the past, especially in the second half of the 20th century, which, in addition to general development factors and conditions, were influenced by many specific factors (economic, social, health, political). The process of depopulation, along with the process of demographic aging, are the main processes that mark the demographic changes in the municipality of Trstenik. The reduction of the natural increase in population has been strongly influenced by the intensively changing birth rate. Since the nineties, the fall of natural increase in population has been accelerating because the birth rates have been getting less while the death rates have been increasing. Negative demographic trends are particularly present in the rural areas of the municipality. It is necessary to stimulate marriage and birth rate with adequate measures of population policy.

Keywords: population; demographic changes; Trstenik

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Economic development perspectives and their impact on the population

Abstract

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REGIONAL DYNAMICS OF FINTECH DEVELOPMENT: IMPACT ON FINANCIAL INCLUSION AND STABILITY IN BRICS

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This study investigates the implications of financial inclusion and the stability within BRICS economies, contextualizing the findings within regional and global political dynamics. Initially, the study aims to uncover the relationship between fintech advancement and inclusion in these markets, considering the geopolitical and socio-economic factors that drive these developments. By introducing a positive fintech shock, the study reveals a dynamic relationship between fintech development and inclusion, which varies across the BRICS countries based on their unique political and economic contexts. This relationship demonstrates a long-term influence on financial inclusion in some BRICS countries more than others, highlighting the role of national policies and international relations in shaping these outcomes. The study extends to the concept of an expanded BRICS, incorporating other emerging economies that are increasingly relevant on the global stage. Such kind of inclusion is crucial for these regions as it fosters economic development, reduces poverty, and promotes social stability, which are essential for maintaining political stability and strengthening international alliances. In examining regional issues, the study considers how diverse geographical features, such as regional economic integration, impact fintech adoption and its subsequent effects on financial inclusion. This factor is vital in understanding the uneven distribution of fintech benefits and the challenges faced by different regions within BRICS economies. However, the study does not find significant evidence suggesting that fintech poses a threat to stability, at least in the short term. This study contributes to the discourse on the intersection of technology, finance, and global politics, offering insights for policymakers and international stakeholders on the potential and challenges of fintech in emerging economies. It underscores the importance of collaborative efforts among BRICS nations to harness fintech for inclusive growth and stability, thereby reinforcing their position in global economic and political spheres.

Keywords: emerging economies; political and economic stability; fintech; BRICS

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POVERTY, SOCIAL EXCLUSION, AND SEGREGATION IN CZECH CITIES AND REGIONS

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This paper investigates the spatial concentrations of income poverty, social exclusion, and segregation in Czechia from 2015 to 2022, addressing the critical need to understand and mitigate these issues. Utilizing a spatially detailed database on social welfare benefit recipients, the research maps the most pronounced concentrations of poverty and social exclusion and evaluates intra-urban and intra-regional disparities.

The analysis reveals two primary findings. Firstly, despite a period of overall economic growth and increased well-being between 2015 and 2019, the concentration of vulnerable populations in areas marked by social exclusion and segregation intensified. Secondly, recent events, such as the COVID-19 pandemic and the War in Ukraine, have introduced significant social and economic uncertainties, including high price inflation and declining real incomes. This study specifically examines the years directly affected by these developments to identify distinct trends in the spatial concentration of social exclusion and segregation in Czech cities and regions that differ from the pre-pandemic period.

The findings are contextualized within the broader framework of long-term social and urban development in a post-socialist country, considering national and local policies and practices related to segregation and social exclusion. Additionally, the study reflects on narratives concerning populations at risk of social exclusion and segregation, situating the discussion within international debates while highlighting the specificities of Central and Eastern Europe.

Keywords: segregation; social exclusion; spatial inequality; post-socialist city

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Abstract

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COMPARING HOUSING POLICIES FOR ROMA COMMUNITIES IN SERBIA AND PORTUGAL

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Comparisons are needed to assess the successes and failures of today's public policies, as well as to promote policy learning. This is particularly important in the case of policies for low-income and disadvantaged groups such as the Roma, Europe's largest ethnic minority, whose housing conditions starkly contrast with those of the general population wherever they reside. Roma families often live in precarious housing in segregated neighborhoods, and face significant obstacles to accessing essential services.

The European Union (EU) Roma strategic framework for equality, inclusion, and participation sets common (horizontal and sectorial) objectives and headline targets to monitor the achievement of these objectives. Within the four sectorial objectives, one objective is to increase the Roma's access to adequate desegregated housing and essential services, and address segregated settlements, closing the gap with other populations. This is to be done by reducing housing deprivation, cutting overcrowding, and ensuring access to tap water. Correspondingly, the Western Balkan countries endorsed the Roma integration declaration, committing, by the time of their accession, to tangible progress in education, employment, health, housing, civil registration and non-discrimination.

This comparative study investigates the approaches of two European countries: Serbia (an EU candidate) and Portugal (an EU member) in relation to the Roma's access to adequate housing and essential services. To do so we use the so-called integrated EU strategic framework on Roma equality, inclusion and participation to compare the range of housing programmes that have been formulated across different local settings, trying to assess whether they follow the EU recommendation for Roma inclusion. The research consists of analysis of relevant academic literature, key communication journals and reports. The study will draw out the implications of its findings for urban politics and housing policy.

Keywords: housing policy; EU Roma strategic framework; Roma; Serbia; Portugal

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Abstract

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THE RELATIONSHIP BETWEEN RESIDENTS' INCOME AND IMMIGRANTS' SETTLEMENT IN LARGE EUROPEAN CAPITALS

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A study based the relationship between immigrant settlement and income in major European capitals using London, Paris, Madrid, and Berlin as examples. We also tried to study Moscow. The cities were selected based on the importance of immigration processes, the availability of regional statistics, and the capital's roles in the country. These cities have attracted large numbers of immigrants, especially over the last 30 years (London and Paris earlier due to the influx of people from former colonies). The example of housing costs and income distribution shows socio-ethnic stratification. Because of the study, typologies of city districts were compiled, taking into account the share of immigrants, income levels, and housing prices, which demonstrate a greater degree of mosaic and heterogeneity of territories. For these European capitals, it was shown that the hypothesis about the connection between migrants' income and microgeography is not always confirmed. The most difficult picture is in London and Paris. In Berlin and Madrid, sectors of migrant localization are noticeable, but there (not to mention Moscow) it is more difficult to identify their connection with income stratification. The most notable characteristic of the cities studied is the increase in the immigrants' number and their percentage, which can reach 15–25%. This fact in itself becomes a significant element of social division. At the same time, immigration in each city has its own characteristics and diversity. Differences between immigrant groups largely determine the degree to which they are isolated or integrated into urban social space. London and Paris attract everyone: rich and poor. Traces of the city's former division are still visible in Berlin. Madrid is home to Latin Americans with similar cultural backgrounds. And in Moscow, the influx of immigrants often provokes an increase in the cultural distance between them and local residents. The large number and immigrants' proportion, their poor integration into the host society, and interethnic conflicts make it difficult to show tolerance and increase social and ethnic contrasts.

Keywords: immigrant settlement pattern; income; housing prices; European capitals; social differentiation

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CONSUMER MOBILITY IN CENTRAL AND PERIPHERAL CITY NEIGHBOURHOODS

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Consumer activities include shopping, entertainment and recreation and they play an important role in determining the urban economy, the city landscape, and the lifestyle of inhabitants. The spatial distribution of consumer locations in the city follows spatial patterns of shopping, entertainment and recreation activities. In contrast to the urban outskirts, the city center usually represents an attractive zone for all consumer activities. However, there are other hot spots for shopping, entertainment and recreation beside the city center. Studies have shown that local (neighborhood) orientation in shopping and leisure activities is one of the most important regularities in consumer spatial behaviour. This research aims to shed light on the similarities and differences in the spatial behavior of both, the residents of the central and peripheral areas in Belgrade (Serbia). Residents living in the city center and those from the outskirts differ in their socio-economic status (educational level, income, car ownership etc.) and consequently in their way of life. Additionally, the central and peripheral city areas are characterized by numerous specificities related to the population density, types of housing, area development, infrastructure, the presence of shops, services and places for leisure and recreation activities in the neighborhood, traffic connections with the surrounding areas, and the like.

The research assumes that the most attractive consumer zones, regardless of their position, are equally appealing to the residents of the entire city. The research is based on the analysis of movements of the residents living in two Belgrade municipalities—Stari grad in the city core and Grocka with peripheral location. The survey included a total of 1,765 respondents, who had 1,774 movements in total. Their primary movements (to work and school) and consumer movements (with the purpose of shopping, entertainment and recreation) by all modes (on foot, by car, by public transport) were observed. The key indicator is the destination of each movement, that shows the connection between the place of residence and the place of consumption. The basic method applied is the spatial analysis of movements, with the thematic movement maps as a main result. The maps enabled the visual interpretation of the results, that helped to define the spatial mobility patterns and the underlying rules of the primary and consumer mobility in two municipalities.

Keywords: consumer mobility; socio-economic status; center-periphery rule; neighborhood; Belgrade

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Abstract

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POST-SOVIET TRANSFORMATION OF RURAL DAGESTAN UNDER SOCIETY MODERNIZATION AND GLOBALIZATION

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The report will highlight the post-Soviet features of the transformation of rural areas of one Russian mountainous agricultural region with high ethnocultural population diversity, using the example of the Republic of Dagestan. Data sources: open statistical databases, field studies, and interview results. To collect data, the authors of the report organized five expeditions in 2020–2024, surveyed 12 districts, and more than 100 settlements. Transformation processes in the mountainous territories of Dagestan occur under the influence of natural-geographical and center-peripheral factors of transformation, as well as the incomplete demographic transition of the population in combination with the increased role of ethnic traditionalism. Along with common features characteristic of other regions of Russia (for example, depopulation, increased mobility of the population), the transformation of rural areas of Dagestan has its own characteristics. The high intraregional diversity of rural areas is associated with different combinations of territorial characteristics. For example, the orographic diversity of Dagestan complicates the center-periphery picture typical of the lowland regions of Russia. Along with suburban municipalities, other prosperous rural municipalities are also distinguished—foothill areas and some mid-mountain basins. In the first, there is an opportunity to engage in agriculture and other activities, and secondly, there is a migration influx of people from high mountain settlements. The article presents a map with natural and socio-economic types of rural areas of Dagestan and describes scenarios for the socio-economic transformation of rural areas using the example of key areas of the main macro-regions. Scenarios for the transformation of rural areas: "inertial" and "modernization". Ethnocultural and religious factors are responsible for the preservation and reproduction of traditional social connections and relationships. They affect the stability of rural settlement, population dynamics, and reproduction of communities. For example, the mountainous Avar regions of northwestern Dagestan have a stable number of permanent residents and real post-Soviet population growth. In the predominantly Lezgin regions of Southern Dagestan, the situation is different and similar mechanisms work much weaker. Scenarios for the rural areas transformation demonstrate the clear juxtaposition of the archaization processes and modernization of the economy and society in the republic.

Keywords: rural settlement; local rural-urban systems; typology of rural areas; mountainous areas; North Caucasus

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Abstract

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MODERNISATION AND (POST-)TRANSITION PROCESSES IN CROATIAN RURAL AREAS: A CREEPING MODERNIZATION THEORY PERSPECTIVE

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In the European Union (EU), the current processes of globalization in rural areas have followed a model for highly developed societies that sociologists call "liquid modernity" (Bauman, 2000) with all its consequences. One of these processes is certainly the demographic exodus from these rural areas, especially from the areas in Eastern and South-Eastern Europe. With the accession of the individual countries to the EU, the population of these areas has migrated mainly for economic reasons.

These (late) modernization processes have also taken place in Croatia, even if they have arrived in rural areas with some delay, which has led to changes in lifestyle and, at the same time, to mass emigration. The characteristics of demographic collapse that have been confirmed for Croatia (Croatian Bureau of Statistics, 2021) can be observed primarily in most rural areas of Croatia, especially in some traditional, sparsely populated and mountainous regions such as the Lika region.

According to sociologist Ivan Rogić (2000), Bauman's theory of fluid modernization can be described as creeping modernization in Croatia. This social phenomenon took place in Croatia in several phases: 1) the first wave of emigration after the First World War; 2) the second wave, characterized by agricultural overpopulation, after the Second World War; 3) the third wave of emigration during the socialist period; and 4) the fourth wave of emigration in connection with the economic (and political) crises of the (post-)transition period. The general (creeping) modernization processes have shaped three types of Croatian peasants throughout history: 1) peasant-soldier/warrior, 2) peasant-worker, and 3) peasant-manager, each on their own, without the previously acquired knowledge and skills of their urban contemporaries.

A peripheral, wild capitalism, a slow transitional bureaucracy and additional bureaucratization are the general results of the modernization processes in the Croatian (rural) areas, which are additionally characterized by shell institutions (Giddens, 2002) and the complete closure of the planned, socialist industry, for which there is no alternative (apart from overtourism). It follows that the unfavorable state of human and social capital in rural Croatia is the result of the historical course associated with pre-industrial traditionalism, socialist egalitarianism and the tendency towards state paternalism.

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Keywords: creeping modernization theory; liquid modernity; (post-)transition; rural areas; rural exodus

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References

Bauman, Z. (2000). *Liquid Modernity*. Polity Press.

Giddens, A. (2002). *Runaway World: How Globalization Is Reshaping Our Lives*. Profile Books.

Croatian Bureau of Statistics. (2021). *Popis stanovništva, kućanstava i stanova 2021. Stanovništvo*. [Data set]. https://dzs.gov.hr/u-fokusu/popis-2021/88

Rogić, I. (2000). *Tehnika i samostalnost: okvir za sliku treće hrvatske modernizacije*. Hrvatska sveučilišna naklada.

Abstract

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THE ROLE OF GEOGRAPHY IN TOURISM-RELATED QUALITY OF LIFE RESEARCH

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Quality of life is a multidimensional construct. This concept has great application and scientific importance. As a research topic, it came into focus in the 1960s in Western countries. At the beginning of the 1980s, the concept was also applied in Central-East European countries, including former Yugoslavia. Through the analysis of numerous indicators, it becomes part of numerous, primarily sociological, and then psychological, political, economic, and geographical research. The basic premise of geography is based on the view that most events during life are connected to a particular space. In the context above, this type of research includes protected natural and cultural entities, mining areas, zones of extensive infrastructure works, and increasingly also zones of intensive tourism development. Therefore, the impact of tourist activities on the quality of life in the local community is becoming increasingly important.

Previous research indicates that the perception of the impact of tourism depends on a number of factors, such as residents profile (demographic, economic, socio-cultural), tourism seasonality, degree of destination development (including the type and number of tourists), level of contact and knowledge about the tourism industry, density of construction, years of residence, and others. The need to quantify the relationship between quality of life and tourism has led to the emergence of several standardized instruments that serve for subjective measurement. Among many, the tourism-related quality of life index (2006; TQOL) provides an answer to the nature of the impact of this activity on the lives of individuals. The mentioned instrument was used in several countries, namely the USA (Arizona and Indiana), Portugal (Azores), and Vietnam (City of Hue). In addition to the application at the national level, there is more and more research at the regional and local (municipal) levels.

In Serbia, this research was conducted in the area of Western Serbia (Zlatibor tourist region) from December 2020 to September 2021. The survey included 423 respondents with permanent residence in the territory of the municipality of Čajetina. The results suggest that tourism development has a relatively positive effect on most variables of quality of life (4.08/5.00). In accordance with the above, the TQOL index indicates a moderately high average value (25.53/60.00). Therefore, the prevailing view is that tourism stands out as a significant generator of change. It has a predominantly positive connotation, while the

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obtained findings indicate that the index varies depending on the characteristics of social groups in the local community. The application of this model represents a good basis for further research, not only in this but also in other tourist areas. The results could serve as essential guidelines for formulating public policies and improving the residents' quality of life.

Keywords: quality of life; geography; tourism and quality of life scale (TQOL); Serbia

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ANALYSIS OF THE TOURISM DEVELOPMENT IN MONTENEGRO—STATUS AND FUTURE TRENDS

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Tourism in Montenegro represents a vital component of the national economy, contributing significantly to its gross domestic product (GDP). Recognized as one of the key sectors, this country on the Adriatic Sea annually attracts millions of tourists from various parts of the world. Thanks to its unique combination of natural beauty, cultural heritage, and favorable climate, Montenegro has established itself as a popular destination for various types of tourism. Statistical data shows that the number of tourists in Montenegro has been steadily increasing over the past decades. Particularly significant growth has been recorded in the international tourism segment. The majority of tourists come from European countries, with a special emphasis on visitors from Russia, Serbia, Bosnia and Herzegovina, and European Union countries. The diversity of offerings, from sunny beaches to mountain resorts, attracts various groups of tourists, significantly extending the tourist season.

Since 1980, OECD experts have set up a strategic development matrix for Montenegro with three main pillars: tourism (today they would likely add sustainable tourism), predominantly rural and interconnected agriculture (today we might add organic food production), and industry, particularly small businesses catering to tourism and local needs (today they might include clean industry organized by Small and Medium-sized Enterprises—SMEs). We believe these are three robust strategic pillars interconnected by tourism, which should be Montenegro's strategic development priority. In Montenegro, in 2021, there were 1,670,879 tourist arrivals and 9,872,573 overnight stays. Comparing these figures to 2019, there was a decrease of 36.8% in tourist arrivals and 31.7% in overnight stays. In comparison to 2020, which was significantly impacted by the COVID-19 pandemic, in 2021 there was an increase of 276.3% in tourist arrivals and 281.6% in overnight stays. It can be noted that there was a noticeable recovery in the tourism sector in 2021; however, this recovery did not reach the levels of 2019. Estimates suggest that tourism will contribute around one billion euros to the gross domestic product in 2022, so the "gray zone" should be sought between actual revenue and estimated contributions. Essential to this is the quality reconstruction and development of basic accommodation capacities, additional tourist superstructure and infrastructure, and market repositioning towards major tourist sources in Europe. Achieving better results in the tourism sector requires diversification of products and services.

Keywords: tourism; services; cultural heritage

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Abstract

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HOW DOES THE TRADITIONAL MOUNTAIN LANDSCAPE CHANGE INTO A TOURISMSCAPE? A CASE STUDY OF THE SILESIAN BESKIDS, POLAND

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The traditional mountain landscape connected with the seasonal mountain economy, such as pastoral function, was present in the Silesian Beskids (the Western Carpathians, Poland) since the 15th century. The location near the large towns (Bielsko-Biała and Żywiec) and Katowice conurbation encourages tourism development. In the Silesian Beskids, tourism was already present at the beginning of the 20th century, but rapid development of services and related tourist urbanization took place in the 1960s and continued to grow, particularly after the socio-economic transition in 1989. In the mountainous landscape of Silesian Beskids, the tourist infrastructure has been emerging, including significant dominants—new landmarks, such as large hotels or ski lift stations, changing the landscape's character and type from the traditional landscape towards the tourismscapes.

The research conducted on the glades of Silesian Beskid, with particular emphasis on the most developed glades in Ustroń (Czantoria, Stokłosica, Równica), focuses on the tourism development process. The main goal was to answer the questions: 1) What is the degree of traditional landscape transformation influenced by tourist development? 2) What are the characteristic features and landmarks of the tourismscape on studied glades? and 3) What is the character of these landmarks (dominants, accents)?

The research included cartographic research aiming to assess the changes in the area of the tourist infrastructure and its influence on the landscape and the identification of the characteristic features and landmarks of pastoral and tourism landscapes in studied time-sections. The results show that the area of tourist elements has increased significantly. The number and type of elements are related to the degradation of landscape identity and aesthetics. The new landmarks, characteristic of tourist landscapes, often replace the remnants of past human activity that could be treated as cultural heritage, such as pastoral huts. The land use changed from pastoral to tourism function. This transformation is reflected in changes to the landscape's characteristics and features (landmarks).

Keywords: tourism landscape; tourism landscape impact; tourism landmarks; tourism landscape features

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Abstract

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LOST IN TRANSITION? HISTORICAL GEOGRAPHIES OF WORLD HERITAGE AND TOURISM IN BULGARIA

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The fall of socialism and the collapse of socialist regimes in 1989 mark a pivotal moment in global history. The fall of the Berlin Wall and the reformation of the Soviet Union led to significant changes to the global power dynamics and geopolitical landscape, including major economic and political changes, particularly for the former Eastern Bloc states. For many, this was the beginning of a long and uncertain period of "transition" defined by demands for political freedom, economic changes, democracy and integration with Western Europe. Although post-socialist economic and political changes have been extensively studies, the focus on the "cultural transition" has been comparatively neglected. More specifically, academic research on heritage politics "in transition" and how the socialist past affects post-socialist heritage management remains limited.

The aim of this study is to address the gap and shed more light on the politics of heritage management and tourism dynamics drawing on the case study of the Ancient City of Nessebar, a widely known summer tourism destination and a UNESCO World Heritage Site located on the Black Sea coast of Bulgaria. The paper focuses on the changing discourse of heritage tourism development and management. Adopting a qualitative approach grounded in semi-structured interviews and archival research, the study provides a comprehensive understanding of the post-1989 authorized heritage discourse. The findings reveal that the governance of heritage and politics of heritage tourism development are still in "transition". The pre-1989 state-centralized and state-subsidized model has not fully been changed and continue to cast its shadows. However, the political changes have brought notable concerns such as lack of government funding, absence of updated protection mechanisms, and uncertain state politics of tourism development and heritage conservation. Overall, the paper concludes that the current model of governance is inefficient, and a new strategy is needed to establish a sustainable balance between tourism and heritage preservation.

Keywords: World Heritage; tourism; transition; socialism; UNESCO

Abstract

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PRESERVATION OF INTANGIBLE CULTURAL HERITAGE THROUGH DIGITAL STORYTELLING

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The preservation of intangible cultural heritage, including oral traditions, folklore, music, and traditional crafts, is crucial for maintaining the cultural identity and continuity of communities. In Serbia, a country rich with diverse cultural expressions, these intangible heritage elements face threats from globalization, modernization, and demographic changes. This paper investigates the role of digital storytelling as a tool for preserving and revitalizing intangible cultural heritage in Serbia, highlighting specific case studies where digital initiatives have been used to document and promote traditional practices. Through ethnographic research and analysis of digital storytelling projects in Serbia, the study examines how local communities and cultural organizations utilize digital platforms to capture and share narratives of their heritage. Examples include the digital archiving of traditional music from the mountainous regions of Western Serbia, the documentation of storytelling traditions among the Romani communities, and the use of social media and interactive websites to promote Serbian folk dance and craft techniques. These digital storytelling efforts not only serve to document endangered traditions but also engage younger generations and diaspora communities, fostering a renewed interest in cultural heritage. The paper addresses the opportunities and challenges of using digital storytelling in the Serbian context, such as the digital divide in rural areas, the need for culturally sensitive approaches to content creation, and the risks of cultural commodification. Despite these challenges, the findings indicate that digital storytelling offers a versatile and impactful approach to safeguarding Serbia's intangible heritage. It provides a platform for communities to actively participate in the preservation process, ensuring that their voices and perspectives are authentically represented. This paper concludes by proposing a framework for enhancing the role of digital storytelling in cultural heritage preservation in Serbia. It emphasizes the importance of collaboration between community members, cultural practitioners, and digital media experts to create sustainable and inclusive digital heritage initiatives. By integrating digital storytelling into broader cultural preservation strategies, Serbia can better protect and promote its rich intangible heritage, ensuring its transmission to future generations and its place in the global cultural landscape.

Keywords: intangible cultural heritage; digital storytelling; cultural preservation; Serbian traditions; community engagement

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OLD FOLK SPORTS, GAMES, AND COMPETITIONS IN THE AREA OF THE FORMER YUGOSLAVIA AS AN ELEMENT OF INTANGIBLE CULTURAL HERITAGE—A COMPARATIVE ANALYSIS

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The subject of the research is the old folk sports, games, and competitions as part of the intangible cultural heritage (ICH) in the territory of the former SFR Yugoslavia. Since 2009, these sports have been part of the representative UNESCO ICH world list. At the end of the first decade of the 21st century, the countries created by the disintegration of the former Yugoslavia (except Serbia) have begun entering them into national registers of intangible cultural heritage (a total of 20 sports and games are on the lists). On the territory of Serbia, there are old folk sports, games, and competitions, which represent intangible cultural heritage, however, they are still not sufficiently recognized by the competent institutions. In this regard, various initiatives have been created for certain old sports to become part of the national list of intangible cultural heritage of Serbia, as a corpus of endangered heritage.

The task of the research is to perform a comparative analysis of old folk sports and games in the territory of the former Yugoslavia. During numerous migrations in the Middle Ages, South Slavs inhabited different geographical areas in the analyzed territory, where their main economic activity was extensive agriculture. Geographical conditions and the way of life have conditioned the development of numerous folk sports, games, and competitions. Shepherd's games (children), sports, and games that prove maturity and folk competitions for fun are the foundation of their later genesis of development. Along with these sports and games, folklore, customs, and gastronomy were practiced as part of the cultural heritage. The rules of most old folk sports, games, and competitions (although mostly oral) remained identical throughout the former Yugoslavia, with minor differences.

Based on field research, which included survey research, focus groups with the participation of experts from various fields, as well as the study of adequate scientific literature, the authors made a classification of old folk sports, games, and competitions through which they performed their comparative analysis as the elements of intangible cultural heritage in the territory of the former Yugoslavia: old sports with props, old martial sports, old athletic sports, folk sports competitions, children's competitive games, sports with animals, water sports, ritual sports games, and folk sports games. A comparative analysis was also made with old folk sports, games, and competitions in the territory of Serbia. The formulated hypothesis assumes that the old folk sports, games, and competitions in the

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territory of the former Yugoslavia, through defined, joint elements, can be presented through a common international European cultural route as part of the common cultural heritage.

Keywords: old folk sports, games, and competitions; former Yugoslavia; intangible cultural heritage; comparative analysis

Abstract

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EUROPEAN RESEARCH COUNCIL AND ITS OPPORTUNITIES (NOT ONLY) FOR THE GEOGRAPHERS

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The European Research Council (ERC) mission is to encourage the highest quality research in Europe through competitive funding and to support investigator-driven frontier research across all fields, based on scientific excellence. Since 2007, ERC funded more than 12,000 projects and over 10,000 researchers. More than 200,000 articles were published in scientific journals. 14 Nobel Prizes, 6 Fields Medals, 11 Wolf Prizes, and dozens of important prizes were awarded to ERC grantees. This workshop is inviting you to become part of this successful story.

We will introduce the European Research Council, the premier European funding organisation for excellent frontier research, and encourage the participants to apply for an ERC research grant under one of the main grant schemes (Starting Grant, Consolidator Grant, Advanced Grant and Synergy Grant). The workshop will focus on 1) the ERC "basics"—presentation of ERC calls, principles of the evaluation process and panel structure; 2) successful ERC grants in the area of geography and environmental sciences, and 3) tips and tricks how to draft your proposal (eligibility criteria, host institution support, choice of panel, choice of descriptors, difference between part B1 and B2, what to focus on when preparing for an interview etc.).

Keywords: European Research Council; frontier research; grant schemes; ERC calls

Spatial planning

Abstract

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A NEW METHODOLOGY FOR ASSESSMENT THE CITY ABUNDANCE IN GREENSPACES AND ECOSYSTEM SERVICES—TOWARD COMMUNITY AND SUSTAINABLE URBAN PLANNING

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Urban greenspaces are a place for recreation and leisure and, most importantly, provide ecosystem services to city residents. They are particularly in demand in metropolitan areas with large populations. In proportion to their high populations, these areas should have large acreages of greenspace to meet society's needs for ecosystem services. The Urban Ecosystem Services (IUES) index allows the abundance of green areas providing various ecosystem services to be assessed and, using a model based on Ossan's statistical concept, allows cities to be classified according to this abundance. The index is an urban ecosystem services indicator, which quantitatively and qualitatively determines the abundance of greenspaces in ecosystem services.

The study area consists of two agglomerations located about 80 kilometers apart in two different countries. The first is the Silesian Metropolis (GZM) in southern Poland and the second area is the Karviná-Ostrava Region (OKR) in northern Czechia.

The study indicated that the most abundant ecosystem services are forests and wetlands in both quantity and quality. Therefore, they should be protected in cities in terms of their acreage and species composition. The best providers of ecosystem services are natural forests, characterized by high biodiversity and full development of all forest values. The results for dominant greenspace types and the height of the IUES index indicate the dominance of forested areas in both study areas. Thus, one can accept the thesis that forest ecosystems in Central Europe are the main providers of ecosystem services, including in urban areas. They provide every section of ecosystem service, from provisioning through regulatory and maintenance to cultural.

IUES can be used as an indicator of sustainable spatial planning. The entire methodology can be used to assess the abundance of municipalities in ecosystem services to monitor them, and increase their potential. It can be used in urban planning at the city scale and the location of new residential developments, but it should be emphasized that it is intended to indicate the abundance of ecosystem services to serve society intact. Urban planning must, therefore, be carried out sustainably that does not degrade the strength of ecosystem services or eliminate urban greenspaces.

Keywords: ecosystem services index; urban greenspaces classification; post-industrial cities; Silesian Metropolis; Ostrava-Karvina Region

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TOWARDS A NEW MAP OF HOUSEHOLD FORMATION AND CO-RESIDENCE PATTERNS IN SOUTHEASTERN EUROPE

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Since Frédéric Le Play's map of household types in Europe (1855) several maps detailing the distribution of joint families or "zadrugas" (Botev, 1990; Kaser, 1995; Todorova, 1993) within the area of the patriarchal régime in Southeastern Europe (Cvijić, 1918) have been published. Additionally, Karl Kaser published a map about household formation patterns in historical Southeastern Europe (1996). However, all these maps have several limitations. They are based on a limited number of cases and primarily focus on joint families. They do not utilize microdata or a life-course approach. Furthermore, these maps only represent dominant characteristics, often excluding urban populations. Pan-European comparisons based on the existing NAPP and Mosaic data collections show a more detailed picture of European household formation systems and co-residence patterns than postulated earlier. They reveal a great deal of variation on both sides of the Hajnal-line (Hajnal, 1982): A simple black-and-white scheme is not sufficient for capturing the whole picture (see Szołtysek, Ogórek, Poniat, Gruber 2019; Szołtysek, Ogórek, Poniat, Gruber 2020).

The availability of new historical microdata from Southeastern Europe allows us to refine and update these maps. These updated maps will be based on samples from the following censuses:

- Wallachia 1838: The first census of Romania, which is almost completely preserved.
- Bessarabia 1850: A Russian revision list, largely preserved for the territory of present-day Republic of Moldova.
- Serbia 1863: The first Serbian census to enumerate women individually, preserved to a significant degree.
- Montenegro 1879: The first Montenegrin Census, partially preserved.
- Albania 1918: The first Albanian census, which is almost completely preserved.

These maps will utilize measures derived from individual characteristics rather than household measures. Variables related to marriage patterns, household formation, and co-residence will be mapped, culminating in a comprehensive map of these combined measures.

Keywords: households; marriage; co-residence; Southeastern Europe

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References

Botev, N. (1990). Nuptiality in the Course of the Demographic Transition: The Experience of the Balkan Countries. *Population Studies, 44*(1), 107–126. https://doi.org/10.1080/0032472031000144406

Cvijić, J. (1918). The Zones of Civilization of the Balkan Peninsula. *Geographical Review, 5*(6), 470–482. https://www.jstor.org/stable/207806

Hajnal, J. (1982). Two Kinds of Preindustrial Household Formation System. *Population and Development Review, 8*(3), 449–494. https://doi.org/10.2307/1972376

Kaser, K. (1995). *Familie und Verwandtschaft auf dem Balkan. Analyse einer untergehenden Kultur*. Böhlau.

Szołtysek, M., Ogórek, B., Poniat, R., & Gruber, S. (2019). "One size does not fit all": Spatial nonstationarity in the determinants of elderly residential isolation in historical Europe. *Population, Space and Place, 25*(6), Article e2242. https://doi.org/10.1002/psp.2242

Szołtysek, M., Ogórek, B., Poniat, R., & Gruber, S. (2020). Making a Place for Space: A Demographic Spatial Perspective on Living Arrangements Among the Elderly in Historical Europe. *European Journal of Population*, 36(1), 85–117. https://doi.org/10.1007/s10680-019-09520-5

Todorova, M. (1993). *Balkan Family Structure and the European Pattern. Demographic Developments in Ottoman Bulgaria*. The American University Press.

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(RE)VALORISING UNDERGROUND BUILT HERITAGE IN CENTRAL AND SOUTH-EAST EUROPE AS CATALYSER FOR COMMUNITY DEVELOPMENT

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This paper is based on activities and some results of the COST Action CA18110 project "Underground Built Heritage as Catalyser for Community Valorisation" (*Underground4Value*), https://www.cost.eu/actions/CA18110 (2019–2023). The action brought together more than 200 experts from 32 countries. Underground Built Heritage (UBH) is a unique cultural resource, being a focus of many recent scholarly papers coming from the interdisciplinary studies of geography, archaeology, conservation, tourism, economy, IT, and others. Natural and human-made caves, underground burial sites, mines and quarries, other human made caves used for habitation and work, subterranean infrastructures (cisterns, tunnels, ancient drainage systems, etc.), and ancient buried structures and settlements are all examples of UBH site typologies. They represent attractive cultural and tourism resources, not only for foreign visitors but also for local communities and domestic visitors. Additionally, such sites are often located in urban areas or their surroundings which make them accessible and suitable for daily visits. Therefore, research on UBH requires an interdisciplinary approach, various techniques, and methodologies. The main goals of the *Underground4Value* project are promoting UBH as a valuable resource to preserve and promote sustainable (re)use of cultural heritage, and to valorise its full potential to support local development. To achieve this overall challenge, the project has been focusing on managing and treasuring the wide participants' competencies to identify key areas of scientific, technical, commercial, managerial, political, cultural, and social nature, currently perceived as problematic for sustainable use of UBHs. Project partners were interacting with local communities, disseminating innovative thinking, and supporting them to explore alternative social trajectories, such as establishing Living Labs, and experimenting with transition management approach. The main results of the *Underground4Value* project focus on creative learning, developing new skills for planners, decision-makers, promoters, and local development facilitators, as well as networking of partners from different European and other countries in-situ, on-line, and on digital platforms. This paper particularly focuses on few examples of (re)valorisation of UBH in Central and South-East Europe, most notably Slavic countries, such as Slovenia, Serbia, Poland and Bulgaria.

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Keywords: underground built heritage (UBH); interdisciplinary valorisation; community development; COST action; Central and South-East Europe

Abstract

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TRAJECTORY OF INTERRELATION BETWEEN SPATIAL PLANNING AND DECENTRALIZATION IN SERBIA

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The important academic issue could be recognized in investigating relations between decentralization, through the sub-municipal government, and the hierarchical structure of the settlements network as a tool for spatial planning and strengthening local communities. The research introduces two questions that have been observed: How does the spatial organization of the settlements network support the decentralization process in Serbia? How does it relate to sub-municipal government? In many countries, decentralization and administrative reforms have shown a tight connection, where it has become an efficient tool for their implementation.

Looking into decentralization as a phenomenon in Serbia, a certain discontinuity is recognized. This has been reflected through the "waves" of appearance, usually presenting how decentralization at the sub-municipal level involves vertical and horizontal relations within the planning sector. Four waves have been recognized:

1. The first wave implied the building of a socialist self-government system in the Socialist Federal Republic of Yugoslavia (SFRY), during the 1950s. In the beginning, small municipalities prevailed, which had been consolidated to support local capacities for effective self-governing. This underpins the local governments' straightening and shifting of functions and responsibilities toward the local level.
2. A prominent role of the Yugoslav self-government system has been reached in the second wave. The 1963 Constitution introduced a form of *mesna zajednica*, which became the formative units of self-government according to the 1974 Constitution. Their number in Yugoslavia reached a peak in 1982 (13,724, that is, 26 per municipality). They got financial and administrative autonomy. Their greatest contribution was reflected in the direct citizens' participation in decision-making at the municipal level. The concept of mesna zajednica was successfully implemented in the planning system, which expressed growing activities in this period predominantly focusing on sub-national units and local potentials.
3. The third wave brought intentional destruction of this phenomenon. The introduction of the multi-party democracy model in the 1990 Constitution decreased the local self-government importance and abolished its property. The administrative and political system became highly centralized and spatial and development policies supported the

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urban-centric development model. This led to selective governing, followed by growing disparities. Spatial planning of the local territories relied on secondary municipal centers that address established sub-municipal governing systems; however, due to the continuing decline of the potential of sub-municipal (secondary) centers, the effectiveness of local planning has decreased.

4. The fourth wave represents recent aspirations toward decentralization, which could be seen as reviving the sub-municipal level. Decentralization became a vivid topic and it was set as one of the key priorities of the Serbian public administration reform. The changes were introduced by the Law on Local Self-Government (2007), where certain competencies were returned to local self-government and foresee their other forms (2021), which leave room for creating sub-municipal units. In the early 2000s, the impact of local planning grew. The Spatial plan of the Republic of Serbia (2021–2035) introduced a supplemented hierarchical model for the spatial organization of the settlements network with a particular focus on local and sub-municipal centers.

Keywords: decentralization; *mesna zajednica*; self-government; settlement network; spatial planning

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Abstract

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SHRINKING CITIES OF BELARUS: DEVELOPMENT FACTORS AND SHIFTS IN THE SPATIAL STRUCTURE

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The article assesses factors, the scale of demographic shrinkage of Belarusian cities and shifts in the spatial structure based on statistical data from three intercensus periods—1989–1999, 1999–2009, and 2009–2019. Using a set of methods of mathematical-statistical, balance, cartographic, typographers, geographic systematization and GIS technologies, for the first time in relation to Belarus, criteria for shrinking cities were determined, calculations of population dynamics for 1989–2019, indicators of natural and migration movements of the population, demographic balance of all cities of Belarus were performed.

The analysis established that the main factors of demographic shrinkage are the migration transition of the 1970s, the political and socio-economic transformations of the transition period of the 1990s, and the demographic transition of the 1980–1990s. The authors determined that 46.1% of the country's cities are classified as shrinking.

A distinctive feature of the methodology in comparison with similar studies is the development of a typograph of cities by the nature of shrinkage, distinguishing three types (outpacing shrinkage, catching-up shrinkage and reversible demographic trend). There is a predominance of cities of catching-up shrinkage with negative population dynamics in two intercensus periods (1999–2009–2019) and a predominantly regressive type of demographic balance (68%), which are geographically distributed throughout the country. Every fourth shrinking city in Belarus belongs to the most unfavorable type—outpacing shrinkage with stable negative population dynamics in three intercensus periods (1989–2019) and a regressive type of demographic balance (since 1999), which are represented in the Vitebsk, Gomel, and Mogilev regions. A peculiar phenomenon is represented by shrinking cities of the third type (7.5%), located in the zone of radioactive contamination after the Chernobyl accident and the socio-economic periphery, in which, against the background of negative dynamics, a progressive type of demographic balance began to be observed.

The demographic shrinkage of Belarusian cities against the backdrop of the transition to post-industrial development has led to shifts in the spatial and functional structure. This trend manifested itself in a reduction of the area of production functional zones.

Keywords: shrinking cities; small-size urban settlement; regressive demographic balance; reduction of the production functional zones areas; types of shrinking cities

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A BOON OR A BURDEN? THE ROLE OF POST-INDUSTRIAL HERITAGE IN THE URBAN SPACE OF THE GZM METROPOLIS (POLAND)

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The Silesian Metropolis (GZM—Górnośląsko-Zagłębiowska Metropolis) is the most urbanized area in Poland. It is a conurbation consisting of cities developed from medieval and modern settlements under the influence of intensive industrialization which started here in the second part of the 18th century. Traditional industries such as mining and metallurgy developed here for over 200 years until the 1990s. Since then, the importance of heavy industries in this region has decreased significantly. Along with the closure of industrial plants, brownfields with specific buildings and other infrastructure are appearing in urban space, constituting a kind of problematic post-industrial heritage.

The aim of the paper is to show different approaches to the post-industrial heritage during urban regeneration of brownfields in GZM Metropolis. There are many examples of successful adaptation of post-industrial buildings and sites to new purposes which is the way of preserving the heritage. There are also many examples of forgotten or neglected post-industrial objects still waiting for its second life. Finally, there are plenty of brownfields simply cleared of infrastructure, with no signs of commemorating the past. What factors determine the fact that similar objects meet a different fate? What are the directions of adaptation of post-industrial sites? What is the role of intangible post-industrial heritage? These are questions that the paper will also try to answer.

Keywords: urban regeneration; post-industrial heritage; GZM Metropolis

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Abstract

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UNDERSTANDING AND ASSESSING RURAL RESILIENCE BASED ON A SOCIAL-ECOSYSTEM FRAMEWORK: AN EMPIRICAL STUDY OF CHINESE VILLAGES

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Natural social systems provide opportunities for human survival, living and development, but such development may be of less benefit to farmers in low-income and remote rural settlements because they lack money and complete infrastructure. Introducing the concept of resilience can help explore the development potential of rural areas and add vitality to the realization of high-quality rural development. Based on ecosystem services (ESs) and ecological thresholds, we calculated ecological resilience. For the social systems dimension, we measure social resilience using a resilience assessment methodology developed by FAO. Afterwards, this study constructed a framework, integrating ecological resilience and social resilience, to assess interactions between rural socioeconomic systems and ecosystems. On this basis, this research further divided the rural resilience system into five spatial clusters with different coupling coordination. The study shows that social resilience is better in rural settlements closer to cities, while remote rural settlements have better ecological resilience. Rural settlements close to cities tend to have higher incomes and better educational opportunities than remote rural settlements. In contrast, remote rural settlements perform well in terms of forest area and natural ecology. Based on these findings, we propose specific policy measures to meet these challenges. The operational framework of this study can provide new insights and meaningful theoretical references for the study of rural resilience.

Keywords: resilience; rural; social ecosystem; framework

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Abstract

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RUINS OR FOUNDATION? THE ROLE OF SELF-ORGANIZATION IN RURAL DEVELOPMENT OF PERIPHERAL RURAL AREAS OF RUSSIA

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The report will discuss the importance of self-organization of the population in peripheral rural areas. Sources include interviews, field observations and open municipal statistics. To collect data, the author took part in three expeditions in 2023–2024 and surveyed three municipal districts covering over 20 settlements in Vologda and Nizhny Novgorod oblasts of Russia. Traditionally, the leading role in the development of rural areas in Russia is reserved by authorities and business representatives, while population itself is considered as passive recipients of assistance. However, in peripheral territories, where the role of the state authorities is barely noticeable and large businesses may be absent, self-organization and mutual assistance practices come to the fore. These practices can be institutionalized and informal, aimed at development and contributing to maintenance of existing assets. The most universal mechanisms of self-organization are the programs of participation implemented at the federal and regional levels. According to Matthew effect, these programs are most effective in areas with high potential and resources for development, while nearly absent in depressive depopulating settlements. Basically, the participation programs are used to maintain existing assets and infrastructure. These programs often become a resource for local authorities to solve problems lacking funds from their subsidized budgets. For development purposes, there are other institutionalized resources of self-organization—grant programs, but such initiatives are much less common. Informal self-organization is most often tied either to a specific person, or to a community or organization. Examples of the first case are much more common, but they are less stable in the long-term prospect. The main limitation of self-organization that condemns the territory to stagnation and depopulation is the lack of social capital and active people in many peripheral villages. Difficulties are distinguishing in areas of high socio-cultural diversity, when the goals and values of various actors differ dramatically and can cause social conflicts. Thus, in peripheral rural areas, forms of self-organization arise that perform the functions of the state where it turns out to be insufficiently effective. This suggests the need to take this factor into account in geographical studies of rural settlement.

Keywords: self-organization; rural development; periphery; participation; rural settlement

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Abstract

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PLANNING OF RURAL SETTLEMENTS IN CROATIA

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Planned rural settlements are a reflection of socio-political, economic, and cultural conditions of society. The question arises whether there are planned rural settlements in Croatia and whether there is adequate awareness of the recognition of the spatial structure of the village as part of the spatial identity, i.e., the cultural heritage that is used in the planning of sustainable development and tourism?

The research showed that in Croatia there is continuity in the planning of rural settlements, which confirms that rural settlements can be the concern of society, that is, the state. Through the planning of rural settlements, social understanding, scientific achievements, legal system, social relations, and numerous other factors are manifested.

Due to the process of globalization and Europeanization, some believe that rural settlements have no prospects. Others, again, have a sentimental (romantic) attitude towards them and glorify its culture and way of life. The question is whether there is a more realistic "third way" that will accept modernization processes and at the same time respect spatial identity?

In any case, the planning of rural settlements should be understood as a specific planning discipline that would: comprehensively solve the problem of rural settlements and rural areas, ensure development that respects heritage, arouse interest, and involve the local population, coordinate the cooperation of the local population and all those who work in rural areas space.

Spatial planning of rural settlements is often reduced to the expansion of the construction area, without thinking about preserving the existing recognizable spatial structure. The result is an imbalance between construction and agricultural land, as well as a loss of spatial identity.

The quality results of the spatial planning of rural settlements, among other things, will depend on the alignment of different sectoral policies to effective administration and self-government as all stakeholders of society.

Keywords: spatial planning; rural settlement; rural spatial identity; cultural heritage; tourism; Croatia

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Historical geography

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THE UNIFICATION OF SLAVIC GEOGRAPHERS AND ETHNOGRAPHERS—A PIONEERING ENDEAVOR OF THE SCIENTIFIC COMMUNITY IN THE 20TH CENTURY

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Throughout human history, science has been the driving force of changes in societies. Unfortunately, many historical circumstances, including security, economic, and health risks, as well as spatial and cultural differences, have affected the extent of cooperation among the scientific community. Precisely, the fragmentation of the Slavs, as well as their "immersion" in broader communities, made it impossible to discuss joint plans and their realization. Although the initial outlines of cooperation existed at the beginning of the 20th century, only after the Great War did the first activities on this issue begin.

As one of the prominent representatives of European geography, Jovan Cvijić encouraged the establishment of the "All-Slavic Scientific Council". Confirmation of his engagement was the initiation of the First Congress of Slavic Geographers and Ethnographers in Prague in June 1924. In accordance with the agreement, Congresses followed in Poland (1927), the Kingdom of Yugoslavia (1930), and the Kingdom of Bulgaria (1936). In addition to Cvijić, respected scientists from Czechoslovakia (Václav Švambera, Václav Dedina, Jiří Daneš, Viktor Dvorsky), Poland (Eugeniusz Romer Ludomir Sawicki, Walery Goetel, Jerzy Smoleński), Bulgaria (Anastas Ishirkov, Mihailo Arnaudov, Ivan Batakliev), and USSR (Yuly Shokalsky, Evgeniy Spektorsky) were present. Support was also provided by representatives of the French (Emmanuel de Martonne, Pierre Defontaines), British (John Bartholomew), and Italian geographical schools (Giuseppe Caraci, Riccardo Riccardi). After Cvijić's death, Yugoslavia was represented by professors Pavle Vujević, Borivoje Ž. Milojević, Stevan P. Bošković, Sima M. Milojević, Borivoje Drobnjaković, Milisav Lutovac (Belgrade), Artur Gavazzi, Josip Roglić (Zagreb), Niko Županič, Jože Rus (Ljubljana), Petar S. Jovanović, Vojislav S. Radovanović, Atanasije Urošević (Skoplje) and other prominent scientists.

The working part was divided into eight thematic sections. The emphasis was on current topics in physical geography, as well as in the field of ethnology and related branches. The results of the held Congresses were expressed by the adoption of a number of resolutions that had application significance. However, there was no discourse, i.e., polemics about socio-political, demographic, and other problems which had to be the focus of interest of the research community. Nevertheless, this pioneering venture showed numerous opportunities for cooperation among Slavic countries. Unfortunately, 88 years have passed

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since the last event. The upcoming fifth Congress, which will be held in October 2024 in Belgrade, will provide an overview of new scientific findings, as well as answers to numerous "open" questions.

Keywords: geography and ethnography; Slavs; the scientific community; first half of the 20th century

Abstract

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SERBIAN GEOGRAPHICAL SOCIETY AND JOVAN CVIJIĆ

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Serbian Geographical Society was founded on April 7th, 1910. Since its foundation until 1927, the president of the Society was Jovan Cvijić, who was, at that time, a full-time professor at the University of Belgrade, a full member of the Serbian Royal Academy, and its president from 1921 to 1927. After Jovan Cvijić, there were 16 presidents of the Society, among whom the majority were university professors. Due to the wars, the Society did not work from 1914 to 1919 and from 1941 to 1946. Almost all its assets were destroyed in the wars.

The Society has had both full-time and part-time members, as well as member-benefactors (donors). In 1911, the Society had 100 full-time and part-time members. During the 1980s, it had more than 1,300 members, and today it has only 300 members who pay the membership and participate in social activities.

Scientific and professional work of the Society members has been performed in the scientific and educational sections. Special attention has been dedicated to the publishing activity. The first volume of the journal "Bulletin of the Serbian Geographical Society" ("Glasnik of the Serbian Geographical Society") was published in 1912. The publishing activity of the Society comprises 190 volumes of "Bulletin of the Serbian Geographical Society", 75 books of Special editions, 73 volumes of the journal "Zemlja i ljudi", 48 books of "Globus", 45 proceedings, scientific monographs, textbooks and manuals, 13 atlases, 12 books of "Mala biblioteka", 12 books of Memoires, and three geographical maps.

The main office of the Society is in Belgrade and branch offices are in several larger cities in Serbia. Besides the regular annual assemblies, accredited seminars, events such as "Cvijićevi dani" and professional excursions, the latest activities of the Society also include the competition in geography (regional and state level) of the students of the seventh and eighth grades of elementary schools. Since 1935, for the greatest accomplishments in science and education, the selected individuals and institutions have been rewarded the Medal of Jovan Cvijić by the Society. All the work in the Society is performed on a voluntary basis, with no compensation. The subsidies of the competent state ministries, which used to be sufficient for the work of the Society 30–40 years ago, are now reduced to 10 to 20% of earlier ones, and they are paid several months later, which considerably makes the work of the Society very difficult.

Keywords: Jovan Cvijić; Serbian Geographical Society; history; activities

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Abstract

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HISTORY OF THE SLOVAK GEOGRAPHICAL SOCIETY

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The first Slovak geographers regularly participated in meetings and other events organized by Czechoslovak Geographical Society, dating back to 1894. In 1946 the branch in Bratislava was established named the Slovak Geographic Society led by Jan Hromádka. The development of Slovak geography as a science, its wider penetration into the school system on all levels, and the continuous growth of personal background were the basic premises for the formation of independent geographical society. In 1955 the preparatory committee started to work (Mikuláš Konček, Michal Lukniš and Ján Hanzlík) and on December 8th in 1955 the constitutive meeting of the Slovak Geographic Society under Slovak Academy of Sciences took place in Bratislava. Michal Lukniš had been elected the first chairman of the society.

In 1959 the first regional branch was established—the East Slovakian subsidiary in Prešov. The first meeting of the society took place in Bratislava in 1959. At this time the society registered 175 members. In the following period, further regional branches were established—the West Slovakian in Bratislava (in 1965, called the Bratislava Branch since 1998) and the Central Slovakian in Banská Bystrica (in 1966), Nitra Local Group in Nitra (called West Slovakian since 1998), Košice branch in Košice (in 2006) and North Slovakian in Ružomberok (in 2009). The society had 372 members in 1967. The members would regularly meet at general assembly within the congress. Until now 18 meetings took place (since 1998 they are called congresses). At the head of the society were Michal Lukniš (1955–1970), Pavol Plesník (1970–1974), Emil Mazúr (1974–1978), Ján Drdoš (1978–1986, 1990–1992), Oliver Bašovský (1986–1990), Michal Zaťko (1992–1998), Jozef Mládek (1998–2006), René Matlovič (2006–2014), Ladislav Tolmáči (2014–2022), and Martin Boltižiar (since 2022).

At present there are nine geography workplaces (eight university departments and one research institute) representing the base of the Slovak geography in the six centres (Bratislava, Prešov, Banská Bystrica, Nitra, Košice and Ružomberok). Nowadays the Slovak Geographic Society has 300 geographers. It has six regional branches (Bratislava, the West Slovakian, the Central Slovakian, the East Slovakian, the North Slovakian and Košice) and five specialised committees (geographical thought, applied geography, geographic education, travel-expeditionary, young geographers and students of geography).

Keywords: history; Geographical Society; Slovakia

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MAJOR AXIS OF ACTIVITY OF THE BELARUSIAN GEOGRAPHICAL SOCIETY: TRADITIONS AND MODERNITY

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The Belarusian Geographical Society (BGS), which was founded in 1954 as part of the Academy of Sciences of the Belarusian Soviet Socialist Republic (BSSR), celebrates its 70th anniversary in 2024. The main activities of the Geographical Society of the BSSR were expeditionary research, publication of monographs, and academic manuals in various fields of geographical science, as well as organising scientific conferences and educational activities on geographical problems. Several periods exist in the development of BGS.

During the first period, the BGS was chaired by representatives of the Academy of Sciences of the BSSR, leaders of scientific schools: academician I. S. Lupinovich (in 1954–1957), academician K. I. Lukashev (1957–1960), and member of the Presidium of the Academy of Sciences of the BSSR T. S. Gorbunov (1960–1963). They combined scientific and educational activities, while being heads of the chairs at Belarusian State University (BSU). At this stage, a lot of organisational work was done to enlarge the number of members of the society. Several sections on the main directions of research were established. Discussions of monographs and textbooks were held, compilations of scientific works were published, and a geographical lecture hall began to work.

During the second stage, the Geographical Society of the BSSR was chaired by Professor V. A. Dementyev (1963–1974) and Professor V. A. Zhuchkevich (1974–1983), the heads of the BSU chairs. During this stage, an editorial-publishing department was established, and the work on the recommendation for the publication of monographs and academic manuals continued (5–10 editions per year). In 1965, the first university book on geography of Belarus was published (edited by V. A. Dementiev, N. T. Romanovsky, and S. M. Melnichuk). Three departments were established in the structure of the State Geography Department: physical geography, economical geography, ethnography, and folklore. Also four committees were established: phenology, toponymy and school geography, local history and tourism, and medical geography. In 1975, the Statute of the BSSR State Geography Centre was developed and approved. A great number of scientific conferences were held, reports of the society members on expeditions and journeys were presented, series of educational television programmes were prepared. More than 10 nature reserves and sanctuaries were founded.

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During the third period of the BGS activity (1983–2000), the BGS was chaired by Professor V. S. Anoshko. A large number of monographs and academic books for universities and secondary schools were published by geographers of Belarus. Republican and international scientific conferences were held in various fields of geographical sciences. The encyclopaedia *Nature of Belarus* (1983–1986), the *National Atlas of the Republic of Belarus* (2002), and other fundamental works were published on the initiative of the BGS. Much emphasis was placed on the history of geographical research in Belarus—museums were organised and memorial boards were erected at the birthplace of Y. D. Chersky, I. I. Domeiko, A. A. Smolich, and others; scientific readings and conferences in honour of K. I. Lukashev, G. I. Goretsky, I. S. Lupinovich, V. A. Dementiev, and others became regular events. Since 1991, Republican competitions in geography have been held. The definition of the geographical centre of Belarus and Europe was initiated.

During the fourth stage, the BGS was chaired by Professor P. S. Lopukh (2000–October 2017). Since November 2017, the BGS is chaired by Associate Professor A. E. Yarotau. In the era of globalisation and increasing environmental problems, the challenges that geographers face are changing. The traditions of scientific geographical schools are being strengthened, differentiation of geographical sciences is in progress. The research fields at the intersection of sciences (geoecology, geophysics, geochemistry, geobotany) are becoming more intensive. Geoinformation technologies are being introduced in all spheres of geographical science. Instruments and equipment are being improved. Earth remote sensing data are being used more frequently. New tasks are being tackled in each field of geographical research and great attention is being paid to the introduction of new teaching technologies into the educational process.

Keywords: Geographical Society; scientific research; direction of activity; nature management

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Abstract

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THE ITALIAN GEOGRAPHICAL SOCIETY AND EUGEO AS HUBS OF GEOGRAPHICAL RESEARCH AND THOUGH

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The Italian Geographical Society (SGI) (http://www.societageografica.it/) was founded in Florence in 1867—at that time the Capital of Italy. Over the last 100 years, and still today, the headquarters has been based in Rome, Palazzetto Mattei, a 16th century building within Villa Celimontana, a public park a few hundred meters from the Colosseum. SGI mission is to promote and disseminate geographical culture and knowledge, enhancing the understanding of the territory, landscape, environment, and the safeguarding of cultural heritage. The SGI acts as a hub for geographical research and thought, with a network connecting academic scholars and geography enthusiasts in Italy, but also in connection with wider international networks. The SGI has always considered the international scale to be important, participating in the main scientific events of international geography. Precisely for this reason, the SGI is among the creators and founders of the Association of European Geographical Societies (EUGEO) (www.eugeo.eu). The initial objectives of EUGEO were to improve communication and exchange ideas between member institutions, to act as a lobbying body for geography in Europe, to improve synchronization of geographical research at a Pan-European level, and to identify new scientific and educational responsibilities for geography within Europe so as to position geography more fully within the center of the European debate. This European institution is now consolidated and carries out its functions in several ways. Contact and dialogue between the various geographical societies takes place through the annual General Assembly; the EUGEO Congresses have acquired increasing importance (in Barcelona, in 2024, the Congress was attended by 750 registered delegates representing 48 countries), taking place every two years and reaching the tenth edition in Vienna in 2025 (https://www.oeaw.ac.at/isr/eugeo-2025). To bring academic geography to contribute to the public debate, in 2018 EUGEO decided to bring to the European and then global scale a "popular" initiative born in 2017 in France thanks to the CNFG (EUGEO member): the GeoNight (www.geonight.net). The 2024 edition registered 286 approved events from 36 countries, with at least one event in each continent. Everyone is invited to submit an event proposal for the 2025 edition, which will be held on April 4th.

Keywords: Società Geografica Italiana; EUGEO; networks; geographical thought; geographical research

Abstract

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THE STELLAR JOURNEY OF MILUTIN MILANKOVIĆ

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Milutin Milanković was a brilliant thinker and a visionary with diverse talents, personifying the spirit of the Renaissance. Although his parents initially intended for him to study agronomy to improve the family estate in Dalj, his course changed when Professor Varićak at the Real Gymnasium in Osijek recognized his exceptional talent for mathematics. Inspired by this encouragement, Milanković enrolled at the Technical University of Vienna, where he earned his degree and gained recognition as a skilled engineer, renowned for designing ceilings, bridges, and buildings. During his studies, he also attracted the attention of Czech mathematician Emanuel Czuber. Even though he was offered a teaching position at the Technical University of Vienna, Milanković decided to leave the field of engineering, feeling it did not align with his greater ambitions. He soon responded to an invitation from prominent Serbian scientists Jovan Cvijić, Bogdan Gavrilović, and Mika Petrović Alas, joining the University of Belgrade as a professor. There, in a humble office equipped with pencil, digitron and paper, he finalized his monumental work, *Canon of Insolation*.

Doing so, the world may have lost an agronomist and engineer, but it gained a groundbreaking scientist. Milanković transformed the study of climate by developing the astronomical theory of climate. He became the founder of cosmic climatology, calculating the temperature conditions of various planets throughout the solar system. In particular, he was the first to precisely quantify the effect of Earth's long-term orbital cycles on climate variations, solving the mystery of the ice ages.

Over that time, the issue of climate change in the past and the mystery of the ice ages were important scientific questions that attracted Milanković's attention. A significant role in developing the idea of climate was played by Serbian climatologist Pavle Vujević, who introduced him to the works of renowned meteorologists and climatologists Julius von Hann and Wilhelm von Trabert. Milanković's theory of insolation was soon recognized and strongly supported by Vladimir Köppen and Alfred Wegener, with major contributions to its affirmation made by Wolfgang Sürgel, Bartel Eberl, and later by Hays III, and André Berger.

Milanković's scientific contributions spanned his 79-year life, during which he consistently pushed the boundaries of his field. It took three decades to withstand the challenges to his theory. Those who did not understand him claimed that it was merely a scientific trick for publicity. Milanković waited more than half a century for the Canon of Insolation to be confirmed by the American expedition of James Hays, John Imbrie, and

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Nicholas Shackleton, who decoded paleoclimatic history as part of the CLIMAP research project in 1976, definitively proving Milanković's insolation cycles. The modern calendar and the migration of the poles are among Milanković's great achievements, though they remain overshadowed by the Canon of Insolation.

The new authorities after the Second World War regarded him as a political enemy. They criticized him for his lack of knowledge about Marxism and Leninism, ignoring the fact that he was a deeply religious man with strong spiritual beliefs. What ultimately spared him was his age, as he was already in his seventies. A man of extensive education, he retained his elegance and dignity throughout his life, embodying the gentlemanly manners and qualities characteristic of the Viennese Biedermeier period.

Keywords: Canon of Insolation; Milanković; Vujević; Köppen

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Abstract

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TRENDS AND PERSPECTIVES IN LINGUISTIC GEOGRAPHY: A CONTESTED BUT FERTILE FIELD

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That language use and geographical space interact manifoldly with each other, is a well-known truism both in linguistics and in anthropogeography. However, the exact nature of this relationship is still largely underresearched and poorly understood. Such interdisciplinary endeavours like *linguistic geography/geolinguistics* or *areal/spatial linguistics* have remained somewhat marginal and often contested, despite wealth of research topics and innovative methodologies they bring, with a highly interdisciplinary potential.

The aim of this paper is therefore to present a methodological discussion, including an historical survey, of the main research topics, trends, and perspectives in linguistic geography understood as an inter-discipline, broadly construed at the intersection of linguistics and anthropogeography, while taking the South Slavic dialect space as the main source of data. Topics covered include toponomastics and geographical terminology, issues in dialect geography, linguistic areas, and linguistic landscapes. In particular, the paper examines the interdisciplinary perspective of geolinguistic research and its intersections with related disciplines such as historical, regional, and population geography. In addition, possible methodological innovations, such as the use of GIS, are discussed in the context of South Slavic data.

Keywords: anthropogeography; linguistic geography; areal linguistics; South Slavic dialect space

Political geography

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FUNCTIONAL ISOMORPHISM OF POLITICAL AND ADMINISTRATIVE BORDERS IN THE MODERN WORLD

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The system of borders and their transformation under the influence of integration and globalization, the relationship of material, formal (established by legal acts) and ethnocultural, linguistic, mental, and other invisible, but often very significant borders, remain in the focus of geographical studies. The "horizontal" interdependence between borders of the same level, for example, state borders is obvious. However, there is also "vertical" interdependence between borders of different levels. I wondered why the research field of border studies is still limited exclusively to state borders. At all levels the functions of formal borders are similar (isomorphic), but performed in different combinations. Each state, regional, and municipal boundaries perform the function of organizing and controlling the territory, delimiting its legal and normative space, including the provision of public services. Institutionalized boundaries of all levels enhance spatial contrasts and contribute to the effects of peripheralization. The objective of the paper is to show the isomorphism of formal borders and their impact on the economy and everyday practices of population using the cases of a few typical regions of Russia. On the one hand, thanks to the barrier and constitutive functions of borders, they contribute to the leveling of the socio-economic landscape within their limits. On the other hand, the same functions enhance the contrasts between neighbouring territories. The properties of borders also include the ability to attract or repel certain types of activity, and to cause or enhance the peripherality of adjacent areas. The contradiction between the continuity of physical and social space and the barrier function of borders determines the "cross-border" practices of population, generates commodity flows, and other similar interactions between neighbouring territories. In turn, interactions dictate the need for cooperation between them to solve a wide range of problems that are cross-border in nature. However, in Russia such cooperation exists practically only at the interstate level. Our analysis of the newest regional and municipal strategic documents proves that this need is either not realized or is absent.

Keywords: borders; isomorphism; Russia

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EPISTEMIC JUSTICE VS. ACADEMIC HEGEMONY: CRITICAL GEOPOLITICS OF THE GLOBAL ORDER OF KNOWLEDGE

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In the global exchange of knowledge, there is a growing favoring of academic practices created in specific countries from the global North, which serve the interests of this informal, but symbolically powerful community. Subsequently, these local views are spreading worldwide as *universal* and unavoidable patterns for those who aim to participate in the global academic communication. Those who fail to comply with the practices of prioritizing specific topics, methods, and ways of thinking are destined for gradual marginalization.

The concept of epistemic justice is commonly restricted to tracking and interpreting imbalances in publications listed in some of the top global indexing databases. This paper goes beyond the quantity approach and focuses on specific discursive practices that create, maintain, or challenge the established global order of knowledge. These practices are mostly from post-socialist countries, Africa, Asia, and Latin America.

Two interrelated issues are examined in this paper. First, the production and dissemination of knowledge. Second, the question of who has the right (and who authorizes it) to evaluate, hierarchize, and control academic knowledge, as well as segregate, through symbolic recognition or stigmatization, those who participate in the creation of this knowledge? The critical geopolitical reading of a world order of knowledge is a suitable analytical tool for answering this question because of the inextricable connection of the considered phenomenon with some traditional patterns of socio-cultural division of the world. The field of critical geopolitics has a strong interest in marginal phenomena and powerless subjects, which are usually omitted when drawing the world's political and cultural map of knowledge.

This paper contains a critical analysis of the experience and positioning of those perceived with epithets such as "backwards", peripheral subjects, or representatives of the "second" and "third" worlds. The question was asked about how those stigmatized as academic "periphery" contribute to epistemic injustice. To reflect such practices, the author employs the term self-peripheralization. The paper also emphasizes that epistemic justice is one of the important aspects in the struggle for a new, more inclusive model of coexistence of different cognitive paradigms and ways of doing science, developing in a broader social and cultural framework.

Keywords: globalization; order of knowledge; epistemic justice; epistemic hegemony; self-peripheralization

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SLAVIC WESTERN WING BETWEEN BALTIC AND ADRIATIC: HISTORICAL, POLITICAL, AND CULTURAL ASPECTS

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The western wing of the Slavic world (Poles, Czechs, Slovaks, and Slovenes) was controlled by the Roman-German Empire for almost a millennium. The periphery was dominated by maritime powers: the Hanseatic League in the Baltic and the Republic of Venice in the Adriatic. Dynamic political processes created a highly fragmented political map. The formation of larger territorial units (lands) promoted the development of strong regional identities. The development of nationalism forced the social and cultural integration of the various countries into nation states. Most of this area was a part of the multi-ethnic Habsburg Empire, which, before the growing pressure of nationalism, switched to German-Hungarian dualism and avoided the Slavic idea of trialism. The Slavic peoples developed mechanisms of cultural defense. After the First World War, the shrinking of Germany and Russia and the disintegration of Austria-Hungary made way for predominantly Slavic countries. This "Europe-in-between" became a politically sensitive area for many minorities and, during and after the Second World War, the scene of mass forced migrations and the dividing geopolitical line between West and East. After the collapse of socialism, the federal entities of Czechoslovakia and Yugoslavia became independent; the latter-one after a series of conflicts. The western wing of the Slavic countries is now part of both EU and NATO. During the centuries of political turmoil and geopolitical divisions and unifications in this area, they gained different experiences in living together with their western (Germanic and Romance) and eastern (mainly Slavic) neighbors: coexistence, cooperation, competition, and conflict. The working hypothesis of this paper is to what extent these experiences can be utilized under today's conditions of a united Europe. We also examine whether and to what extent these experiences can serve as a bridge for cooperation with the wider Slavic world in Europe. When analyzing the leadership and policies of the EU, one gets the impression that the current political groupings have learned almost nothing from the series of disintegrations of multi-ethnic states.

Keywords: political geography; Slavic world; Europe; ethnic identity; culture

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NAVIGATING THE COMPLEXITIES OF ORTHODOX TERRITORIALITY: INSIGHTS FOR POLITICAL GEOGRAPHY

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A common approach involves applying the principles of political geography to other domains. The political map of the world, for instance, illustrates international relations as a system of relatively equal states, each sovereign over its territory, with no hierarchical relationships. This framework is often inappropriately extended to the relationships between Orthodox Churches, using political geography's terminology and concepts to create maps of "canonical (sovereign) territories." However, the spatial organization of the Orthodox world, while sharing some similarities with the state-based international system, also exhibits significant differences. The idea that the world is neatly divided into canonical territories with well-defined borders is an artificial construct. The Orthodox Church system is inherently asymmetric, dynamic, and flexible. Beyond territorial boundaries, the Orthodox structure also encompasses communities, reflecting the influence of dramatic political and social upheavals of the 19th and 20th centuries, which introduced the element of diaspora into this structure.

Conventional political maps fail to capture the complex nature of Orthodox Church territories. Instead, a proper representation of the Orthodox structure would involve a multidimensional map reflecting overlapping jurisdictions and fluid boundaries. This map would illustrate the dynamic and adaptive nature of Orthodox territoriality, contrasting sharply with the fixed and rigid borders of sovereign states. Understanding this distinction is crucial for accurate analysis. The erosion of territorial structures within the global order highlights the need to study the spatial organization of Orthodoxy. The Orthodox Church's spatial dynamics, characterized by non-linear boundaries and adaptive jurisdictions, offer valuable insights into managing religious and cultural diversity in an increasingly globalized world. Recognizing the unique aspects of Orthodox spatial organization can provide new perspectives on geopolitical and social analyses. It is essential to avoid forcing Orthodox Church relationships into the framework of sovereign state relations. Such an approach risks focusing on specific conflicts rather than the broader organizational structure. Appreciating the distinct spatial dynamics of the Orthodox Church, we can better understand its organizational complexities and derive lessons applicable to broader geopolitical contexts.

Keywords: canonical territories; territorial organization of Orthodoxy; diaspora; jurisdictions

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(NO) MORE CHANGE: THE FRENCH PROPOSAL AND NORTH MACEDONIA'S EU PERSPECTIVE

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Since receiving candidate status for the European Union (EU) in 2005, North Macedonia's accession process has encountered several significant delays. Initially, Greece obstructed the country's EU path due to a long-standing dispute over its name. This deadlock was resolved through the 2018 Prespa Agreement, a landmark compromise that resulted in constitutional amendments and the official renaming of the country to North Macedonia. Following this agreement, it was widely anticipated that the accession process would resume according to established EU protocols. However, in 2019, further delays arose due to the introduction of a revised EU accession methodology. Even after the adoption of this methodology, Bulgaria imposed a veto, citing North Macedonia's failure to adhere to the 2017 Treaty of Friendship, Good Neighborliness, and Cooperation. This veto remained in place for two years, until the introduction of the French proposal. With this, Bulgaria agreed to lift its veto, while North Macedonia committed to enacting additional constitutional amendments, specifically the inclusion of ethnic Bulgarians in the preamble of its Constitution.

The French proposal formally started North Macedonia's EU accession process. Nevertheless, to progress beyond the initial phase, the country must fulfill its commitment to constitutional reforms. The proposal itself, and the ongoing delay in implementing these amendments have further deepened the political polarization within North Macedonia.

This paper examines the essence of Bulgaria's demand for constitutional amendments, which is viewed by some as a "simple legal modification" and by others as a form of "Bulgarian diktat" or/and "Bulgarization." Although the enhanced enlargement methodology has rendered the accession process more predictable and credible, it has not dispelled the uncertainties facing North Macedonia. The analysis suggests that North Macedonia will need to adjust its positions on identity and historical issues with Bulgaria throughout the negotiation process, in line with the principles of the 2017 Treaty and the European Union's emphasis on fostering good neighborly relations as an essential element of the enlargement process.

Keywords: North Macedonia; EU accession; bilateral disputes; French proposal; constitutional amendments

Abstract

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MODELING INTERRELATIONSHIP BETWEEN RELIGIOSITY, ETHNIC AND CONFESSIONAL IDENTITY IN THE CONTEXT OF ENSURING SOCIETAL SECURITY IN THE ASIAN BORDERLANDS OF RUSSIA

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It is presumed that religion in the contemporary world has ceased to fulfil its initial functions of explaining nature. Still, it preserves strong cultural and social dimensions, ensuring the diversity of modern societies, social integration, and spiritual development. In border territories connecting culturally divergent countries, religiosity takes on fanciful shapes, reflecting historically driven patterns of resettlement of peoples and having a natural relationship with ethnic and confessional identities. Based on the results of sociological studies in two regions of Russia (the Altai krai and the Republic of Altai, n = 941, structured interviews) and the Centrality Religiosity Scale (CRS) by Stefan Huber and Odilo W. Huber, the authors explore different facets of interdependence between subjectively defined and test-measured religiosity, compare them with confessional and ethnic self-identification, that allow not only to compare similar tools with different functionality, but also receive insights about conjugacy and divergence of religiosity, religion and ethnicity, taking into account two society with different ethnic composition. According to the results, the majority of the population in the two regions are rather "episodic" believers, whereas the level of high religiosity is more often found among women, residents of the national republic, and Buddhists. The highly religious Orthodox population is about 5.2%, and confessions differ not only by their dogmas and practices but also by the configuration of dimensions of religiosity. In comparison with the CRS index, self-evaluation gives smoother results, allowing non-believers to have higher degrees of personally defined religiosity.

Keywords: religiosity; religious identity; societal security; ethnicity; Asian borderland

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Ethnology


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THE 100th ANNIVERSARY SINCE THE FIRST CONGRESS
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ANTHROPOGEOGRAPHIC SCHOOL AND ETHNOLOGICAL SCIENCE IN SERBIA

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The paper intends to chronologically present the development path of ethnology as an educational and scientific discipline from the anthropogeographical school of Jovan Cvijić to the present day. There is a long list of all those who, from Dositej's enlightenment, through Vuk's romanticism and Cvijić's school of anthropogeography, contributed to the development of ethnology in Serbia. It is undeniable, however, that with the appearance of Jovan Cvijić, ethnology became independent and gained its place in the scientific and educational system. The Cvijić's anthropogeography school was shut down without the subsequent generations having produced an original approach: contemporary anthropology in Serbia is based on taking over the current world scientific models of anthropological schools from the West. Cvijić's key role in branding ethnology as an educational and scientific discipline in Serbia—from the "science of the people" to current anthropological directions is unquestionable. The term science of the people is a concise description of all the directions in which the researches of our early ethnologists, educated under the influence of Cvijić's anthropogeographical school, as well as those of later researchers, whose traces of activity go back to after the Second World War. Cvijić's school became known beyond the then borders of Yugoslavia. Naturally, understandings about the subject and goals of ethnology have changed, and the methods of scientific work have been improved. Today, anthropology is dominant, and the state of ethnological and anthropological science in Serbia can be monitored at least on three levels: education and institutions; scientific production—realization and presentation of scientific work; scientific configuration—diversity and directions of scientific approaches.

Keywords: chronology; anthropogeography; ethnology; anthropology; scientific directions

Abstract

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"ANTHROPOLOGISTS DON'T STUDY VILLAGES; THEY STUDY IN VILLAGES": PLACE AND SPACE IN ETHNOLOGICAL TERMS

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"Anthropologists don't study villages; they study in villages." This insightful statement by Clifford Geertz (1973) encapsulates the essence of the role of place and space in ethnological terms. It underscores the importance of researchers to focus more on people than the place itself. This approach provides a deeper understanding of the culture and stimulates discussions on the relationship between geographical and ethnological/anthropological research problems and methodology, addressing disciplinary priorities.

Since the second half of the 18th century, geography and the ethno and anthropo disciplines have coexisted, reflecting the centuries-long tradition of documenting cultural differences between different peoples. Explaining differences was inconceivable without spatial mapping, a practice that can be traced back to antiquity when it was common to explain cultural differences in terms of proto-geographical determinism.

The first part of our discussion will shed light on the history of the relationship between geography and delineations of ethnological/anthropological activities. These relations, which have evolved, mirror the successive differentiation and specialization of scientific disciplines that can be traced back to the 18th century. Then, the first ideas emerged to emancipate ethnographic issues, which were then part of the historical-geographical observation of the world. This period was characterized by a close bond between history and geography, with the two disciplines often referred to as "ancient/medieval/new history/geography" to mark their focus in the pre-Enlightenment. Even in the 20th century, some remnants of the original roots were preserved, particularly in anthropogeography.

The dynamics of the spatial foci will be illustrated through research examples from Slovenia. Since the second half of the 20th century, Slovenian social scientists and humanities scholars witnessed several postmodern "turns," including the "spatial turn." This term refers to a shift in focus in various disciplines, including ethnology and anthropology, towards studying space and place as fundamental dimensions of human experience, social organization, and symbolic universe. It is instructive to see how ethnologists and anthropologists have reflected on space and place, given that space is one of the fundamental research dimensions (and thus a taken-for-granted category); yet, it must be subject to continuous reflection.

Keywords: ethnology and geography; disciplinary history; spatial turn; ethnology/anthropology in Slovenia

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REVITALISING THE COUNTRYSIDE? ETHNOLOGICAL RESEARCH ON COUNTER-URBANISATION AND RURAL TRANSFORMATION IN BULGARIA

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The depopulation of rural areas in Bulgaria is a complex and long-lasting process that began in the mid-20th century. The sizable internal population movements from rural to urban areas in Bulgaria during the communist era led to rapid urbanisation. This was as the result of forced collectivisation and industrialisation. Further rural depopulation was exacerbated by mass emigration abroad in the first two decades of the post-communist transition. This led to a serious deterioration in the demographic, economic, social, and cultural characteristics of rural areas. However, in the last decade, although the general trend of decreasing rural population (and the country's population in general) has been maintained, the number of movements from rural to urban areas has been smaller than those in the opposite direction. These movements include both returnees to their ancestral villages and new settlers buying rural property. The newcomers also include Bulgarian citizens who have returned from living and working abroad, as well as foreigners who have chosen to settle in Bulgarian villages.

The paper aims to provide an overview of the research work on counter-urbanisation in the country that has been carried out by a research team from the Institute of Ethnology and Folklore Studies with Ethnographic Institute and Museum of the Bulgarian Academy of Sciences since 2018. The conceptual framework of the research will be presented. Aiming to investigate the forms and mechanisms of social, cultural, and economic interaction between rural newcomers themselves and with local residents, and how this affects rural transformation, we integrate ethnography with approaches from other disciplines such as social geography, rural sociology, human ecology, policy studies, etc. Key research questions that we address include: What attitudes and prerequisites do locals and newcomers have towards each other? How are different cultural perceptions reconciled in rural settings? How are different knowledge and habits transferred and assimilated? To what extent are compromises made in a diversifying rural environment? What are the potential sources of conflict and what are the strategies for resolving them? How the practices and activities of each group affect the rural landscape and shape the ways in which existing local environments, assets and resources are used.

Keywords: rural-urban studies; counter-urbanization, locals; newcomers; Bulgarian countryside

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ETHNOGRAPHIC AND ANTHROPOLOGICAL ANALYSIS OF THE CULTURAL TOPOGRAPHY OF A REGION: EXAMPLES FROM MACEDONIAN FOLK CULTURE

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Considering the cultural topography of a region as an anthropological phenomena and as a form of identification of people according to their local regional ethnic and cultural characteristics was very clearly pronounced in the folk tradition of the Macedonians and was probably one of the most significant cultural forms for the formation and preservation of cultural characteristics in conditions when it was still difficult to talk about a national identity, which, usually, follows the processes of the creation of nation-states, as well as the initiation of revival processes. In that sense, regional identification was one of the most powerful mechanisms for the survival of cultural values and, in a long historical process, perhaps the only form of identification of collectivities, until the formation of ethnic or national representations of the existence of peoples, nations, etc. Even during field research in modern conditions, people's extremely strong sense of belonging to the local regional ethnic communities can be observed.

However, in order to be able to proceed with the further analysis of some of the aspects of the spatial concept of the ethnographic landscape, we need to start by determining the conditional definition of the region. The region is understood as a separate, relatively independent ethnic and social organizational unit, in which, under certain historical, social, and political conditions, the members create, keep, and use common elements of identification, which on the one hand create mechanisms for mutual cultural connection, and on the other hand, elements of differentiation from others. The members of a certain region are in the largest number of cases connected through a system of common clan's affiliation, that is, they connect the representations of the common origin, the same ancestor, or some other type of mutual connection. At the same time, the basic methodology and mechanisms in the formation of local-territorial identities correspond to the basic principles and principles of the creation of collective identities, which is why this problem largely remains in the domain of identity studies. Here, the spatial structure and organization of the area will be significant, as part of the elements used in building this type of identities.

Keywords: ethnography; cultural topography; region; identity; space

Abstract

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CULTURAL IDENTITY OF CITIES IN BOKA KOTORSKA AS A PLACE OF INTERACTION: INTANGIBLE CULTURE AND CONTEMPORARY SPACE

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Understanding the intangible cultural heritage as an important element of the cultural identity of a town or a geographical entity is a contribution to understanding the complex processes of the wider community and their symbolic and spiritual values. In this sense, in this paper I will deal with the cities in Boka Kotorska, with a focus on Kotor and Herceg Novi. The research includes the analysis of cultural content in the mentioned towns, the observation of those elements of intangible culture that strive to be integrated in the modern space. In other words, in my work I will deal with those aspects of cultural heritage through which they try to secure the symbolic values of the local community in such a way that they "fit" into the modern cultural space. So, I am interested in the relationship between the wider community and intangible culture, its use in the contemporary environment, and the promotion of this geographical unit as a specific cultural area within Montenegro.

Bearing in mind that we are talking about coastal towns, I will also deal with the combination of tourism and culture, more precisely, the promotion of the "cultural products" of this geographical entity. In this sense, the research also includes an analysis of the importance of the *My CrnaGora* portal, within which the mentioned cities are promoted as a destination. Starting from the assumption that in these cities the question of cultural identity is simultaneously a question of image and positioning on the map of coastal cities in the surrounding area, in this paper I will present the potential of intangible cultural heritage in the process of cultural and touristic affirmation of the towns in Boka Kotorska.

In such environment, sustainability and (modern) application of intangible culture proved to be a key parameter in constructing the cultural identity of the town, the geographical entity and its promotion. Therefore, one of the conclusions of this paper is that if there is a sustainability and/or need for further use of an element of intangible culture, it will be protected in the future and through different social circumstances and practice and will become one of the key patterns for building cultural identity of Boka Kotorska.

Keywords: cultural identity; intangible culture; contemporary space; promotion; Boka Kotorska

Contributed papers

Physical-geographical processes and their effects on the population

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DAS KARSTPHÄNOMEN REVISITED: SERBIAN GEOSCIENTIST JOVAN CVIJIĆ AND THE (INTER)NATIONALIZATION OF GEOMORPHOLOGICAL THOUGHT

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Abstract: This paper explores the evolution of geomorphological and hydrological research on karst landscapes in Central and Southeastern Europe before 1914. It provides fresh insights into the emergence of the term "karst" as a universal framework for understanding soluble rock phenomena, originally derived from a limestone plateau near Trieste. Focusing on Jovan Cvijić's seminal work *Das Karstphänomen* (*The Karst Phenomenon*; 1893), submitted as his Ph.D. thesis at the University of Vienna, my essay reassesses Cvijić's contribution to karst geomorphology. I argue for a nuanced reconsideration of Cvijić's book, emphasizing collaborative research and the interaction between the internationalization of geoscientific knowledge and emerging national identities on the Balkan Peninsula prior to World War One. Taking a history of science perspective, my paper examines the epistemic, political, and social dimensions of early karst research across three stages: its emergence as an imperial endeavour in the late Habsburg Monarchy, its synthesis and systematization through Cvijić's work, and the establishment of the north-western Dinarides as the "Classical" Karst.

Keywords: karst research; history; geomorphology; scientific cooperation; internationalism

1. Introduction

The term "karst" originates from a barren plateau in the hinterland of the Bay of Trieste (Adriatic Sea), which in Slovenian is called "Kras", in Italian "Carso", and in German "Karst" (Kranjc, 1994). From the 18th century, naturalists and travellers traversed this region along ancient trade routes between Trieste and Vienna, likening its features to landscapes in Southeast Europe, expanding the geographical scope of the term beyond its traditional boundaries. Until 1918, this plateau formed part of the multinational Habsburg Monarchy, and karst research gained governmental support, driven by large-scale water supply and reforestation projects.

Jovan Cvijić (1865–1927), a Serbian geoscientist, pioneered karst classification and typology, laying the foundation for modern karst studies with his seminal work *Das Karstphänomen* (*The Karst Phenomenon*; Cvijić, 1893). Submitted as a Ph.D. thesis at the University of Vienna, it synthesized international literature and established the Dinaric Karst as the world reference site for dissolutional landforms and aquifers. Cvijić's work introduced Slavic terms such as "polje" (karst plain), "doline" (enclosed depression), or "ponor" (swallow hole) to the international scientific community (Stevanović & Mijatović, 2005).

Despite notable scholarly contributions focusing on Cvijić and the founding figures of karstology (Ćalić, 2007; Ford, 2007; Henniges, 2017a; Jović & Kostić, 2015; Shaw, 1992;

Stevanović, 2013; Trudgill, 2008), gaps remain in understanding pre-*Das Karstphänomen* research and the broader socio-political context shaping karst studies. This essay advocates for a reassessment of early karst sciences, highlighting collaborative efforts across local, regional, and transnational communities. Drawing on Fleck's (1935) sociological concept of "thought collective", it explores the social dynamics driving knowledge production in karstology, emphasizing the influence of diverse stakeholders.

Thus, I will not deal with the historical range of naturalists studying phenomena in soluble rocks, but analyse the emergence of a scientific community (sharing the same theories, methods, and visions about karst) at three stages: the origin of karst research as a cooperative undertaking in the late Habsburg Monarchy, its synthesis and systematization in Cvijić's *Das Karstphänomen*, and the final establishment of the "Classical" Karst as a type area.

2. "Karst knowledge" as an imperial enterprise

In the late 1880s, as Cvijić was earning his spurs in field research, karst and its understanding as a phenomenon affecting many territories across Southeast Europe was already a hot topic in the Habsburg Monarchy. This interest spanned geological, paleontological, and prehistoric studies, driven by practical applications like tourism, water sources, and land use. Both "expert" studies and indigenous knowledge contributed to understanding karst landscapes, which often held geopolitical significance due to their borderland locations and multinational populations.

In the early 19th century, scholars and travellers explored karst features, with Postojna Cave in Carniola gaining attention for its touristic potential. Possibly the first to discuss the "type of karst formation" with sites outside the Dinarides was Friedrich Simony (1847). Based on his excursions to the Dachstein Mountains, he compared its "surface" and the "closely related cave formation" with similar features in the limestone area in Moravia. Political changes in 1848/49 led to further scholarly pursuits, focusing on describing and comparing topographical features in other regions of the empire.

Adolf Schmidl's (1858) extensive observations in the Monarchy's limestone areas and the work of geologists like Ami Boué (1856) contributed to understanding karst beyond regional boundaries. By noting that karst features also occur in Greece, Minor Asia, and Syria, the latter finally detached the term from its local reference. The establishment of scientific institutions in 1850s Vienna such as the Imperial Geological Survey facilitated collaborative research. Large-scale surveys and geological mapping sought to increase the efficiency of governance, dismantle disparities within the Monarchy, and legitimize its territorial framework as a natural and cultural unit in the face of political crises. The development of the term "karst" as a model of thought unifying different Habsburg territories contributed to the creation of a scientific framework for imperial identity. Subsequent mapping of karst areas throughout the Balkans and the Middle East was a precursor to the internationalization of the model.

With the ecological studies of Joseph Lorenz (1860), the notion of karst as an environment threatened by deforestation and water scarcity gained prominence, leading to large-scale reforestation efforts supported by Viennese ministries. Behind these cross-regional efforts to transform entire landscapes from their "neglected state" to a "more humane" one were not only economic motives but also stereotypical images of the Balkan Peninsula as the "European Orient", embodying Habsburg policymakers' notion of the

Empire as a "cultural state". The attribution of the term "karst" to areas beyond the Monarchy thus promoted the notion of their potential for "civilization" and integration and ultimately underpinned Habsburg's expansive claims.

The 1870s saw increased public interest in karst environments, with tourism and water supply projects driving exploration and research. The establishment of the very first Speleological Society in Vienna (1879) facilitated collaborative research, with a focus on public engagement and interdisciplinary approaches.

Overall, the development of karst knowledge in the Habsburg Monarchy was influenced by imperial territoriality and served both state and civil society interests. Karst evolved into a versatile model for understanding and applying earth science knowledge, with implications for tourism, environmental engineering, and governance. The discourse on karst was embedded in power-political contexts, reflecting stereotypical notions and advocating for models to address natural and cultural diversity.

3. Drafting *Das Karstphänomen*

The establishment of *Das Karstphänomen* as a significant breakthrough in geomorphology owes much to Cvijić's synthesis of existing research and his field observations. Cvijić's academic journey began with mentors and fieldwork experience in Serbia before he moved to Vienna on a scholarship in 1889. There, under the guidance of his teachers like Albrecht Penck and Eduard Suess, Cvijić honed his skills through lectures and practical fieldwork.

Similar to Suess' famous opus *Das Antlitz der Erde* (*The Face of the Earth*; 1883–1909), Cvijić aimed to synthesize all existing research on karst landforms into a comprehensive monograph, drawing on personal observations and literary sources. His earlier work in Belgrade, focusing on geographical terminology standardization, laid the groundwork for this endeavour. Participation in field excursions of his mentor Penck and self-guided trips throughout the Dinarides further shaped his thesis.

Methodologically, Cvijić faced challenges in validating and comparing research data gathered from literature studies. On the one hand, a significant portion of publications on karst features stemmed from local and "non-professional" researchers with varying observation methods. On the other hand, the endeavour to link and globalize these diverse bodies of karst knowledge also raised epistemological issues such as the accuracy and objectivity of research outcomes. The need for credibility was particularly pronounced in the field of geomorphology, which emerged as a new sub-discipline during the "geologisation" of geography in the 1880s. Cvijić addressed these challenges by two strategies: firstly, by restricting his scope to surface landforms, he set his research apart from the study of caves, a field that was increasing seen as "amateurish". Nevertheless, Cvijić eagerly made use of the rich sources provided by the speleological community. Secondly, he accentuated the importance of his fieldwork, even though arguments in his thesis were derived from the selection, analysis, and systematization of (published) observations made by others. This emphasis served to highlight his practical skills and the empirical foundation of his findings.

In presenting his findings, Cvijić adopted a scholarly approach, using descriptive writing and content-related tools to gain the trust of his academic audience. In addition, he included illustrations and diagrams to reinforce his arguments and convey authenticity.

In consequence, Cvijić's meticulous documentation and classification of karst landforms paved the way for standardized terminology in the field. By promoting the use of terms borrowed from South Slavic languages and providing clear definitions based on morphological criteria, Cvijić ensured consistency and clarity in scientific discourse.

4. Making the karst (inter)national

Shortly after defending his thesis in 1892, Cvijić's *Das Karstphänomen* was published, featuring further dissertations in Penck's series *Geographische Abhandlungen* (Geographical Treatises). By this time, Cvijić had already left Vienna for Belgrade, where the then 27-year-old had been appointed full professor. However, the reception of *Das Karstphänomen* proved to be more controversial than its current status as the founding work of karst geomorphology suggests. It divided not only geographers and geologists, academics and "non-professionals", but also, scholarly communities that, driven by different concepts and methods, favoured research based on global synthesis or local fieldwork.

The reason for this criticism may lie in Cvijić's firm rejection of the dolines' collapse origin, which earned him opponents among its Habsburg supporters. The Serbian origins of Penck's protégé may also have played a role, which, given the national tensions of the 1890s, must have caused resentment among colleagues with a German-nationalist mind-set. Cvijić did, however, receive support from his teacher's (former) Ph.D. students, who used their networks to place favourable reviews, and above all from Penck himself. For the growing circle of his students, gaining a foothold in the promising but largely "amateurish" karst research was an opportunity to establish a reputation in the developing field of geomorphology.

Beyond these scholarly debates, novel media such as postcards, photographs, and dioramas, with their compelling landscape images, brought karst areas to public attention. Whereas Cvijić's thesis referred more to the Dinaric Karst as a whole, popular representations highlighted the "Classical" Karst, both as a geographically unique region and as a landscape holotype. Moreover, the developing tourist infrastructure, especially in Carniola, familiarized a growing number of visitors with karst landforms (Shaw & Čuk, 2015). Atlases and (school) wall maps, exhibited at international fairs and used in classrooms, influenced the "worldviews" of broad segments of society (Henniges, 2017b). Especially favoured were representations of iconic landscape types like Alpine glaciers, the Pannonian Steppe, or the Dinaric Karst. These visually captivating images, distilled to a few "characteristic" landform elements, also became popular in bourgeois households due to their quality, exotic appeal, and affordability. The *Geographische Charakterbilder* (Geographical Character Pictures) reproduced in large numbers by the Viennese publishing house Hölzel, with depictions of Postojna Cave (Carniola) and the coastal karst of Kotor (Montenegro), are examples of this trend.

Apart from this popular discourse, the elevation of *Das Karstphänomen* to a foundational work in karst geomorphology took place in the 1900s, propelled by the influential network centred around Penck. In Cvijić's case, his loyalty bore fruit when William Morris Davis (1901), a Harvard geographer, encountered *Das Karstphänomen* during his trip to Europe in 1899. Joining Penck and his students on an excursion to Bosnia and Herzegovina to investigate karst phenomena, Davis later incorporated many of Cvijić's findings into his framework, notably within

his prominent cycle of erosion theory. At the same time, Cvijić's work gained prominence among French scholars, coinciding with geopolitical shifts and Cvijić's alignment with Serbian nationalism. His advocacy for a South Slavic state and collaboration with the French geographer Emmanuel de Martonne (1909) further solidified his influence in karst research.

Expanding upon this legacy, Cvijić's influence extended beyond academia. His advocacy for a South Slavic state during World War One and his role as a scientific advisor at the Paris Peace Conference demonstrated his commitment to broader political and social causes. Thus, Cvijić's impact transcended scholarly debates, leaving a lasting imprint on both scientific inquiry and geopolitical developments in Southeast Europe.

5. Conclusion

This paper has examined the foundations of karst sciences as a scholarly community, evolving in the late 19th century around a cohesive framework of shared concepts, practices, and political-cultural convictions. While historians, often beginning with Cvijić's thesis, have thus far studied major advances in geological thought, my essay focuses on the various dimensions involved in the "making" of *Das Karstphänomen*, providing a better understanding of the processes around the globalization of this scientific concept.

Epistemically, Cvijić's thesis drew upon diverse sources to systematize the study of surface landforms, enhancing credibility and facilitating cross-border exchanges. The adoption of evolutionary principles in geomorphology further distinguished physical geography from other fields, driving methodological innovations and advancements in hydrological research.

Politically, the study of karst phenomena emerged within the context of Habsburg rule, responding to imperial imperatives and practical resource management needs. Geopolitical agendas shaped Cvijić's collaborations and research priorities, reflecting broader tensions and ambitions within this region.

Socially, unacknowledged stakeholders, including field researchers and science popularisers, played crucial roles in the production and dissemination of karst knowledge. However, their contributions were gradually marginalized with the professionalization of the geosciences, highlighting evolving disciplinary identities and power dynamics within the field.

Overall, the pooling of this broad topographical and practical knowledge within a new, scientifically accredited format and the global comparison of dissolutional landforms, distinct from phenomena of fluvial geomorphology, can be considered as the essential merit of *Das Karstphänomen*. Cvijić's extensive correspondence, field notes, and hand-drawn maps illuminate the impact of his (visual) knowledge on the observation and collective perception of landforms, offering promising avenues for future research (Jović & Stanić, 2015; Milanović Pešić et al., 2019).

References

Boué, A. (1856). Beiträge zur Geographie Serbiens. *Sitzungsberichte der Kaiserlichen Akademie der Wissenschaften. Mathematisch-Naturwissenschaftliche Classe*, *20*, 549–573.

Ćalić, J. (2007). Karst Research in Serbia before the Time of Jovan Cvijić. *Acta Carsologica*, *36*(2), 315–319. https://doi.org/10.3986/ac.v36i2.200

Cvijić, J. (1893). *Das Karstphänomen: Versuch einer morphologischen Monographie*. Hölzel.

Davis, W. M. (1901). An excursion in Bosnia, Hercegovina and Dalmatia. *Bulletin of the Geographical Society of Philadelphia*, *3*(2), 21–50.

de Martonne, E. (1909). *Traité de géographie physique*. Armand Colin.

Fleck, L. (1935). *Entstehung und Entwicklung einer wissenschaftlichen Tatsache*. Benno Schwabe & Co.

Ford, D. (2007). Jovan Cvijić and the founding of karst geomorphology. *Environmental Geology*, *51*, 675–684. https://doi.org/10.1007/s00254-006-0379-x

Henniges, N. (2017a). *Die Spur des Eises: eine praxeologische Studie über die wissenschaftlichen Anfänge des Geologen und Geographen Albrecht Penck (1858–1945)*. Leibniz-Institut für Länderkunde.

Henniges, N. (2017b). The Rolled World: German school wall maps and their publishers in the nineteenth and twentieth centuries. *IMCOS*, *151*, 45–53.

Jović, V., & Kostić, A. (Eds.). (2015). *Jovan Cvijić: life, work, times*. Serbian Academy of Sciences and Arts, Geographical Institute "Jovan Cvijić" SASA.

Jović, V., & Stanić, M. (2015). Jovan Cvijić's correspondence. In V. Jović & A. Kostić (Eds.), *Jovan Cvijić: life, work, times* (pp. 213–231). Serbian Academy of Sciences and Arts, Geographical Institute "Jovan Cvijić" SASA.

Kranjc, A. (1994). About the name and the history of the region Kras. *Acta Carsologica*, *23*, 81–90. http://www.dlib.si/?URN=URN:NBN:SI:DOC-NI5SYH7H

Lorenz, J. R. (1860). Bericht über die Bedingungen der Aufforstung und Kultivierung des kroatischen Karstgebirges. *Mitteilungen der Kaiserlich-Königlichen Geographischen Gesellschaft in Wien*, *4*, 97–140.

Milanović Pešić, A., Ćalić, J., Petrović, M. D., Terzić, A., & Vuksanović-Macura, Z. (Eds.). (2019). *From the notebooks of Jovan Cvijić. Selected Pages and Interpretations*. Serbian Academy of Sciences and Arts, Geographical Institute "Jovan Cvijić" SASA.

Schmidl, A. (1858). *Die österreichischen Höhlen*. Buchdruckerei von Gustav Emich.

Shaw, T. R. (1992). *History of Cave Science: the exploration and study of limestone caves, to 1900* (2nd ed.). Sydney Speleological Society.

Shaw, T. R., & Čuk, A. (2015). *Slovene Karst and Caves in the Past*. Založba ZRC.

Simony, F. (1847). Höhlenbildung in den geschichteten Kalken. "Karstbildung" bezeichnete Gestaltungen der Gebirgsoberfläche. *Berichte über die Mittheilungen von Freunden der Naturwissenschaften in Wien*, *1*, 55–59.

Stevanović, Z. (2013). The history of hydrogeology in Serbia. In N. Howden & J. Mather (Eds.), *History of Hydrogeology* (pp. 257–274). CRS Press. Taylor & Francis Group.

Stevanović, Z., & Mijatović, B. (Eds.). (2005). *Cvijić and Karst*. Serbian Academy of Sciences and Arts, Board on Karst and Speleology.

Suess, E. (1883–1909). *Das Antlitz der Erde* (Vols. Ia–III/2). Freytag.

Trudgill, S. T. (2008). Limestone landforms 1890–1965. In T. P. Burt, R. J. Chorley, D. Brunsden, N. J. Cox, & A. S. Goudie (Eds.), *The History of the Study of Landforms or the Development of Geomorphology* (Vol. 4, pp. 107–125). Geological Society of London.

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RUSSIANS IN ANTARCTIDA: A RETROSPECTIVE AND CHALLENGES OF OUR TIME

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Abstract: The report reflects Russia's contribution to the exploration of Antarctida from the discovery of the sixth continent by the Russian expedition on the ships Vostok (Captain Faddey Bellingshausen) and Mirny (Captain Mikhail Lazarev) January 22, 1820 to the present days. Russia's priority in the discovery of Antarctida is confirmed by the documents of that expedition and reflected in the toponyms of Antarctica: Bellingshausen Sea, Lazarev Sea, Lazarev Mountains. With the beginning of the work of the Soviet Antarctic Expedition (since 1955), the period of fundamental complex research of Antarctida, which continues to this day, begins, based on the work of an extensive network of Antarctic stations. Currently, there are seven permanent Russian stations (Vostok, Mirny, Bellingshausen, Novolazarevskaya, Progress, Russkaya, Molodezhnaya), two stations – Druzhnaya-4 and Leningradskaya – as of 2024 are mothballed. Throughout the operation of these stations, Russian scientists have conducted many sectoral and comprehensive studies and made many discoveries in geography and related branches of knowledge. The report pays special attention to the discovery of the subglacial Lake Vostok at a depth of 3769.3 m in the area of the Antarctic station of the same name, which was the result of field and theoretical research by the outstanding Russian scientist Andrey Kapitsa. Studying this lake provides insight into changes on Earth over the past 440,000 years. This knowledge aids in better understanding and predicting the processes of climate change on our planet as a whole. Russian scientists and government are aware of the importance of studying the southern polar region of the Earth, and after a certain decline in research activity in the 1990s, Russia is now again among the leaders in the study of Antarctica. This can be seen in the construction of the new permanent Vostok station complex. The report presents in detail the challenges of our time and reflects Russia's mission in Antarctic, which provides for maintaining its international status in accordance with the 1959 Antarctic Treaty, cooperation between scientists from various countries working in this region and minimizing risk factors for it from human society.

Keywords: discovery of Antarctida; scientific research by Russian scientists; subglacial Lake Vostok; Russia's mission in Antarctic

1. Introduction

Russia is one of the most remote countries in the world in relation to Antarctida. Nevertheless, it is not by chance that it was the Russian navigators who discovered this southern ice continent. It is no coincidence that since the middle of the twentieth century, Russia (then the USSR) has begun active scientific development of this continent. Now Russia is one of the recognized leaders in the study of the sixth part of the Earth. This is evidenced by the many Antarctic scientific stations and their constant technical updating, an example of which was the Vostok station. The presence of such stations and their active work have provided a number of outstanding scientific achievements, including the discovery of the huge subglacial Lake Vostok.

For Russian scientists Antarctida is the most important testing ground for scientific research, for understanding the laws of nature and trends in its development.

2. The discovery of Antarctida

The sixth continent was discovered during the circumnavigation of Captain 2nd rank Faddey Faddeevich Bellingshausen and Lieutenant Mikhail Petrovich Lazarev (Figure 1) on the sloops Vostok and Mirny in 1819-1821. The hypothesis of the existence of *Terra australis incognita* ("Unknown Southern Land") was put forward by geographers of the ancient world, and medieval scientists supported it. Starting from the XVI century, this land was placed on maps in the area of the South Pole, and navigators unsuccessfully searched for it in the XV–XVIII centuries. The famous traveller James Cook claimed after his circumnavigation in 1772-1775 that he "indisputably rejected the possibility of the existence of a continent here, which, if it can be discovered, is only near the pole, in places inaccessible to navigation".

Figure 1. The discoverers of Antarctida F. Bellingshausen and M. Lazarev.
Source: https://en.wikipedia.org/wiki/First_Russian_Antarctic_Expedition

Despite Cook's unconditional authority, Russian navigators dreamed of discovering new lands and planned new expeditions to the Southern Ocean. Marine Minister I.I. de Traverse and Vice Admiral G.A. Sarychev were among the initiators of the expedition. They, as well as I.F. Kruzenshtern and O.E. Kotzebue, presented their views and gave instructions to Bellingshausen. The main task of the Bellingshausen and Lazarev expedition was to cross all the meridians in the southern circumpolar zone at the highest possible latitudes, find out if there are lands there, and, if possible, go to the South Pole. Faddey Bellingshausen commanded the sloop Vostok, and Mikhail Lazarev commanded the sloop Mirny. On July 4, 1819, the ships left the Russian harbor of Kronstadt and headed for Rio de Janeiro, where they arrived on November 2 of the same year.

On December 15, Vostok and Mirny appeared in Antarctic[1] waters and made a hydrographic inventory of the southwestern shores of the island South Georgia. Capes, bays

[1]Antarctic is a region that, in addition to the continent of Antarctida, includes the waters of three oceans (Indian, Pacific, Atlantic or Southern Ocean), limited by the current of the West Winds, as well as the islands of the Southern Ocean.

and a group of islands named after the expedition members were discovered. Heading south, the Russian ships approached the coast of Antarctica on January 16, 1820 (now the Coast of Princess Martha). About this important date for world history, F. Bellingshausen wrote the following: "Continuing our way south, at noon in latitude 69° 21' 28", longitude 2° 14' 50" we encountered ice, which presented itself to us through the snow that was then in the form of white clouds. The wind was moderate from NE, with a large swell from NW; because of the snow, our vision did not extend far; I brought the wind to SE, and after heading in this direction for two miles, we saw that solid ice stretched from the east through the south to the west; our path led directly into this ice field, dotted with bumps" (Bellingshausen, 2008, p. 36).

The outstanding Soviet oceanographer N.N. Zubov noted in his monograph: "For the first time people saw these shores, but it was impossible to approach them, the ice blocked the way. The Russian sailors conscientiously noted all the signs of land, but did not assert anything else. After all, even a person who would walk along this coast could doubt whether it was the land or the ice surrounding it. So modestly, a new date entered the chronicle of great discoveries on January 16 (art.)—the day when the Russians discovered Antarctida—the sixth continent of the globe" (Zubov, 2014, p. 18).

Despite heavy ice and stormy weather, on February 5–6, Vostok and Mirny again approached the icy shores of the continent they discovered (now the Coast of Princess Ragnhill). The voyage lasted until mid-February, then the sloops headed for the shores of Australia. After repairs and resupply in Port Jackson (now Sydney) on May 8, 1820, the ships sailed to the tropical Pacific Ocean, where a group of Russian islands were discovered in the northern region of the Paumotu archipelago (Tuamotu), which were named after famous Russian commanders and navigators. Vostok Island (named after the flagship) was discovered in the Line Island group (Central Polynesian Sporades), Alexander Island in the Cook Islands Group, Mikhailov and Simonov Islands in the Fiji Islands area. Most of these islands are currently mapped under local names.

On September 9-10, 1820, Vostok and Mirny returned to Port Jackson and, after repairs, headed back to Antarctica on October 31, this time to its western part. Maneuvering among the ice and icebergs, the sloops twice crossed the Southern Polar Circle. On January 9, 1821, the sailors saw the island, which was named after the founder of the Russian Fleet Peter I, and on January 17—a mountainous coast, called the Land of Alexander I. During two voyages, Bellingshausen and Lazarev reached the shores of Antarctida in several places (in the Eastern and Western hemispheres) and circumnavigated the entire continent.

Then both ships sailed to the South Shetland Islands, where two archipelagos were discovered and described, the islands of which were named after the victories of the Russian army in The Patriotic War of 1812, as well as the names of admirals and officers of the Russian Navy.

On January 30, 1821, the ships left the Antarctic waters. On February 27, Vostok and Mirny arrived in Rio de Janeiro. After a two-month stay in Brazil, on April 23, they set out on their way back and, stopping on the way to Lisbon and Copenhagen, July 24, 1821 successfully completed a circumnavigation, arriving in Kronstadt. It is important to note that in more than two years of sailing, the expedition lost only two sailors (the usual mortality rate was much higher). The merit in preserving the life and health of their subordinates belongs to the commanders of the ships and their officers.

Speaking about the geographical discoveries made, the commander of the expedition mentions that "during our voyage, twenty-nine islands were found, including two in the southern cold zone, eight in the southern temperate zone, and nineteen in the hot zone; one coral shoal with a lagoon was found" (Bellingshausen, 2008, p. 36). In addition, the expedition carried out a large amount of research in various fields—oceanology, zoology, botany, climatology, physical geography and others. The marine inventory of all the studied areas, as well as the correction of the contour of the shores of the lands already mapped, were so accurate that the map of the South Shetland Islands, compiled by Bellingshausen, was used as a basis by English cartographers until the middle of the XX century. The drawings of the expedition artist Mikhailov, even after a century, have not lost their value and were published in the English "Antarctic Lot", published in 1930.

The Russian Antarctic expedition ended with complete success, becoming the second (after James Cook), who travelled all over Antarctica. Of the 751 days of the expedition, 527 were spent under sail; the total length of the route was 49,860 nautical miles (86,475 versts). The expedition spent 127 days in latitudes above 60° South; the team approached the shores of Antarctic continent 9 times, including four times at a distance of 3–15 km. 28 objects were mapped on the Antarctic map, 29 islands in high southern latitudes and tropics were discovered and named.

3. Research by Russian scientists

The main tasks of the Bellingshausen expedition were related to geographical research. It is known that due to the extreme haste of the Bellingshausen and Lazarev expedition equipment (the Imperial decree was issued on March 15, and the departure took place on July 4, 1819), it was not possible to assemble a scientific team, and almost all scientific observations, both in the field of geography, ethnography and natural sciences, were carried out by officers and by the only scientist on board - extraordinary professor of Kazan University Ivan Simonov. Since Simonov was the only professional scientist on board, he had to simultaneously collect plant and animal samples along with his direct duties; the latter, like stuffing stuffed animals, he willingly entrusted to the ship's doctors Berg and Galkin. Probably, the work of a journalist and historiographer of the expedition was no less important for Simonov; it was his travel notes that became the first publications about the course of the voyage. Pavel Mikhailov, an academician of painting, was hired to record events, landscapes of open islands and biological species.

The results of the scientific observations of the expedition participants were presented in its full description by F. Bellingshausen, published in 1831 in two volumes with an appendix of an atlas of drawings. This publication, partially or completely translated into German and English, was the beginning of Russian publications on Antarctic research.

The results of the Russian Antarctic expedition published by Bellingshausen attracted the attention of the scientific community, but they did not receive any significant development in the Russian academic environment due to the obvious limited possibilities for further exploration of the open continent. Such opportunities have appeared in Russia after more than a century.

Fundamental comprehensive research by Russian scientists in Antarctica began in connection with the establishment of the Soviet Antarctic Expedition in 1955, whose activities

continue to this day. These studies are based on the work of an extensive network of Antarctic stations. The first of them was the Mirny station on the coast of the Davis Sea (Coast of Pravda/Truth), in the Land of Queen Mary. The station is named after the sloop Mirny, opened on February 13, 1956, and provides work for up to 20 polar explorers.

Currently, seven permanent Russian Antarctic stations are operating (Vostok, Mirny, Bellingshausen, Novolazarevskaya, Progress, Russkaya, Molodezhnaya), two stations – Druzhnaya-4 and Leningradskaya – as of 2024 are mothballed. Another 12 stations were closed for various reasons. During the operation of these stations, Russian scientists have conducted many sectoral and comprehensive studies in geography and adjacent branches of knowledge. Here are some of the main ones for the entire period of work of Russian scientists since 1956 (Markov et al., 1968; Slipenchuk & Shcherbakov, 2023; Treshnikov, 1980):

- synchronous observations under the program of the International Geophysical Year, and then during the periods of international geophysical cooperation (1959–65), conducted in Antarctida for the first time, were combined with long-distance hikes and flights inland. In 1957–67, Soviet scientists carried out 13 sea and winter expeditions here[2];
- determination of the main morphometric characteristics of Antarctica (the area of the continent, the average height of the icy and rocky Antarctida, the volume and thickness of the ice, the perimeter of the continent, etc.);
- study of the geomorphology of Antarctida (the history of glaciation of the continent, types of subglacial relief, relief of glacial cover, volcanoes), drawing up the first map of the subglacial relief of the continent based on the results of field research[3];
- geological and geophysical research (the history of the geological development of the continent, the development of its tectonic scheme, magnetism and paleomagnetism, the study of fossil flora and fauna, mineral exploration);
- study of meteorological and climatic conditions (temperature regime, thermal balance, precipitation, atmospheric pressure and air circulation, climatic zoning, etc.);
- glaciation studies (structure of the glacial cover, types of glaciers of the continent and its shelf, zones of ice formation and ice movement, icebergs, determination of the budget of glaciation of the continent, etc.);
- periglacial (identification of the oases of the mainland and their origin, study of the components of the geographical shell of the periglacial, including soils, waters and biota, biogeographic zoning of Antarctida);
- geographical zoning of the continent (development of a zoning scheme, identification of types of Antarctic landscapes, etc.).

During this time, many large and small discoveries have been made. One of these discoveries was the discovery of the vast subglacial Lake Vostok in the eastern part of Antarctida in the area of the Antarctic station of the same name at a depth of 3769.3 m.

[2] The most important intercontinental trips of Soviet sledge-tractor trains from Mirny: in 1957 to the Geomagnetic Pole (head A. F. Treshnikov), in 1958 to the Pole of relative Inaccessibility (head E. I. Tolstikov), in 1959 to the South Pole (head A. G. Dralkin), in 1964 from the Vostok station to The pole of relative inaccessibility and the Molodezhnaya station (head A. P. Kapitsa) and in 1967 along the Molodezhnaya route – the Pole of relative inaccessibility – the Novolazarevskaya Plateau station (head I. G. Petrov).

[3] For this work, the Soviet geographer and polar explorer A.P. Kapitsa was awarded the USSR State Prize.

4. Discovery of the subglacial Lake Vostok

The discovery of Lake Vostok is the result of many years of work by a large group of scientists, in which the leading role belongs to the outstanding Russian geographer, Professor of Moscow State University A.P. Kapitsa, a participant in several Antarctic expeditions who worked directly at the Vostok station. The first public announcement of this unique phenomenon was made by A.P. Kapitsa at an Open conference of the Scientific Committee on Antarctic Research in July 1994 in Rome. It became a real scientific sensation that attracted the attention of the entire Antarctic scientific community. The following year, the first article about this lake was published in the famous British scientific journal Nature (Kapitsa et al., 1996). This publication initiated the international SALE (Subglacial Antarctic Lakes Exploration) program.

Russia has started a targeted study of Lake Vostok since the summer season of 1995-1996. As a result of an extensive series of field work (seismic and ground-based radar measurements, etc.), the phenomenal physical parameters of this lake were determined by 2008. It was revealed that this lake is an aquatic body located in a hollow of bedrock with an area of 15,790 km^2 of water mirror. Its length reaches up to 250 km, and its maximum width is about 50 km. The maximum depth is about 1200 m, and the average is 400 m. The volume of water contained in it is about 6,100 km^3 (Lukin et al., 2022, p. 49).

As part of the ongoing research, in February 2012, for the first time in human history, the surface of the subglacial Lake Vostok was reached as a result of drilling of the Antarctic ice sheet. During the opening of the lake, Russian researchers obtained a unique material – a core of lake ice from the bottom layers of an Antarctic glacier and samples of frozen lake water. Comprehensive studies of these samples have yielded scientific results of global importance, which have made a fundamental contribution to the knowledge of the nature of the unique subglacial reservoir. In January 2014, the subglacial Lake Vostok was reopened and a core 0.71 m long was extracted. The study of the subglacial Lake Vostok contributes to the formation of a scientific picture of climate change on Earth over the past 440,000 years. This knowledge helps to better understanding and predict the current processes of climate change and the nature of the planet as a whole.

5. The revival of the Vostok station

Russia is aware of the importance of studying the southern polar region of the Earth, and after a certain decline in research activity in the 1990s, our country is now again among the leaders in the study of Antarctica. Evidence of this was the construction of a new complex of the permanent Vostok station. The Russian Antarctic station Vostok was founded on December 16, 1957. The thickness of the ice cover under the station is 3,700 m. Since the first commissioning, the complex has been reconstructed twice (in 1974 and 1982) and conserved three times.

In 2020, on the 200th anniversary of the discovery of Antarctida, due to the high wear of the station, it was decided to build a new wintering complex for Vostok worth about 7 billion rubles. It is designed to be year-round and is able to provide comfortable work for scientists in the number of 15 persons in winter and 35 persons in summer season. The complex was manufactured in Gatchina (Leningrad region) on base of Russian and Belorusian components, and it was assembled there in 2020 as part of a control assembly. In December 2021, four Russian transport vessels with modules of the new Vostok station complex reached Antarctida and began unloading. The complex, consisting of 133 modules, as well as fuel and equipment,

began to be unloaded in Tala Bay near the Russian Progress station. From there, the complex was moved to the Vostok station by sledge-tracked hikes. The transfer of modules and installation of the complex took two years, it began in January 2022, and ended in January 2024.

The new complex replaced the outdated structures of the Vostok station, which were 97% worn out. Now scientists can conduct research in comfortable conditions (Figure 2). The station stands on 36 supports with a height of 3 m, which will allow it to remain uncovered by snow for many years. All systems have double or triple redundancy, and a two-year supply of fuel and food is provided.

Figure 2. Russian Vostok station
Source: https://www.southpolestation.com/trivia/20s/vostok2.html

The station is located at the area of the South geomagnetic pole of the Earth. There is also a kind of cold pole of the Southern hemisphere and the entire planet. On July 21, 1983, the station fixed a record low temperature for the entire previous observation period of -89.2 °C. Polar explorers here conduct the most important research – they monitor solar activity, study space phenomena that affect both people and technology. They track climate change. In addition, space dust is periodically collected at the Vostok station. In a normal meteorite impact on Earth, its material becomes incandescent and all organic matter on it burns up. But in the case of falling microparticles up to 5 microns in size, their organic matter does not have time to warm up to complete combustion, so traces of hypothetical extraterrestrial life may remain on them. A number of other types of scientific activities are also possible on the basis of the station, and it is partially being conducted at the present time, for example, by observing events in the magnetosphere and ionosphere.

The new wintering complex of the Vostok station in Antarctica was put into operation in January 2024. The start of operation was given by Russian President Vladimir Putin, who, together with Belorusian President Alexander Lukashenko, watched the ceremony via video link. "The new wintering complex," Vladimir Putin said, "is perhaps the best and main gift for the 70th anniversary of the Russian Antarctic expedition, which starts this autumn. I am convinced that the new station will strengthen the cooperation of scientists from different countries, will become an open platform for solving urgent problems in the field of nature

and environmental studies and, of course, for promoting joint scientific innovation programs within the framework of the Union state of Russia and Belarus. The tasks facing our polar explorers are very important and interesting. It is enough to mention only the continuation of research on the subglacial Lake Vostok. The available results have already brought unique data. ... Back in 1970, I remember, my colleagues told me, I met with them, unique technologies for deep drilling of glaciers were developed. The obtained glacial cores provided information that over the past 42,000 years, four complete climatic cycles have passed from warming to glaciation. Curious, isn't it? Very. But such a schedule is being built, as far as I understand, and we can understand where we are going" (President of Russia, 2024).

Vostok station is our only station in the center of the continent. Over the years, the Vostok station has become one of the main symbols of fundamental scientific research of global importance of Antarctica. Even greater opportunities to penetrate the secrets of the ice continent open up to it in the future.

6. Challenges of our time

Studying the nature of Antarctica quite naturally reveals new problems, and its scientific development generates challenges that require close attention from humanity. These include, first of all, the climatic changes of the planet, affecting the ice continent. It has been established that Antarctica itself is an important climatic factor for the Earth, a factor of global importance. It has also been established that the ice dome of the mainland is already losing its mass. It is still insignificant, but it is not yet clear how the trend that has already been identified will develop. Almost the entire world science is involved in solving this problem. It has also become one of the priorities for Russian science. In particular, the *Strategy for the Development of the Russian Federation's activities in Antarctica until 2030* sets a specific task of "Determining current and future climate changes in Antarctica" (Russian Government, 2021).

Another universal planetary challenge affecting the whole of Antarctica has become *the consequences of anthropogenic impacts* on the natural environment. Among these impacts are the inevitable environmental pollution associated with the operation of polar stations and the movement of vehicles. The spread of microplastics in the environment is of particular concern. Risk factors should also include the ongoing fishing of marine aquatic organisms in the waters of the Southern Ocean and actively developing Antarctic tourism. The accumulated damage from these impacts is undeniable, but it is not defined in numerical parameters, and the risks of the corresponding consequences for the nature of the continents have not been assessed. In the *Strategy*... mentioned above there is a special section on the "Protection of the Antarctic environment", which involves not only measures to eliminate accumulated damage, but also scientific research to adequately respond to this problem, which is worsening over time. In particular, the named *Strategy*... envisages to "Study the state of Antarctic ecological systems as the basis for measures to protect the environment of Antarctica and the Southern Ocean".

Another urgent challenge in the region is the issue of *preserving the historical heritage* in Antarctica, represented here by historical sites and individual monuments. Historical sites and monuments are protected under the Antarctic Treaty System as one of three classes of protected areas in this part of the world. The list of historic sites was first compiled in 1972, and has since expanded to 95 sites, the last of which was listed in 2021. Seven Russian objects are represented

in it. Russia can partially consider the international Monument to the Antarctic Treaty on King George Island as its own (Figure 3). In the long term, until 2030, it is planned to intensify work in this area, which is relevant, including in the interests of tourism development in this region.

Figure 3. Antarctic Treaty Monument on King George Island
Source: https://commons.wikimedia.org/wiki/Category:Antarctic_Treaty_Monument

Russian toponymy in Antarctica is a kind of historical heritage, associated with the names of Russian scientists and travelers (Bellingshausen Sea, Lazarev Sea, Lazarev Mountains, Somov Sea, Bystrov Rock, Gamburtsev Mountains), Russian tsars (Peter I Island, Alexander I Land), names of ships (Vostok), cities (Leningradskaya) or abstract ideas (Friendship, Progress, Peace, The Shore of Truth). There are also toponyms in Antarctica derived from the word Russia: Russian Mountains and Russkaya station. A number of Antarctic objects have Russian names assigned by the Bellingshausen and Lazarev expedition in 1819–1820, but replaced by later names of English origin: Waterloo Island—King George, Rozhnov Island—Gibbs Island, Mordvinov Island—Elephant Island, Berezin Island—Greenwich, Polotsk Island—Robert, Smolensk Island—Livingston.

However, despite the importance of these challenges, the most pressing problems in modern Antarctica are the following three of them, discussed below.

6.1. The clash of interests of countries and their causes

The interest of many countries in the Antarctic region is due not only to the desire to consolidate the parts of the continent discovered by seafarers and polar explorers, but also to the desire to ensure their future with resources. Almost all minerals known to the world are located in the depths of Antarctica. These include huge deposits of natural gas, oil, coal, and gold. Thus, natural gas reserves are estimated at 100 trillion m^3, which is about 200 times more than in Russia. Zinc, nickel, iron ore, lead, copper, titanium, manganese, chromium, platinum, precious stones, mica, crystal, granite, zirconium, cobalt and many other natural resources could also be mined here.

Research in Antarctica often leads to the discovery of mineral deposits. Thus, according to information provided to the Environmental Audit Committee of the House of Commons of the United Kingdom, in May 2024, Russian research vessels in the Weddell Sea discovered an oil field with reserves of about 511 billion barrels, which is 10 times more than the amount of raw materials extracted in the North Sea over the past 50 years (McHardy, 2024).

In 1988, the parties to the Antarctic Treaty attempted to discuss the possibility of mining and adopted the relevant convention. However, it never entered into force, and instead, in 1991, the Madrid Protocol was signed, prohibiting mining of any minerals in the Antarctic.

Nevertheless, the protocol may be revised 50 years after its entry into force. The possibility of revising this Treaty puts to all countries interested in the Southern mainland the question of further spreading their influence and strengthening their positions on it.

Antarctica has become a territory of geopolitical claims for the leading countries of the 21st century. The struggle for minerals around the world has only been gaining momentum over the years, so it's only a matter of time before states switch from wait–and-see tactics to offensive ones and assert their rights to new territories rich in reserves of vital resources.

6.2. Claims to Antarctic territories

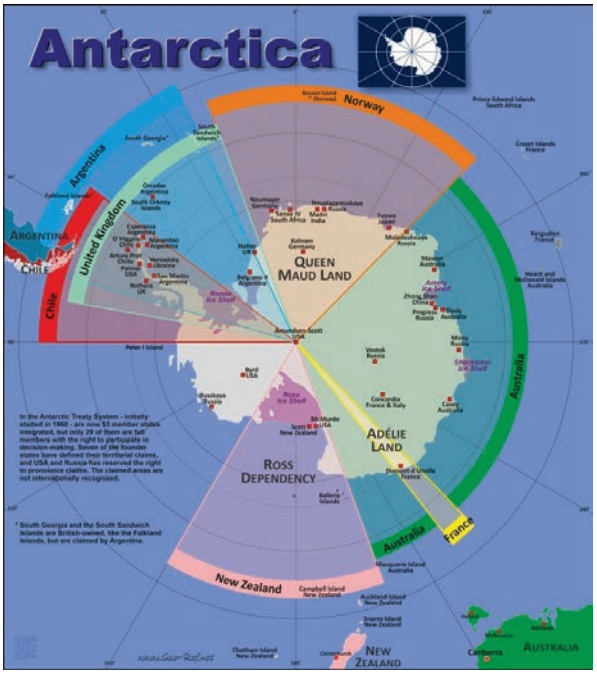

Figure 4. State claims on the territory in Antarctida
Source: http://www.geo-ref.net/ph/xaa.htm

Since the twentieth century, Antarctica has been actively divided into zones of influence, which were conditioned by the territorial claims of a number of states. Australia, Argentina, Great Britain, New Zealand, Norway, France and Chile are the countries that managed to designate their rights to Antarctic territories (before the Antarctic Treaty came into force) and consolidate them at the legislative level through local decrees (Figure 4).

The Antarctic Treaty[4] establishes the status quo on the mainland and the free order of access of participants to the territory of the continent, limits the expansion of previously existing territorial claims, as well as making new ones. As a result of the conclusion of the Treaty, there are three groups of countries: 1st – Australia, Argentina, Great Britain, New Zealand, Norway, France and Chile – previously had territorial claims; 2nd – Peru, Russia (USSR), USA and South Africa – states that reserved the right to make such claims; 3rd – Belgium, Bulgaria, Brazil, Germany, India, Italy, China, Pakistan, Poland, Romania, Ukraine, Uruguay, Czech Republic, Sweden, Ecuador, South Korea and Japan – countries that have not officially declared their territorial interests.

The main purpose of the Treaty is a ban on the development and basing of nuclear weapons, military bases, and the burial of radioactive materials. It is allowed to use Antarctica

[4] The Antarctic Treaty was concluded on December 1, 1959 in Washington and entered into force on June 23, 1961 after it was signed by the 12 original States parties.

only for peaceful and scientific research purposes, for the protection and for the protection and conservation of aquatic organisms in the seas surrounding the continent. The last point is dealt with by a specially created CCAMLR commission, which was established in 1982 in order to protect the Antarctic ecosystem. According to the Treaty, States that have certain claims on the territory of the mainland do not have a tool to confirm their sovereignty on the lands of Antarctica.

6.3. Militarization of Antarctica

Since Antarctica has never had a permanent population in human history, there has been virtually no military activity in it. The Antarctic Treaty, as it is known, prohibits military activities on the continent. Military personnel and equipment can only be used for scientific research or any other peaceful purposes, such as the delivery of supplies, etc. However, there are signs that the situation is changing.

For six decades, the treaty has served as the cornerstone of governing the harshest and most ancient continent. It promoted scientific research, international cooperation, prevented militarization, jammed territorial claims and strengthened environmental protection. The main participants are the USA, Great Britain, Australia, New Zealand, Russia, Norway, Germany, Chile and Argentina. Currently, they are focused on improving life technologies in low temperature conditions and on gaining confidence in carrying out work in Antarctic conditions. But it will probably take a little time, and the parties to the agreement will lose opportunities and incentives to develop these areas. It is possible that after 2048 Antarctica can be divided between states in the same way as any other continent.

The militarization of Antarctica by Western countries has practically already begun. The supply of the American Antarctic station McMurdo is carried out by the heavy military icebreaker *Polar Star*, owned by the US Coast Guard. For Russia, icebreakers are a tool for economic development. American icebreakers are warships. And in this capacity, it is a tool for maintaining American influence.

At the beginning of 2020, the US State Department presented a new strategy for national security and defence of the polar regions, which provides for the creation of a "ready, combat-capable and available" fleet of polar icebreakers. The State Department called for the creation of "appropriate assets and resources capable of ensuring the permanent presence of the United States in the Arctic and Antarctic" (Department of Defense, 2019).

In addition to increasing the pace of construction of combat icebreakers, the United States is creating a network of its military bases in the Southern Hemisphere. One of them is being created in Ushuaia, the administrative center of Tierra del Fuego, the southernmost province of Argentina, from where Antarctica can really be managed.

In September 2018, the National Geospatial-Intelligence Agency (NGA) of the United States, whose task is to provide cartographic support for combat operations of the American army, released a high-resolution map of Antarctica with detail down to the size of a car, called the "Reference Elevation Model of Antarctica" (Polar Geospatial Center, n.d.). The map covers about 98% of the surface of the sixth continent. The US military is in a hurry to get a "firm foot" in Antarctica, where, according to NASA, the melting of ice is accelerating, which facilitates access to the natural resources of the ice continent.

7. Russian mission in Antarctica

Russia's mission in Antarctica in modern conditions involves, first of all, maintaining its international status in accordance with the Antarctic Treaty of 1959. "This treaty is unique, it reliably closes the problem of the militarization of Antarctica, it reliably closes the problem of anyone's territorial claims to this continent, and secures the status of Antarctica as a reserve where countries can engage in scientific research activities, which, strictly speaking, is happening" (Interfax, 2009). Russian Foreign Minister Sergey Lavrov said in 2009 year. Since then, Russia's position on this issue has not changed.

In accordance with its stated mission, Russia is actively conducting research activities on the mainland, ensuring the cooperation of scientists from various countries working in this region and minimizing risk factors for it from human society. Thus, in 2010, the *Strategy for the Development of the Russian Federation's activities in Antarctica for the period up to 2020 and for the longer term* (Russian Government, 2010) was approved, and in 2021, by order of the Government of the Russian Federation, an *Action plan for the implementation of the Strategy for the Development of the Russian Federation's activities in Antarctica until 2030* was approved. Section III of this plan provides for "Conducting comprehensive Antarctic expeditionary research within the framework of the Russian Antarctic Expedition". Among the main activities of this section is the conduct of "Comprehensive studies of the subglacial Lake Vostok and the paleoclimate of the Earth in the area of the Russian Antarctic station Vostok" (Russian Government, 2021).

Today, Russia's state priorities in Antarctica are divided into eight areas, including: promoting the preservation and development of the Antarctic Treaty system, modernizing Russian infrastructure on the continent, conducting comprehensive scientific research, protecting the Antarctic environment, and others. One of the most important tasks in the coming years will be the construction of a new scientific expedition vessel to replace the ship Akademik Fedorov, which has served its time. The new flagship of the Russian scientific fleet will provide support for the activities of the Russian Antarctic Expedition and will become the largest research vessel in the world.

Scientific centers of the country: academic institutes, universities, observatories, etc. make an important contribution to the implementation of Russia's mission in Antarctica. The leading one on polar topics is the Arctic and Antarctic Research Institute (AARI) located in St. Petersburg. The Institute has been functioning since Soviet times and has been studying all issues in high latitudes: climatic conditions, forecasting, processes in the atmosphere, near space, marine environment and ice cover. In accordance with the Strategy for the Development of the Russian Federation's activities in Antarctica until 2030, the AARI is responsible for coordinating the development of comprehensive fundamental and applied scientific research in the southern polar region of the planet. A special place in these works belongs to the research of the state of Antarctic ecological systems as the basis of measures to protect the environment of Antarctica and the Southern Ocean.

The formation of adequate ideas about Russia's mission in Antarctica is actively promoted by the country's museums, the central place among which is occupied by the Museum of the Arctic and Antarctic in St. Petersburg. It is the world's largest museum dedicated to the polar theme. It was opened in 1937. His collection consists of more than 70,000 exhibits, including archaeological relics, monuments of the history of the polar regions development, evidence

from the first Soviet Antarctic expeditions. Visitors are presented with samples of hiking equipment, technical devices, vehicle models, dummies of northern animals, as well as photographs, maps, drawings, documents and other unique written sources.

Various non-governmental organizations play a significant role in promoting the Russian Antarctic agenda. One of the most notable of them was the *Association of Polar Explorers* (APE), a Russian interregional public organization founded in 1990. Until recently, its president was an outstanding polar researcher, Doctor of Geographical Sciences, Professor Arthur Chilingarov, who was awarded the highest awards of the Soviet Union and Russia. Work at APE is carried out in 10 areas, including in the field of scientific research and social initiatives.

Among other non-governmental organizations involved in polar research, the *Russian Geographical Society* (RGS), founded in 1849, stands out. It is symbolic that among its first members were the discoverers of Antarctica F. Bellingshausen and M. Lazarev, as well as other polar explorers. Professor Arthur Chilingarov was the first vice-president of the Russian Geographical Society until his death.

8. Conclusion

The Russian State pays great attention to the study and development of the polar regions of the planet. There is a growing interest to this region in Russian society, and the traditions of the discoverers and explorers of the high latitudes of the planet are maintained. In honor of the 200th anniversary of the discovery of the sixth continent, 2020 was declared the *Year of Antarctica* in Russia. Russia continues and develops its glorious polar traditions. On Navy Day, Russian Defense Minister Andrei Belousov unveiled bas-reliefs dedicated to outstanding events in the history of the Russian Navy at the Admiralty (St. Petersburg). Among them were the bas-relief "The Discovery of Antarctida by Russian sailors" (1820) and portrait bas-reliefs to admirals Mikhail Lazarev and Faddey Bellingshausen. "The ships under the command of Faddey Bellingshausen and Mikhail Lazarev were the first in history to reach Antarctida. The discovery of the sixth continent by Russian navigators became the most important geographical event of the XIX century. And two hundred years later, the Russian presence in Antarctica meets the scientific, economic and geopolitical interests of our country," Belousov said at a solemn ceremony on July 28, 2024 (Interfax, 2024).

Russian Orthodox Church Primate Patriarch Kirill visit to Antarctica in February 2016 became another important event in the Russian history of Antarctica. Here for the first time he celebrated the Divine Liturgy in the only permanent church in Antarctica – the Orthodox Church of the Holy Trinity at the Russian Bellingshausen station, on Waterloo Island. In this church, the Primate also held a water prayer and a memorial service for the 64 polar explorers who died in Antarctica. At the meeting with polar explorers on February 18 of the same year, Patriarch Kirill stated that "Antarctica is the only place where there are no weapons, no military activities, no scientific research aimed at the emergence of new means of destroying people... this is a kind of image of an ideal humanity – evidence that people can live without borders, without weapons, without hostile competition" (DZEN, 2021). These words clearly reflect the principles of our country's attitude to the ice continent and the meaning of the Russians' stay in Antarctica at all times.

References

Bellingshausen, F.F. (2008). *Two–time surveys in the Arctic Ocean and sailing around the world*. Drofa publishing house.

Department of Defense (2019). *Report to Congress. Department of Defense Arctic Strategy*. Department of Defense, USA. Available at: https://media.defense.gov/2019/Jun/06/2002141657/-1/-1/1/2019-DOD-ARCTIC-STRATEGY.PDF

DZEN (2021, May 28). *Zachem Patriarkh Kirill poseshchal Antarktidu?* Dzen.ru. Retrieved August 12, from: https://dzen.ru/a/YJ0flBronjkMBdPJ?ysclid=lzvbxkc2dz170487306

Interfax (2009, December 25). *Rossya protiv peresmotra dogovora po Antarktide*. Interfax.ru. Retrieved August 12, from: https://www.interfax.ru/russia/116541

Interfax (2024, July 24). *Belousov zayavil, chto prisutstviye v Antarktide otveshayet interesam strany*. Interfax.ru. Retrieved August 12, from: https://www.interfax.ru/russia/972864

Kapitsa, A. P., Ridley, J. K., Robin, G. D., & Zotikov, I. A. (1996). A large deep freshwater lake beneath the ice of Central East Antarctida, *Nature*, 381, 6584. 684–686. https://doi.org/10.1038/381684a0

Lukin, V. V., Markov, A. N., & Popov, S. V. (2022, October 20–22). *Discovery and study of Antarctic subglacial Lake Vostok. In memory of geographer A.P. Kapitsa*. Proceedings of the III International Conference "Rational nature management: traditions and innovations". Nauka publishing house.

Markov, K. K., Bardin, V. I., Lebedev, V .L. et al. (1968). *Geography of Antarctica*. Mysl publishing house.

McHardy, M. (2024, May 14). Russia just found huge oil reserves in Antarctica. Newsweek.com. Retrieved June 4, 2024 from: https://www.newsweek.com/russia-ukraine-oil-antarctica-putin-1900233

Polar Geospatial Center (n.d.). *Rema*. Polar Geospatial Center (pgc.umn.edu). Retrieved August 12, from: https://www.pgc.umn.edu/data/rema/

Popov, S. V., Maslov, V. N., Lukin, V. V., & Popkov, A. M. (2010). Relief of the bottom and water body of the subglacial Lake Vostok, East Antarctica. *Reports of the Academy of Sciences, 433*(5b), 693–698. https://pureportal.spbu.ru/ru/publications/---------(653cdc24-872c-4dee-a7fa-36024de683c9).html

President of Russia (2024, January 28). *Tseremoniya vvoda v ekspluatatsiyu novogo zimovochnogo kompleksa stantsii «Vostok»*. Kremlin.ru. Retrieved December 8, from: http://www.kremlin.ru/events/president/transcripts/73336

Russian Government (2010). *Strategy for the Development of the Russian Federation's activities in Antarctica for the period up to 2020 and for the longer term*. Russian Government, Moscow.

Russian Government (2021). *Action plan for the implementation of the Strategy for the Development of the Russian Federation's activities in Antarctica until 2030*. Russian Government, Moscow. Available at: https://www.garant.ru/products/ipo/prime/doc/401325832/?ysclid=lztywnip5r828959796

Slipenchuk, M. V., & Shcherbakov, A. B. (2023). *Andrey Kapitsa: Columbus of the twentieth century*. Molodaya Gvardiya publishing house.

Treshnikov, A. F. (1980). *Antarctica: research, discoveries*. Hydrometeoizdat.

Zubov, N. N. (2014). *Domestic navigators – explorers of the seas and oceans*. Paulsen publishing house.

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NUNA CAVE—SIGNIFICANT COMPONENT OF THE SOUTHERN MT. MIROČ KARST, EASTERN SERBIA

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Abstract: The paper presents the Nuna Cave, as one of the more than 20 documented caves in the karstic environment of Miroč Mt. in eastern Serbia. The wider surroundings encompass the 100 km long gorge of the Danube River (Iron Gates, Djerdap) in the segment where it is entrenched into the Southern Carpathian Mountains, with the Pannonian Basin upstream and the Dacian Basin downstream. The first karst explorations in the area date back to the 19th century, while the majority of them took place in the second part of the 20th century, focusing on speleology, hydrogeology, surface karst morphology, biospeleology and geoarchaeology. Tectonically, Miroč Mt. is an anticlinal structure. On the terrain surface, Upper Jurassic limestones are the dominant lithological component. Typical features of karst morphology are ponors (stream-sinks) along the long lines of contacts between karstic and non-karstic rocks, approving the status of exemplary contact karst along the whole outline. Nuna Cave is the southernmost ponor of Miroč karst. The length of the cave passages is 135 m, while the denivelation between the highest and lowest point is 17 m (+6, −11). Despite the relatively small length, the cave contains large number of indicators pointing to its geological history, morphogenesis and recent hydrological and morphological processes.

Keywords: karst; caves; speleology; Miroč Mt; eastern Serbia

1. Introduction

The Danube gorge (Iron Gates, Djerdap), entrenched into the Southern Carpathians between the Pannonian Basin and Dacian Basin, has been thoroughly studied by scientists, practitioners and explorers of diverse range of interests. On the right bank of the Danube, (which belongs to Serbia, as opposed to the left bank, belonging to Romania), the earliest karst exploration history dates back to the year 1830, when a Prussian officer Otto von Pirch visited the caves near the town of Golubac, at the entrance to the Danube gorge (Pirch 1830). German-Austrian geologist and ethnographer of French origins Ami Boué travelled

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through the Iron Gates for explorations as well (Boue, 1840, 1891). Sources related to karst research in Serbia in the 19th century have been assembled by Ćalić (2007). Famous Serbian geographer Jovan Cvijić had not included the Danube gorge locations in his first book about caves in eastern Serbia, except Rajkova Pećina Cave in Majdanpek, 40 km away (Cvijić, 1895). However, he started to work in the Iron Gates/Djerdap area in early 20th century, studying the morphogenesis of the gorge, as well as the river terraces and caves (Cvijić, 1908, 1921). Prior to the construction of the dam on the Danube River for hydroelectric plant with hydroaccumulation, the state authorities ordered the exploration of caves along the Danube course which would be submerged by the lake. Some of those caves are included in the book by J. Petrović (1976), but without the locations and without the detailed cave maps.

The renaissance of cave explorations in the area started in early 1990s and is extending well to 2000s, dominantly through the work of non-profit speleological clubs and societies. Great majority of these explorations have been concentrated on Miroč Mt, the most prominent karstic area of the Danube gorge.

2. Geological settings

General tectonic pattern of the Danube gorge was elaborated and synthetized by Marović et al. (1997), as well as by Berza, T. (1997). As for Miroč Mt. tectonic structure, it is defined as anticlinorium, the axis of which is mildly plunging towards the north and is composed of the Miroč anticline and the Visoki Čukar anticline, separated by the Vulevica syncline (Bogdanović et al., 1973a). In the basement, there are Palaeozoic formations—schists of the Miroč anticline core, transgressively overlain by Middle Jurassic sandstones. On the surface, they are exposed only on a small area on the anticline axis, where the dominant formation, the Upper Jurassic limestones, are dissolved and eroded. The outskirts of the main limestone ridge are covered by autochthonous Lower Cretaceous reef limestones with sandstones and marls. These rocks are eroded from the top of the anticline but are still present on its limbs. During the Late Cretaceous and Early Palaeogene, two nappes were thrusted over the autochthone: the Severin nappe, consisting of flysch rocks (quasi-Sinaia and Sinaia beds), and the Getic nappe, consisting of crystalline schists (Tekija crystalline, with gneisses and mica schists of Proterozoic age) (Grubić 1990, 1992). The folding of the Miroč anticlinorium caused the erosion which washed out both nappes, autochthonous Cretaceous beds, and on a small surface even the Upper Jurassic limestones from the central part of the mountain. Parts of the nappes are sporadically present on hypsometrically lower locations, as tectonic klippen (Bogdanović et al., 1973a).

Considering the fact that karstified limestones are important groundwater environments, hydrogeological studies have also been numerous, mostly since 1990s. The most significant contributions were authored by Dragišić et al. (1992), Stevanović et al. (1996), Stevanović (1997), Milanović (2007), and Rabrenović (2013).

3. Geomorphological characteristics

Miroč is a N-S oriented mountain with the highest peak Veliki Štrbac at 768 m a.s.l. General inclination of topographic surface basically has a two-sided symmetry, following the anticline

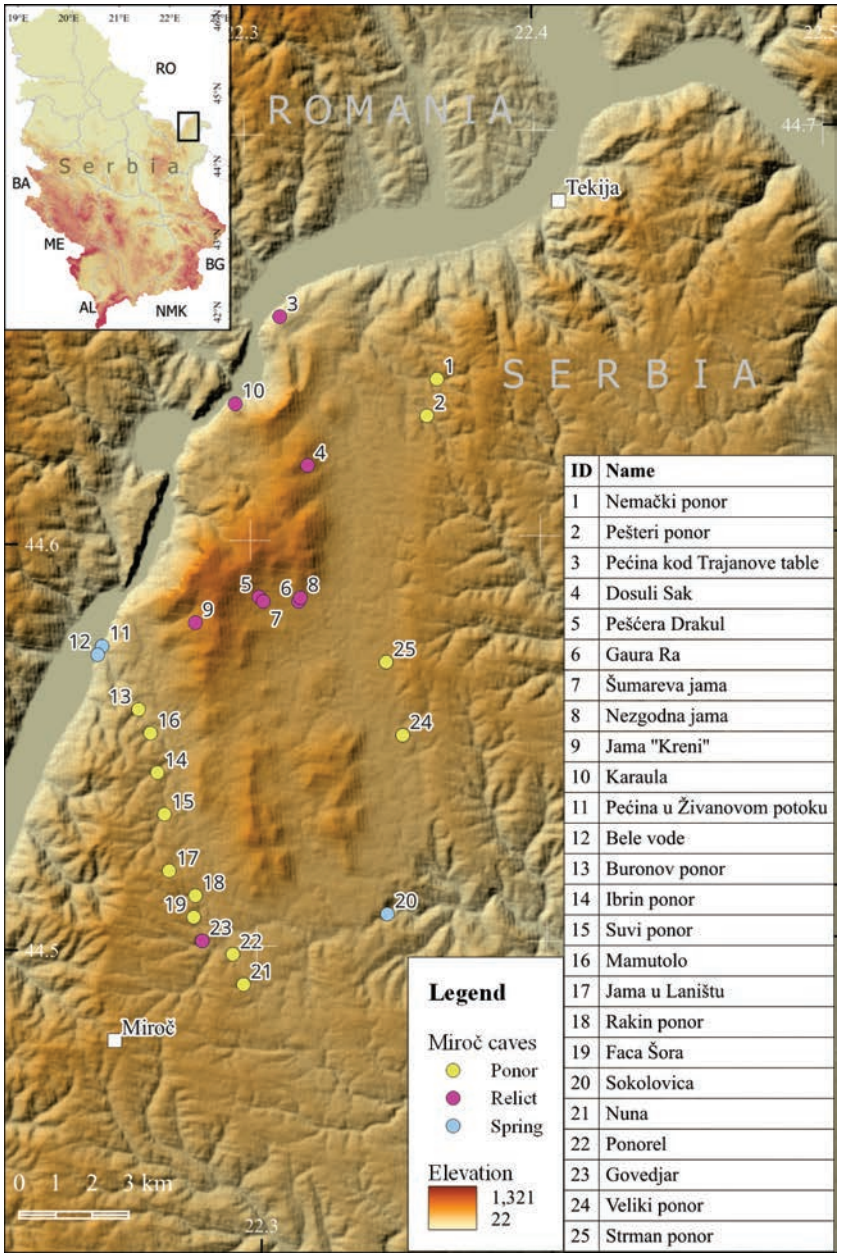
and sloping to the east and west. Nevertheless, due to complex geological relations and different erosion dynamics in various geological formations, the west limb of the anticline hosts a small local watershed from which the streams flow either directly to the Danube or in short segment to the east, sinking to Jurassic limestones of the western contact of Miroč karst. Similarly, on the eastern limb of the anticline there is a local watershed along the Veliki Beljan ridge (and further to the north), from which short seasonal streams flow westwards and sink on the eastern contact of the Miroč karst, while larger rivers flow eastwards to the Dacian plain.

Miroč karst spreads on the area of about 100 square kilometres; about 20 km long in N-S direction and up to 8 km wide in W-E direction. It is developed mostly on limestones of the Tithonian (Upper Jurassic) age, and that is the Miroč karst *sensu stricto*. Formations of Upper Jurassic limestones are also present in several smaller patches which orographically overlap with the northernmost Veliki Greben Mt, with no obvious "border" towards Miroč Mt. Therefore, it may be called Miroč karst *sensu lato*.

Surface karst relief was studied in detail by Milić (1965), Zeremski (1988), Menković & Košćal (1997), Telbisz et al. (2007), Petrović et al. (2016). Among the surface karst forms, dolines are dominant. They are developed only on Jurassic limestones but lacking on Cretaceous lithological units which contain limestones.

Typical features of Miroč karst morphology are ponors (stream-sinks) dotted along the extensive lines of contacts between karstic and non-karstic rocks, making this area an exemplary contact karst throughout the length of the whole limestone outline (Figure 1). With these characteristics, it is comparable to the contact features of the Dinaric karst (Mihevc, 1989; Gams 2001). Caves formed at the contacts usually contain large quantities of clastic allogenic material which influences their further development (Palmer, 2001).

Existence of ponors on the western contact of Miroč karst was first spotted by Jovan Cvijić, during his fieldwork related to Djerdap fluvial terraces. He mentioned the ponors of Baranova Reka (river), Ibrina Reka and Rakina Reka (Cvijić, 1921), which in the present topographical maps bear the names Buronov Ponor, Ibrin Ponor and Rakin Ponor. After the speleological explorations from the early 1990s till nowadays, these caves are in the group of longest and deepest caves in Serbia. The majority of them was explored and surveyed by the speleologists from the Student Speleological and Alpinistic Club (ASAK) from Belgrade, who published the results in a number of scientific publications (Zlokolica-Mandić et al., 1996; Zlokolica-Mandić & Mandić, 1997; Mandić et al., 1997; Mandić, 2004; Ljubojević et al., 2001; Ljubojević 2001; Ljubojević 2003; Ćalić, 2015, Gajović et al., 2017).



ID	Name
1	Nemački ponor
2	Pešteri ponor
3	Pećina kod Trajanove table
4	Dosuli Sak
5	Pešćera Drakul
6	Gaura Ra
7	Šumareva jama
8	Nezgodna jama
9	Jama "Kreni"
10	Karaula
11	Pećina u Živanovom potoku
12	Bele vode
13	Buronov ponor
14	Ibrin ponor
15	Suvi ponor
16	Mamutolo
17	Jama u Laništu
18	Rakin ponor
19	Faca Šora
20	Sokolovica
21	Nuna
22	Ponorel
23	Govedjar
24	Veliki ponor
25	Strman ponor

Figure 1. Distribution of caves on Miroč Mt.

Note. The ponor cave entrances outline the spatial extent of surface karst. SRTM 30 DEM, cartography by M.V.Milošević

4. Nuna Cave

Nuna Cave is the southernmost cave of the Miroč karst *sensu stricto*. It is a ponor of a nameless seasonal stream flowing in the eastward direction between the streams Ponorel on the north and Inarijski Potok on the south (Figure 2). The entrances to the cave are situated at the foot of the 10 m high limestone escarpment oriented along the direction 100–280° (Figure 4a).

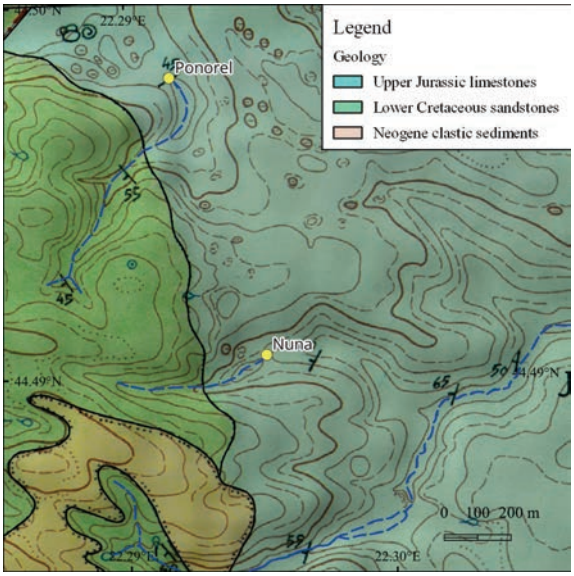


Figure 2. Geological map at the scale 1:25,000 showing the position of Nuna Cave and Ponorel Cave.
Note. Adapted from *Osnovna Geološka karta SFRJ 1:25,000, (sheet Miroč)* [unpublished geological map SFRY] by P. Bogdanović, V. Marković, D. Dragić, M. Rakić, M. Babović, D. Rajčević, V. Popović, and Lj. Milojević, 1973b, Savezni geološki zavod, Beograd. Additional cartography by M.V. Milošević

Upper entrance at the 3 m of relative height has an elliptical cross section and it is not hydrologically active. Lower entrance lies at the bottom of the blind valley and its cross section is triangle-shaped (height 2.5 m, width 2 m). Close to the entrances, the passage is 3-6 m wide and even has the elements of a maze passage. Further downstream, the passage turns narrow, having a so-called canyon-shaped cross section. The length of the cave passages is 135 m, and the denivelation between the highest and the lowest point is 17 m (+6, -11). The cave was first explored and mapped in 2004, and revisited in 2024 for checking the hydrological situation, quantity of clastic infills, tectonic mapping, etc. In both cases, there was no active inflow to the ponor, while the passage contained only several muddy pools. Passage walls have the muddy remnants higher than 2 m from the floor, which is the sign of occasional large-extent flooding with high discharges. Lack of the ponding lines indicates that the floods had torrential character and that the waters infiltrated to deeper karst conduits relatively fast. The floor is covered with mechanical sediments of various granulation—from clay and sand to the meter-sized blocks, except in the zone of the cross-sections c-c (Figure 4d)', d-d', and e-e' in which the floor is in bedrock. The cross-section b-

b' shows the so-called "keyhole profile"(Figure 4c), indicating that in the first morphogenetic phase the water flowed in phreatic conditions (under pressure, forming the scallops), while in the subsequent phase the flow weakened, creating the vadose conditions in which the flow started to incise, leaving the upper part of the keyhole dry (Figure 3).

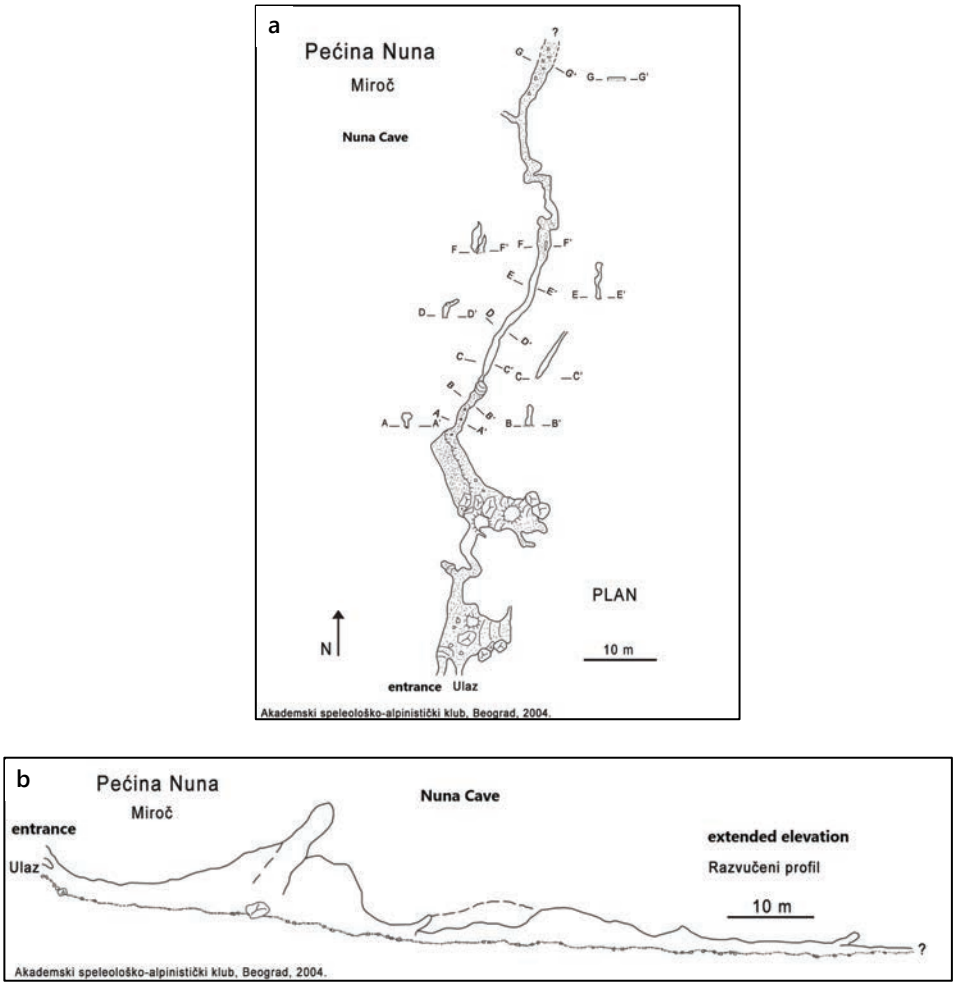


Figure 3. Plan (a) and extended profile (b) of the Nuna Cave (surveyed by: J. Ćalić and V. Ljubojević)

Inclined walls and ceiling of the cave show many other erosional forms, such as *pendants*; also called "erosional stalactites" (Figure 4b). Sometimes they may be formed due to filling of the passages with large quantities of clastic sediments, causing the erosion of limestone above the sediment infill (in the passage ceiling). However, in the case of Nuna Cave, they indicate the speleogenesis along the rupture zone extending generally in the N–S direction, representing the most prominent fault zone in the Serbian Carpatho-Balkanides (Timok–Cerna–Jiu fault zone).

Figure 4. Entrance to the cave (a); pendants (b); keyhole cross-section (c); cross-section c–c of Figure 3a (d).
Note. Photos by A. Mladenović

Judging from several places inside the cave, it can be concluded that the dominant process of cave passages evolution was mechanical erosion of fault-rocks (fault breccias), while chemical erosion represents the "shaping" mechanism. Most probably, the same stands when speaking about the genesis of pendants. Taking in mind orientations of the main fault-zone structures, it can be concluded that these forms represent eroded limestone between fault and Riedel-shears (with angle of about 30 degrees between the structures). In spite of the fact that the dry valley on the surface extends towards the east, the cave passage follows the tectonically-guided N–S direction.

The end of the passable part of the cave is the passage in which the ceiling is lowering to impassable dimensions. The floor is covered with medium-sized pebbles and rubble, occasionally with very shallow stagnant water (Figure 3a and 3b).

5. Conclusion

The Nuna Cave, situated in the southern part of the Miroč Mt. karst area, was first explored in 2004, but the results have not been published until now. Despite being relatively short in comparison with the other caves in the area, its geological and geomorphological characteristics are diverse and inspiring for continuation of research in the direction of other sub-disciplines, such as palaeontology (limestone in Nuna and surrounding caves is fossiliferous), sedimentology of clastic deposits, magnetostratigraphy, speleothem dating, biospeleology, and others.

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References

Berza, T. (1997). A hundred years of tectonic studies in South Carpathians: the state of the art. In A. Grubic, & T. Berza (Eds.), *International symposium "Geology in the Danube Gorges"* Yugoslavia and Romania. Geoinstitut Special Publication 25, pp. 271–276.

Bogdanović, P., Marković, V., Dragić, D., Rakić, M., Babović, M., Rajčević, D., Popović, V., & Milojević, Lj. (1973a). *Osnovna geološka karta SFRJ 1:100,000, (list Donji Milanovac)* [Basic geological map SFRY 1:100,000 (sheet Donji Milanovac)]. Savezni geološki zavod, Beograd.

Bogdanović, P., Marković, V., Dragić, D., Rakić, M., Babović, M., Rajčević, D., Popović, V., & Milojević, Lj. (1973b). *Osnovna Geološka karta SFRJ 1:25,000, (sheet Miroč)* [unpublished geological map SFRY]. Savezni geološki zavod, Beograd.

Boué, A. (1840). *La Turkie d'Europe*. Paris: Arthus Bertrand.

Boué, A. (1891). Geološka skica evropske Turske [Geological Sketch of European Turkey. Translation from French by J. Cvijić, J. M. Žujović, &. M. M. Žujović. *Geološki anali balkanskog poluostrva (Annales géologiques de la Péninsule balkanique) 3*(3), 1–157].

Cvijić, J. (1895). Pećine i podzemna hidrografija u istočnoj Srbiji [Caves and underground hydrography in eastern Serbia]. *Glas Srpske kraljevske akademije nauka, 46*, 1–101.

Cvijic, J. (1908). *Entwicklungsgeschichte des Eisernen Tores*. Petermanns geographische Mitteilungen / Ergänzungsheft 160, Ergänzungsband XXXIV (Heft 158–162), mit 2 Karten, 9 Abbildungen und 31 Figuren im Text. Gotha-Perthes.

Cvijić, J. (1921). Đerdapske terase [Djerdap terraces]. *Glas Srpske kraljevske akademije 101*(43), 1–32.

Ćalić, J. (2007). Karst research in Serbia before the time of Jovan Cvijić. *Acta Carsologica 36*(2), 315–319. https://doi.org/10.3986/ac.v36i2.200

Ćalić, J. (Ed.)(2015). *Caves of the Djerdap National Park*. Djerdap National Park.

Dragišić, V., Stevanović, Z., & Filipović, B. (1992). The occurences of deep siphonal circulation of karst aquifer of Miroč Mountain (Serbia). *Theoretical and Applied Karstology 5*, 115–120. https://digitalcommons.usf.edu/kip_articles/5341/

Gajović, V., Ćalić, J., Mladenović, A., Rajšić, A. (2017). Preliminary speleogenetic considerations on the deepest Serbian cave—Rakin Ponor on Mt. Miroč. In Petra Gostinčar (Ed.), *Milestones and challenges in karstology, Abstract book of the 25th International Karstological School* "Classical Karst", Abstracts & guide book (p. 24). ZRC Publishing Abstract. https://www.researchgate.net/publication/321244752_Preliminary_speleogenetic_considerations_on_the_deepest_Serbian_cave_-_Rakin_Ponor_on_Mt_Miroc

Gams, I. (2001). Notion and forms of contact karst. *Acta Carsologica 30*(2), 33–46.

Grubić, A. (1990). Olistostrome u sinajskim slojevima istočnomiročke podzone. *Geološki anali Balkanskog poluostrva (Annales géologiques de la Péninsule balkanique) 54*, 19–30.

Grubić, A. (1992). Geološki profil Dževrinskog brda u SI Srbiji. *Geološki anali Balkanskog poluostrva (Annales géologiques de la Péninsule balkanique) 56*, 17–35.

Ljubojević, V. (2001). *Caves of Mt Miroč (Danube Gorge, Eastern Serbia)*. 13th International Congress of Speleology, 4th Speleological Congress of Latin América and Caribbean, 26th Brazilian Congress of Speleology, Brasilia DF. https://www.cavernas.org.br/wp-content/uploads/2021/02/26CBE_493-498.pdf

Ljubojević, V., Pačevski, A., Ćalić-Ljubojević, J. (2001). On the genetic conditions of black manganese deposits from two caves of Eastern Serbia. *Theoretical and Applied Karstology 13-14*, 75–79. https://www.karstology.iser.ro/TAK13.html

Ljubojević, V. (2003). Pregled speleoloških istraživanja na Miroču, Nacionalni park Djerdap [Speleological explorations of Miroč Mt, Djerdap National Park, in Serbian with English abstract]. *Proceedings of the 4th Symposium on Karst Protection* (pp. 109–115). Akademski speleološko-alpinistički klub [Student Speleological and Alpinistic Club ASAK]. http://www.asak.org.rs/karst/miroc/mirocpregled.html

Mandić, M., Pavlovic, R., Ložajic, A., Ljubojević, V. (1997). Speleological characteristics of the Miroč Mountain and their relation to the tectonic framework. In A. Grubic, & T. Berza (Eds.), *International symposium "Geology in the Danube Gorges"* Yugoslavia and Romania. Donji Milanovac–Oršava, Geoinstitut Special Publication 25, pp. 117–120.

Mandić, M. (2004). Modifikovanje speleotema u Suvom ponoru na Miroču—korozija kondenzacionih voda ili nešto drugo? [Speleothem modifications in Suvi Ponor Cave on Miroč Mt.—condensation corrosion or something else? in Serbian with English abstract], *Proceedings of the 5th Symposium on Karst - Protection* (pp. 77–86). Akademski speleološko-alpinistički klub [Student Speleological and Alpinistic Club ASAK].

Marović, M., Grubić, A., Djoković, I., Toljić, M., Vojvodić, V. (1997). The Neoalpine tectonic pattern of Djerdap region. In A. Grubic, & T. Berza (Eds.), *International symposium "Geology in the Danube Gorges"* Yugoslavia and Romania. Geoinstitut Special Publication 25, pp. 111–115.

Menković, Lj., Košćal, M. (1997). Geomorphologic characteristics of the area and morphogenesis of the Djerdap gorge. In A. Grubic, & T. Berza (Eds.), *International symposium "Geology in the Danube Gorges"* Yugoslavia and Romania. Geoinstitut Special Publication 25, pp. 89–90.

Mihevc, A. (1989). Kontaktni kras pri Kačičah in ponor Mejame. *Acta Carsologica 18*, 171–194.

Milanović S. (2007, February 27–28). *Water Potential of Miroč Karst and Concept of Ground Water Tapping*. 4th Conference on hydrogeology, ecology, monitoring, and management of groundwater in karst terrains, Safety Harbor, Fl. USA.

Milić, Č. (1965). Morfologija kraške oaze Miroča [Morphologie de l'oasis karstique de Miroč; Résumé en français]. *Zbornik radova Geografskog instituta "Jovan Cvijić" SANU [Recueil de travaux de l'Institut de géographie "Jovan Cvijić"] 20*, 15–56.

Palmer, A.N. (2001). Dynamics of cave development by allogenic water. *Acta Carsologica 30*(2), 13–32. https://www.dlib.si/stream/URN:NBN:SI:doc-RGLTACT8/7776d2c5-879e-4fdf-b003-cce91f6ad0a8/PDF

Petrović, A.S., Ćalić, J., Gajović, V. (2016). Paleodrainage network reconstruction on Miroč Mt. (Eastern Serbia). *Revista de Geomorfologie 18*, 69–76. https://doi.org/10.21094/rg.2016.119

Petrović, J. (1976). *Jame i pećine SR Srbije* [Caves of Serbia]. Beograd: Vojnoizdavački zavod.

Pirch, O. F. (1830). *Reise in Serbien in Spaetherbst 1829*.—Berlin bei Ferdinand Dümmler. p. 8+276+2, Berlin. [Putovanje po Srbiji u godini 1829. Srpski prevod Dragiše J. Mijuškovića. Srpska kraljevska akademija, p. VI+247, Beograd 1899]

Rabrenović, M. (2013). *Ocena ranjivosti karstne izdani vrela Bledrija na Miroču* [Unpublished thesis] Univerzitet u Beogradu, Rudarsko-geološki fakultet.

Stevanovic Z. (1997): Characteristics of karst areas in Djerdap zone. In A. Grubic, & T. Berza (Eds.), *International symposium "Geology in the Danube Gorges"* Yugoslavia and Romania. Geoinstitut Special Publication 25, pp. 181–190.

Stevanovic Z., Dragišić V., Dokmanovic P., Mandic, M. (1996). Hydrogeology of Miroč karst massif, eastern Serbia, Yugoslavia. *Theoretical and Applied Karstology 9*, 89–95. https://digitalcommons.usf.edu/kip_articles/5348/

Telbisz, T., Mari, L., Ćalić, J. (2007). Morfometrijska analiza vrtača na Miroču upotrebom GIS-a [Doline morphometry on Mt.Miroč, using GIS methods; in Serbian with English abstract and summary]. *Glasnik Srpskog geografskog društva 87*(2), 21–30. file:///C:/Users/tjoji/Downloads/462-606-1-PB.pdf

Zeremski, M. (1988). Geomorfološka karta kraške oaze Miroča [Carte géomorphologique de l'oasis karstique de Miroč, Résumé en français]. *Zbornik radova Odbora za kras i speleologiju III*; SANU Posebna izdanja 589, Odeljenje prirodno-matematičkih nauka [Recueil des rapports du Comité pour le karst et la spéléologie III, ASSA Editions speciales, Classe des sciences naturelles et mathèmatiques], 63, 7–21.

Zlokolica-Mandić M, Mandić M, Ljubojević V. (1996). Some Significant Caves at the Western Rim of the Miroč Karst (Yugoslavia). *Theoretical and Applied Karstology 9*, 77–88. https://digitalcommons.usf.edu/kip_articles/5348/

Zlokolica-Mandić M., Mandić M. (1997). Buronov ponor [Buronov Ponor Cave]. *Zbornik 3. Simpozijuma o zaštiti karsta* [Proceedings of the 3rd Symposium on Karst Protection] (pp. 245–253). Akademski speleološko-alpinistički klub [Student Speleological and Alpinistic Club ASAK].

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SECURITY IMPLICATIONS OF CLIMATE CHANGE IN THE ALTAI HIGHLANDS: THE CASE OF THREE RUSSIAN REGIONS

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Abstract: Analysis of existing studies shows that insufficient attention has been paid to the relationship between security and climate change in mountain areas of Russia, where climatic processes are very intense. In particular, in the Altai mountains, an important center of glacier melting with diverse landscapes, the climate changes already caused not only reduction of ice-sheet, but also provoked transformations of land use and conditions of life of rural population living in highlands. The sociological research, accompanying geological and glaciological study and including face-to-face structured (n = 912) and semi-structured (n = 72) interview with population and experts (n = 163) was conducted in 2022–2023 in three highland areas of the Altai mountains (the Republic of Altai, the Republic of Tyva and the Altai krai). The main focus of the study was to evaluate subjective perceptions of climate change along with repertory of security indicators on the base of mixed qualitative and quantitative design. It was found that all mountain regions were perceived as epicenters of climatic threats, but possessed a specialization, determined by peculiarities of landscape and typical land and nature use. Over half of inhabitants assessed living near melting glaciers as dangerous, and were affected by the changes in traditional economic activities, constituting important part of family income. The national republics had similar risk perception profiles, with a significant share of seismic, thermal and hydrological factors, whereas the Altai krai foothills were characterized by the predominance of risks associated with changes in precipitation regime, floods and snow level. The anxiety of people was often related to difficulties of farming (livestock deaths, lack of fodder), economic and social uncertainty.

Keywords: climate change; glacier melting; highland territories of the Russian Altai; perception of risks and security; regional security issues

1. Introduction

Since the last decades of 20th century marked by growing scientific evidence and power of epistemic communities shaping environmental policy throughout the world climate change has become strongly associated with security issues. In global politics and international relations, different scientific discourses have been formed around the so-called climate-security nexus, focusing on causes and consequences of global warming, and public policy-oriented think-tanks emphasized the role of climate change as a "threat multiplier", weakening institutions, exacerbating socioeconomic stresses and vulnerability of exposed groups (Huntjens & Nachbar, 2015; McDonald, 2024; Pérez de las Heras, 2020). A vast

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number of scientific works linked climate with a broad spectrum of social issues: armed conflicts and violence (Koubi, 2019; Levy et al., 2017), sustainability of critical infrastructure (Kumar et al., 2021), geopolitical rivalry (Bazilian et al., 2020), threats of food (Wheeler & Von Braun, 2013), culture (Simpson et al., 2022), and social security (Chin-Yee, 2019; Dankelman, 2012).

Contemporary view of the field shows that deterministic mechanisms, underlying the climate-security nexus are sometimes uncritically overestimated. The relationship between climate and security seems to be more complicated than appears at first sight, and requires close attention and efforts from social scientists to create new theoretical and empirical grounds, dealing with asymmetry in power and subjectivity of stake-holders, unequal exhibition and difficulties of measurement of different dimensions of security, lack of comparability of historical and contemporary data in various regions, and other theoretical and methodological aspects (Gemenne et al., 2014). Many works prioritize the role of climate and ecological factors in explaining social issues. For example, such methodological reduction is observed towards migration, which analysis under climatic standpoint is focused on "climate refugees" and the volume of population under the threat of homelessness, unemployment, insufficient water, and food supply (Martin, 2010; Piguet et al., 2011; Trombetta, 2014). Meanwhile, critical studies underline that the course for desecuritization advocating to replace military strategies by those orienting towards sustainable development goals and diverse ways of thinking about migration, including the right to stay, not always leads to democratization of political and public discourses (Baldwin et al., 2014).

Another assumption is based on the central role of the State and global agencies in determination of climate change issue and decision-making. There are deep concerns about attention paid to climate risks for national states, regional and global instability, scarcity of resources, whereas the role of informal institutions and possibilities of peaceable management are underappreciated. Politization and securitization of public discourses about climate give rise to significant shift towards technologies and interventions, supporting the governmental position (Wæver, 2011). In the meantime, even if security cannot be fully separated from the State, creating institutional conditions for implementation of rights and opportunities for population, ensuring conditions for labor, social and cultures services, the role of other players, especially professional groups, local communities and civic initiatives seem to grow. Thus, existing conceptions of the climate change–security relationship propose different frameworks of meaning and interpretations of climatic events, sources of security threats, loss and profit, responsibility of actors, admissible measures and sets of responses (McDonald, 2024). Most of them are biased towards climate risks and vulnerabilities rather than security itself. At the same time, theoretical approach based on a securitization may be a relevant analytical tool allowing to consider security as a specific form of social practice, and threats and risks as social constructs (Trombetta, 2023), reified through global and national climate policy plans, scientific and public discussions, adaptation and mitigation measures.

It is widely accepted that climate change has a great impact on socio-ecological systems. Dual character of such systems suggests that their security may be viewed as a result of two different kinds—ecological (natural) security, describing integrity and preservation of natural complexes, biological diversity, and social dimensions of security, including their national,

regional, local, economic, political, professional variants, manifested in social relations and interactions (Omelchenko et al., 2021). Depending on disciplinary approach and direction of research, the latter may be interpreted as a state, quality or process, have different static or dynamic characteristics, objects and subjects, which minimal list include persons, social groups and organizations and society as a whole (state, nation or global community). The modern thinking about social security supposes modernization of social structures and institutions, their accommodation to new social, realities, including those related to the change of climatic patterns. It may be defined as a stable ensemble of factors, ensuring life and health of population, protection of their interests, culture and way of life, guarantees of justice and sustainable development, capacity to effectively prevent and not only protection against internal or external threats (Yanovsky, 2008).

Mountainous territories are an object of close attention from geographers, climate scientists, ecologists, civic activists, governmental and non-governmental organizations. The special role of mountainous regions was firstly highlighted at the 1992 United Nations Conference on Environment and Development (UNCED), where they have been identified as priority objects of research and protection, and a milestone for the political recognition of the unique services providers, possessing unique nature, diversity of ecologic systems and climatic conditions, vulnerable under anthropogenic interference—active mining, deforestation, intensive activities for the extraction of plant raw materials leading to depletion and erosion of soil, reduction of biodiversity. The population of mountain areas (up to 10% of the world population), especially indigenous peoples, are also suffering from direct and indirect changes in environmental conditions, forced to transform or abandon the traditional way of life (Stone, 1992).

Many studies have confirmed that climate change rates in mountain areas are elevation-dependent. Temperature increases are particularly rapid in the cryosphere and influence atmospheric stability and patterns of precipitation (Pepin et al., 2022). Risks, associated with the climate change in mountainous regions are mainly concentrated around the retreat of glaciers, representing a major stock of freshwater in solid form (snow and ice) and an origin for many rivers, and the corresponding changes in landscape. So, the diminishing cryosphere has many direct consequences, including the potential loss of water supply, shifting of snowmelt, the spread of hydrological and geomorphological hazards (increases in extreme precipitation events, frequency and severity of floods, movement of landslides, fire outbreaks, etc.), affecting social and economic systems (Beniston, 2005). Indirect threats derive from direct consequences of climate fluctuations. Especially, risks of permafrost degradation affect transport and communication infrastructures, hydropower and irrigated agriculture. The prevalence of hazardous phenomena and soil degradation undermine social and cultural facilities, tourism development and recreational services (Huggel et al., 2015).

Among intracontinental mountainous areas of Eurasia, a specific place is occupied by the Altay mountains—transborder territory, situated in four countries—the Russian Federation, China, Mongolia, and Kazakhstan, with unique natural landscapes, identified by World Wildlife Fund (WWF) as one of the 35 global remaining untouched areas and priority places of irreplaceable and threatened biodiversity. Climate change here has great variability and largely affect the inter-mountain basins with an abrupt continental climate (Kokorin, 2011). In the special focus are temporal and characteristic changes in icesheet, experiencing intensive

melting and reduction of glaciers surface (since the Little Ice Age, the glaciers decreased by 47.9%), causing river flow redistribution, formation of leaking ice lakes and other natural hazards (Ganyushkin et al., 2022). Difficult access and peripheral position contributed to the long-term retention of traditional forms of economy by indigenous people in Altai highland areas. Even today, in the conditions of modern civilization, the everyday life of mountain people is largely organized around nature, biological resources (livestock products, crop production, gathering of wild animals, crafts) represent a significant share of household consumption and income. Historically contingent nature management of the Altai peoples has formed a system of traditional knowledge and skills, necessary for surviving in mountain forests, steppes and semi-deserts, close to glaciers.

Climate change significantly transforms natural conditions and hinders preservation of economic traditions of peoples, living in the extreme climate conditions. Discussing permafrost degradation in Arctic zone some scholars introduce the special notion of "cryolitic man", describing peculiarities of lifestyle, psychology and values of peoples, for a long-time inhabiting lands, covered by perennial cold soils (Vinokurova, 2016). Arctic and mountain territories with rude climate have been used since ancient times. Peoples, living here, have created a unique culture of sustenance and livelihood, reflected in folk epos, "cultural code" of ethnos. Adaptation to extreme natural conditions not only tempered body and character of locals, but also honed skills, necessary for surviving. The Altai peoples—Altaians, Tuvans, Kazakhs and other ethnic groups have developed unique agricultural technologies allowing to ensure food supply in the long winter and short summer conditions, and, at the same time, provide nature preservation by means of distribution of pastures according to types of livestock and different time periods, reduced and justified consumption, gentle, sacred attitude to nature. The peculiar spirituality of the local population, formed on the basis of close interaction between humans and nature, is an integral part of the culture of indigenous small peoples. Recent works recognize the importance of traditional knowledge and need for its integration with scientific knowledge and technologies in finding optimal ways of coping with climate risks. They depart from simplified victimological discourse about indigenous peoples treated as victims, forced to deal with climate risks, created by industrialized and more developed countries and corporations. Thus, Herman (2015) introduces the conception of "indigeneity", profoundly based on local identity, the sense of responsibility for managing nature and describes "native science" as holistic, locally valid, contextual, value-laden, opposed to "western science", providing discipline-based, universal, abstract, and value-free approach.

Meanwhile, the analysis of previous studies shows, that security-climate relationship in mountainous regions, especially related to the Altai mountainous country, is underexplored, the research field is fragmented and concentrated on separate issues, such as water supply (Pomeroy et al., 2016; Tang et al., 2022) or functioning of individual social communities (Spies, 2020). Taking into account the increasing volume of climate-induced natural hazards, social and economic damage, and actually developed national and regional policies, the complex research, focusing on evaluation of security of population under climate change has scientific and practical relevance and may give valuable insights, concerning subjective perceptions of mountain peoples about climate as a security issue in relationship with

regional and personal vulnerabilities, representations about actors, responsible for adaptation and mitigation of climate change, and required aid.

2. Data and methods

Principles and content components of the research rest on a corpus of recent works about climate change and security, and determined by geographic scope—intracontinental mountains regions, represented by the Altai Mountainous country, characterized by high degree of natural predisposition and vulnerability to transformations of the natural environment, preservation of the importance of ethno-cultural traditions of the population. The conceptual model relies on integrative, interdisciplinary and system approaches, determining the choice of essential notions, their operationalization and transformation into empirically verified indicators. The mixed design, combining qualitative and quantitative, population and expert data, allowed cross-validation of results from different data sources and analytic techniques. Given model takes into account not only social and economic, but also ethno-cultural factors, associated with climate change, gives special attention to the cultural needs and the role of ethnic identity, national mentality as factors, mediating perception of climate risks, and possible measures. Inclusion of security as a key element in the model reflects contemporary tendencies not only identify threats and vulnerabilities, evaluate and manage risks of climate change, but also reveal opportunities and growth points for sustainable development of mountainous regions, social stability and well-being of population in the condition of uncertainty.

Information base of the research consisted in results of sociological expeditions, conducted in 2022–2023 in three Russian regions—the Altai krai, the Republic of Altai, and the Republic of Tyva. The route of the expeditions passed through areas located close to the glaciers (North-Chuya ridge in Kosh-Agach region, Mongun-Taiga Mountain massif in the Tyva Republic) as the most vulnerable to global warming. Survey instruments included structured interviews (n = 912, quota sample, controlled for sex, age, place of residence, age range from 16 to 80), supplemented by semi-structured in-depth interviews (n = 72), personal observations and expert interviews with specialists from local administrations, customs officers, environmental protection departments, territorial authorities of the Ministry of Emergency Situations, scientists working on climate change (n = 163). Qualitative data analysis was performed with IBM SPSS 26.0 and programming language R. Inductive strategy and qualitative data analysis permitted to make an accent on local peculiarities and common narratives about climate change and its consequences in everyday life. Open coding was used to analyze interviews' fragments and describe climatic realities accounting for local context. Qualitative data was processed by means of MaxQDA 23.0.

3. Results

3.1. Climatic risks in the worldview of regional communities

In all three regions meteorological measurements show the cyclic character and significant increase in amplitude of fluctuations and average temperatures, indicating high responsiveness of territories to climate change consequences (Galkin, 2021). In all agro-climatic zones of the Altai krai there has been a decline in winter period by eight days in

average, in some districts there was an increase in the duration of spring and autumn periods (Maximova et al., 2016). Observations in the periglacial areas of North-Chuya and South-Chuya in the Republic of Altai ridges have also shown the shift towards positive values (Kakorin, 2020). The climate change in arid territories (for example in the Kosh-Agach district) is accompanied by temperature fluctuations, lowering winter precipitation, increasing summer rainfall, decrease in number of days with stable snow cover (Kocheeva et al., 2012). The analysis of the climate in the Republic of Tyva has shown the rise of continentality of climate, and simultaneously, the repeatability of warm winters. The extreme temperatures in summer and winter are increasing, and the rainfall is decreasing, especially in warmer weather (Kuular, 2015). Thus, a general trend of warming is accompanied by significant fluctuations of temperatures in warm and cold periods, reduction of predictability and stability of climate.

Regional experts, commenting about environmental issues in their regions, were almost unanimous in identifying them as "individual, local problems" (72.7% in the Altai krai, 41.0% in the Republic of Altai, and 45.5% in the Republic of Tuva). Serious concern was manifested only in national republics: 13.1% of experts in the Republic of Altai and 4.5% in Tuva claimed that ecological situation is massively life-threating. About fifth part of experts in all regions agreed that ecology is characterized by threats for health, the same quantity—affirmed that ecological conditions, in contrary, are healthy and favorable for people. Experts also confirmed that climate changes represent a real concern, but, according to 74.3% of experts in the Altai krai, 59.0% in the Republic of Altai, and 63.3% in the Republic of Tuva, it is a slow, gradual process. At the same time every fifth expert in the Altai krai, fourth in the Republic of Tuva and third in the Republic of Altai characterized them as quick and intensive. In that way, for the moment, expert community do not identify climate as exclusively security issue, there are some concerns, but they are not perceived as catastrophic nor very quick.

According to the results of survey among population, only the fifth part of residents in three regions (21%), from 27.9% in the Altai krai to 16.4% in the Republic of Altai didn't recognize that climate is changing. Low rates of "difficult to answer" responses indicated that climate topic was important and produced reflexions on its relevance (7.1% in the whole data) especially in the Republic of Altai (3.4%, in the Republic of Tyva 8.9%, and 12.1% in the Altai krai).

Despite growing data about warming of climate in the mountainous area, the main tendency in the evaluations of population was predominance of opinions about decrease in average annual temperature. Almost half of respondents (48.6%) independently of region reported about climate cooling, this tendency was particularly visible in the Republic of Altai (56.8%), where 62.3% of residents of the Ulagan district and 51.9% of the Kosh-Agach district were of that opinion. In the Republic of Tyva evaluations were similar (49.5% in the region), the more obvious in the Mongun-Taiga kozhuun (60.0%), whereas in the Altai krai people less often noted that the climate is cooling (34.3%), except Soloneshinsky district (48.8%), significance of differences was tested by means of z-criterion ($p < 0.01$). Assessments of local experts partially echoed those of inhabitants: 63.9% of experts in the Republic of Altai and 46.2% in the Tuva witnessed about decrease in temperatures, whereas in the Altai krai 62.9% of specialists noticed warming.

In addition to average temperatures, respondents were asked to evaluate temperature regimes in cold and warm periods of year. Results were almost identical, difference in assessments didn't overcome 2%. In comparison to cooling in winter, noticed by 64.6% of respondents, and cold summers (65.6%), warming was perceived as much less frequent: only 16.7% of participants have noted that temperature has become warmer in winter, and 17.1%—in summer. The absence of changes was reported by 17%–18% of respondents.

Regional comparisons have revealed tendencies, similar to those with average temperatures. Cooling was more frequently reported in the Republic of Altai (in winter 75.2%, in summer 70.9%) and the Republic of Tyva (in winter 75.1%, in summer 75.3%), while in the Altai krai rates were significantly lower (winter 39.8%, summer 50.0%). In the Altai krai cooling was more considerable in summer (differences with winter more that 10 percent points, further—pps.), in the Republic of Altai—in winter (diff. 4.3 pps), whereas in the Republic of Tyva differences were minimal (about 1.0 pps). Significance of inter-seasonal variations was confirmed by 10% level only for the Altai krai (marginal homogeneity criterion for paired samples, p = 0.089), while in national republics evaluations for different periods were quite similar (p_{RA} = 0,726, p_{RT} = 0,705) (Figure 1).

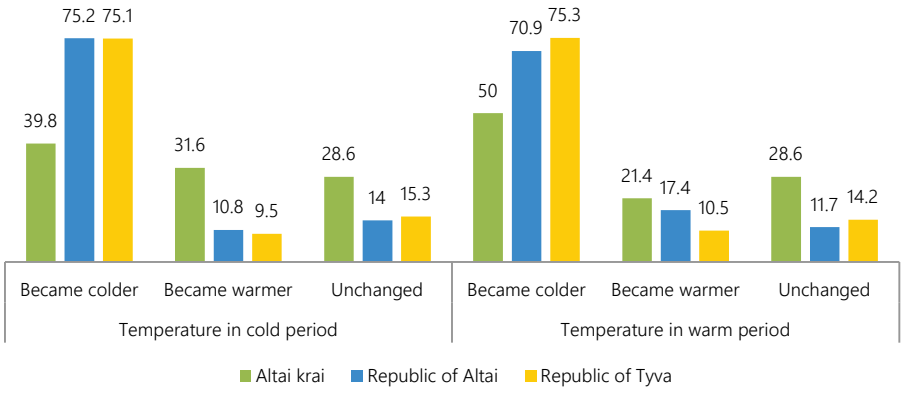

Figure 1. Residents' perception about changes in average air temperatures in winter and summer periods, by region, %.

Therefore, inhabitants of highland areas have high awareness of climate change in different periods of year, and describe them usually in terms of instability and worsening (for example summer frosts are seen as a proof that the summer becomes cooler even if people notice periods of anormal heat). Since the mountainous climate is very rude (in many settlements where the survey took place, mean annual temperatures are negative), actual evaluations are made by projection of long-term characteristics of weather, forming representations about climate. These representations evolve around everyday household and personal practices, such as bearing warm clothes, buying fuel, lighting the fireplace, contemplating nature and agricultural activities, becoming more difficult and expensive: "I always laugh, when I hear about global warming on TV. I say—everywhere is warming, but here—cooling. The last summer we constantly wore jackets, warm clothes, and this year will

be the same" (woman, 42 years, Republic of Altai, Kosh-Agach); "We see cold snap, where is warming? It's July, before there were green plants, cows grazed, nowdays, everything has changed, we see chill and frosts" (man, 66 years, Republic of Altai, Kosh-Agach); "The hay is expensive, coal, firewood as well. It is cold, even in summer, the wind blows, we heat the stove at least once a day" (woman, 52 years, Republic of Altai, Tashanta).

Global changes in climate provoke various side effects, related to temperature regimes, changes in humidity, precipitation, atmosphere circulation, reflected in growing number of natural hazards. Over 40% of respondents in three regions have noticed that in their district there were heavy flooding, earthquakes and heavy snowfalls, thunderstorms, over a third part were anxious about steppe and forest fires, strong winds. Every fourth respondent agreed that climate change affects biodiversity and lead to disappearance of plants and animals, fish in rivers and lakes, almost fifth part indicated the issue of groundwater discharge, in highlands associated with melting permafrost, about 15%—worried about gravitational exogenous processes, manifested in the increase of rock falls, landslides and mudflows. A vulnerability coefficient, showing the ratio between the share of respondents, who were personally touched by the hazard and the share of those who reported about existing issue, was counted. The highest coefficient in the united data (0.53) was attributed to the death of plants and animals, mostly known by own experience. The population was also highly involved in the problem of flooding (0.43) and groundwater discharge (0.39).

Regions of the research differed by the spread of natural phenomenon and by the share of people, whose households were concerned. According to our research, in the Altai krai the most significant were floods (56.9%), strong snowfalls (39.4%), groundwater discharge (23.4%), strong winds (21.2%). Personal (household) vulnerability index was maximal for flooding, caused by high water (0.63) or groundwater (0.61), strong winds (0.43) and loss of animal and plant species. In the Republic of Altai all assessed natural hazards were evaluated as frequent by at least 20% of inhabitants. The most acute were issues of earthquakes (65.2%), strong snowfalls (46.2), fires (44.4%), floods (40.6%), storms and strong winds (37.9%). It is in this region, where people were mostly concerned about rockfalls, snow avalanches, landslides, mudflows (over 20%) (Table 1). The level of vulnerability had maximal values in the case of death of plants and animals (0.5), snowfalls, reducing access to transport and communication infrastructures, critical for surviving in mountains (0.39), and floods, causing damage and threating lives of people, living in the riskiest zones (0.34). In the Republic of Tyva the highest rates of regional spreading were for earthquakes (42.2%), heavy snowfalls, and snowstorms (41.7%), steppe and forest fires (41.7%), floods (37.5%), strong winds, and storms (33.3%). Every fifth respondent reported about the death of plants and animals, caused by changes in weather and climate. The latter was particularly personal issue (vulnerability index 0.74). In personal interviews these stories were told with high levels of drama and emotionality: "This year people nearly died. Recently, this month, a man from sovkhoz drove 200 animals, by the way 20 dead from wind, rain, hail. Chaban himself was pulled out of there, we met him" (woman, 80 years, Tuva, Mogen-Buren); "This year was very hard. My husband wanted to sell sheep, but wind, storms, snowfalls didn't stop. Last year in November it snowed. Chabans, wintering here, suffered much, they lost their livestock. In spring it was very sad to see them" (woman, 42 years, Tuva, Toolayty). For other indicators, index was much lower, maximal values—storms and winds (0.32), snowfalls (0.28), but in fact

all these phenomena were strictly related to each other (Table 1). Thus, in national republics, people's evaluations were focused on seismic, thermal and hydrological factors, almost all risks and personal vulnerability were evaluated higher, whereas in the Altai krai (a reference region with foothills remote from glaciers) only several risks, related to precipitation regimes, flood and snowfall were important and dealing with people's lives.

Table 1. Subjective evaluations of occurrence of natural hazards in the district of residence in recent times and personal damage, %

Natural hazards	Altai krai		Republic of Altai		Republic of Tyva	
	Neighborhood	Touched personally	Neighborhood	Touched personally	Neighborhood	Touched personally
Steppe and forest fires	19.3	3.6	44.4	6.1	41.7	4.7
Floods caused by heavy rainfall, summer flood	56.9	35.8	40.6	13.9	37.5	7.8
Groundwater discharge	23.4	14.2	24.7	7.0	12.5	3.6
Earthquake	12.0	2.6	65.2	17.5	42.2	6.3
Rockfalls, snow avalanches, landslides, mudflows	4.7	1.1	20.9	3.1	16.1	3.1
Storms, strong winds	21.2	9.1	37.9	11.2	33.3	10.9
Death of plants or animals, bees, disappearance of fish in rivers and lakes	16.8	7.3	31.2	15.9	20.3	15.1
Heavy snowfalls, snowstorms	39.4	10.9	46.2	18.2	41.7	12.0

In expert survey local specialists were also asked to evaluate whether climate change, threaten traditional economic activities and practices of nature use, force to change habitual way of living or abandon historically driven methods of farming. Nine items, describing most frequent traditional activities, representing a source of income for people living in agricultural areas, were assessed by means of 10-point scales, where 0 points denoted *absence of risk* and 10 points *maximal risks*. Results after summarization are presented at the Figure 2.

Regional profiles show similarity in national republic, characterized, on the one hand, by high rates of zero-risk assessments (average value for all indicators—41.6% in the Republic of Altai and 44.1% in the Republic of Tyva, for comparison in the Altai krai only 16.7%), and, on the other hand, by significantly high shares of high evaluations.

In the Altai krai the majority of activities had been identified as zero, low or moderate risk, only two domains had high values (breeding domestic animals and beekeeping), whereas in the Republic of Altai most concerned activities, affected by climate change included large-scale livestock farming (31.1% of high evaluations of risk) and family livestock farming, small stock production (32.2%). Over 20% of experts agreed the climate change strongly threatens gardening and horticulture, over 15% that fishing and collection of wild plants and fruits is also under the threat. In the Republic of Tyva, similarly to the Altai,

poultry breeding, beekeeping and hunting weren't treated as activities, threatened by climate changes. Four areas of natural management were mostly concerned: cattle, horse, reindeer breeding (29.0% evaluations of high risk), collection of weeds, berries (24.2%), breeding domestic animals (22.0%), and fishing (21.4%).

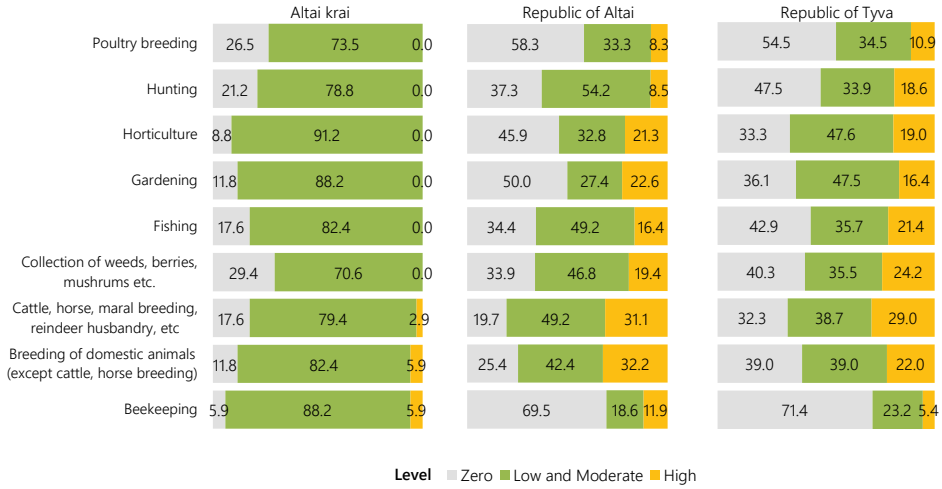

Figure 2. Climate-induced risks for traditional land use, expert evaluations in three regions, %.

The ensemble of collected data showed that climate issues are deeply rooted in the lives of mountain peoples who are highly dependent on the state of natural environment. The deterioration of homeostasis of socio-ecological systems, resulting from climate fluctuations, seriously affects the daily life and wealth of mountain dwellers. These impacts can be direct, through living conditions and health, endangered by natural hazards, or indirect, through worsening and complicating working conditions and traditional activities. The next section examines, how these effects are reflected in subjective evaluations of security of population in different spheres of life.

3.2 Security of population living in mountains under climate change: physical, health and economic dimensions

According to the belief that security is a complex, multidimensional and multilevel phenomenon, encompassing various facets of life, and supposing, from the one side, protection against dangers, threats and risks, and, from the other side—provision of opportunities for satisfaction of variety of needs (vital or existential), empirical evaluation of population's security under climate change necessitated a graduated approach.

Although all areas where the survey took place can be identified as riskier in comparison with other regions and natural zones, certainly, people had their own ideas about the risk status of their homes. Thus, answering the question, whether the place they live belongs to the zone of natural risks (snow avalanches, rockfalls, mudflows, or other natural hazards), about a third part of respondents answered in affirmative. Yet in the Republic of Altay

people were more aware (only 3.9% answered that they did not know), and 63.6% agreed they lived in a safe place. In the Republic of Tyva every fourth respondent confirmed that he/she lived in a dangerous place (60.8% claimed the opposite, 14.3% doubted), whereas in the Altai krai 30.3% of participants thought they live in dangerous zone and 59.0%—in secure environment.

Taking into account the subjectivity of such attribution, it was reasonable to conduct a deeper investigation of the perception of security and its social, cultural and economic correlates. It was found, that despite qualifying their location as quite secure many people (43.6% in total, 57.7% in the Altai krai, 36.7% in the Republic of Altai and 40.1% in Republic of Tyva) didn't feel safe from natural hazards and dangers.

Further analysis consisted in finding factors, determining personal evaluations. One of hypotheses linked feeling of security with the state of health, which according to the previous studies (Kokorin, 2011; McDonald, 2024) becomes climate-dependent. The survey revealed that 61.9% of respondents had rather good health and experienced only seasonal sickness (in the Altai krai the share was lower—57.1%). A quarter of residents (in the Altai krai almost third part—28.7%) had chronical diseases, about 4.3%—had a handicap, that objectively reduced possibilities for adaptation to climate change. Moreover, half of respondents (in the Republic of Tyva—39.3%, in the Altai krai—53.6%, in the Republic of Altai—51.3%) noted a deteriorating health in recent times, and at least partially the worsening was explained by climatic and ecological reasons: 19.7% of noted that their condition was getting worse not only because of age or heredity issues, but also because of changes in climate and weather, 17.2%—blamed the poor ecology, 9.4%—bad quality of food and water.

The most evocative securitizing discourse about climate change envisages more severe consequences for underprivileged social groups. The analysis has shown that despite difficult socio-economic situation—over half of experts unanimously characterized their regions as rather unfavorable and undeveloped, the population preferred to identify the level of wealth of their families as "middle" (about 70% in total, 71.5% with no regional differences). The number of poor people (by self-evaluation) reached 5.2% in the Altai krai, 9.4% in the Republic of Altai and 4.8% in the Republic of Tuva. Meanwhile, even if self-categorization by property status and financial situation was sensitive, other indicators revealed existing points of tension. Thus, at least 40% of respondent (in the Republic of Altai 50.2%) were not sure to find another job after loosing their actual source of income, 15.8% (in the Altai krai—21.8%, in the Republic of Tyva—9.5%) were not satisfied with living conditions, and almost 14% (in the Altai krai—15.6%; in the Republic of Tyva—9.7%) thought that their quality of life will worse in the future (Table 2).

The regression analysis allowed to assess above-described indicators simultaneously and find significant predictors of security feelings in relation to national hazards associated with climatic changes. The final logistic model included five determinants (gender, age, ethnicity, confidence in finding a job, satisfaction with life), whereas other six (house location, material position and expectations about changes in standards of living, education, health state, and region of residence), were dropped out as non-significant by backward Wald stepwise elimination algorithm.

Table 2. Indicators of security of population, %

		Region			Total
		Altai krai	Republic of Altai	Republic of Tyva	
Does the place where you home is located belong to the zone of natural hazards?	Yes/No/Don't' know	30.3/59.0/10.7	32.5/63.6/3.9	24.9/60.8/14.3	29.7/61.2/9.1
How safe do you feel from natural hazards and dangers??	Safe/Unsafe	42.3 (57.7)	63.3 (36.7)	59.9 (40.1)	56.3 (43.6)
What is the state of your health?	Only common colds and infectious diseases	57.1	61.8	69.1	61.9
	Serious diseases, injuries	11.1	8.3	7.3	9
	Chronical diseases	28.7	23.8	21.3	24.8
	Uncurable disease, handicap	3.1	6.1	2.2	4.3
What is the level of wealth of your family?	Poor/Middle/ Rich	5.2/71.5/23.3	9.4/69.7/20.8	4.8/64.7/30.5	7.2/69.2/23.7
If you lose your basic source of income, are you sure that you can find another job, a salary?	Yes (No)	60.4 (39.6)	49.7 (50.3)	61.7 (38.3)	56.8 (43.2)
How satisfied are you with your living conditions?	Satisfied (Not satisfied)	78.2 (21.8)	85.2 (14.8)	90.5 (9.5)	84.3 (15.8)
How do you think your standard of living will change in the near future?	Will be worse/not change/improve	15.6/46.7/37.7	13.9/35.0/51.1	9.7/21.0/69.3	13.5/35.6/50.9

Among demographic factors gender and age mostly affected the sense of security. Thus, women in average had 1.6 times less protection feelings against natural forces than men. Young people under 30 years had 2.5 times better chances to feel secure than people aged 50 and older (differences with a group of 30–49-year-olds were non-significant).

Another important factor was ethnicity. Two groups were compared: Russians and indigenous peoples of national republics (Altayans, Altai Kazakhs, Telengits, and some less numerous groups, such as Kumandins). It was found that belonging to the Russian ethnos reduces significantly, by 49%, the sense of security, while other peoples, for whom severe mountain climate is a natural habitat with deep cultural traditions and spiritual meaning, feel in average more adapted, protected and less vulnerable.

While house location, material position and expectations about changes in standards of living, along with education, health state and region of residence had no importance in determining subjective feelings of security, among socio-economic factors, there were two, contributing to its development. So, people, confident in their ability to find a new job or another source of income in a case of necessity had 2.0 times better chances to feel secure in given natural environment. Apart from accessible work, important factor in feeling safe was satisfaction with living conditions: accumulated unsatisfaction by one point (four-point scale was used) decreased by 28% the probability to be in the group of those who had stronger feelings of security (Table 3).

Table 3. Results of the regression analysis (logistic model).

Predictors	B	SE	Wald	df.	p.	Exp (B)
Gender (Male vs Female)	0.445	0.221	4.074	1	0.044	1.561
Age (under 30 vs 50+)	0.933	0.323	8.316	1	0.004	2.541
Age (30-49 vs 50+)	–0.002	0.238	0	1	0.995	0.998
Ethnicity (Russians vs other ethnic groups)	–0.676	0.216	9.838	1	0.002	0.508
Confidence to be able to find a job easily	0.647	0.211	9.427	1	0.002	1.91
Satisfaction with living conditions	–0.333	0.154	4.674	1	0.031	0.717

Local experts were also asked to define groups of population, most of all suffering from natural hazards, facing difficulties to cope with their consequences, adapt way of life, preserve health and other issues of adaptation. The majority of experts agreed that the entire population consume risks of climate change, but also highlighted, that several groups are more affected: older population (37.7%), low-income groups (24.7%), large families (11.0%), that was in line with the results, obtained in the regression analysis. This means, however, that security in conditions of climatic uncertainty in mountainous areas is not homogenous or universally accessible, it subjectively evaluated and related to a wide range of social moods and expectations of various, inter alia, economic nature.

3.3 Security providers and support measures

Applying the concept of securitization to the field of climate change supposes not only identify main focus of discourse (on national, global, or local stability), and consumers (victims) of risk, but also actors, responsible for ensuring security, as well as admissible and justified ways to cope with problem.

According to the significant share of local population (43.4%), the climate change is first and foremost governmental issue, and all authorities, from federal to municipal levels, should take responsibility over it. This standpoint is particularly relevant for the Altai krai (51.9%, in the republics—32-43%). The second place in the rating is taken by population itself (30.8% in total, 35.5% in the Altai krai, the minimal share—in the Republic of Tyva—24.9%), the third—by local authorities (29.4%, in the Altai krai—37.8%), proving that peculiarities of situation may be managed only by possessing the necessary amount of information, and here population trust more in themselves or at least in local leaders, but

not to remote federal powers, nor to regional governments almost equally distant. Ecological and other non-profit organizations are recognized by the quarter of residents as powerful actors, capable to manage climatic risks. At the same time, scientific or research organization do not possess enough subjectivity in the public eyes as well (only 16.8% of respondents have chosen this variant, but in the Altai krai the role of analytical institutions is more important) (Table 4).

Table 4. Answers to the question: "Who should address the issue of climate change and provide adaptation to its consequences?" (multiple choice question), %.

	Total	Region		
		Altai krai	Republic of Altai	Republic of Tyva
All levels of government	43.4	51.9	43.2	31.5
Population itself	30.8	35.5	30.4	24.9
Local authorities	29.4	37.8	25.7	26.0
Ecological, non-profit orgnizations	25.6	19.8	26.2	32.6
Government and federal authorities	22.6	19.5	21.5	29.8
Regional governments	20.4	19.1	16.7	30.9
Scientific, research organizations	16.8	21.0	12.3	21.5
Other	1.8	—	3.3	1.1

As it was shown, climate-driven events have become habitual in the mountainous areas which have already had extremely harsh conditions, and climate-dependent economy. So, it is no surprising that people who took part in the interviews among possible forms of help firstly mentioned cash assistance and subventions (60.9%), accompanied by provision of medicines (55.9%) and food (41.8%). It is noticeable that more than a third part of residents consider migration as a possible strategy and demand for help with moving to a safer place, another 25% are ready to get assistance in changing profession. Consulting and assistance in adapting household economy for new conditions are not largely required (about 20%) (Table 5).

Table 5. Answers to the question: "What forms of assistance people living in areas at high risk of natural and climate threats need?" (multiple choice), %.

	Total	Region		
		Altai krai	Republic of Altai	Republic of Tyva
Cash grants	60.9	70.7	60.5	48.1
Provision of medicines, medical services	55.9	61.4	50.8	59.9
Food provision	41.8	45.6	38.3	44.4
Help with moving to a safer place	31.9	45.6	26.7	24.6
Psychological support	24.7	26.6	20.6	31.6
Employment, assistance in the choice or change of profession	24.6	15.4	28.8	27.8
Assistance in household management	20.6	7.7	26.7	24.6
Advice, consultation of specialists	20.1	14.7	20.3	27.3

4. Conclusion

In 2023 the President of Russia signed a decree, establishing new climatic doctrine of, whose strategic goal is ensuring secure and sustainable development of Russia, including institutional, economic, ecologic, and social factors, manifested under climate change and concomitant threats (Decree of the President, 2023). All regional governments had to develop adaptation plans, taking into account peculiarities of climatic situation, risks, and opportunities in their territories. For example, a regional plan in the Republic of Altai was adopted in April 2023 (Decree of the Government of the Republic of Altai, 2023) and included 28 priority measures, managing climate risks in the field of life safety and real economy, infrastructure, agriculture, forest management, and nature use. The analogic plan in the Republic of Tuva included 22 measures, directed towards modernization of heating systems and communal infrastructure, modernization of agriculture (development of effective irrigation systems, creation of seed), preservation of forests, a large part of measures directed towards improvement of existing monitoring and measurement systems, ways of presenting population in the case of danger, preservation of natural areas (Decree of the Government of the Republic of Tyva, 2023). All documents are centered around national interests and global obligations of Russia concerning its impact in implementation of international conventions, but, at the same time, represent an attempt of differentiated approach to adaptation and mitigation, paying attention to local peculiarities. Given their timeliness and exceptional relevance, the Ministry of Economic Development conducted series of seminars, devoted to evaluation of climatic risks and vulnerability in regions, but real systems of climate policy are actually under active development.

The presented research contributes to that process by collecting evidence and fulfilling sociological analysis of local realities. The population of the inter-continental Altai has a sufficiently strong but not fully differentiated perception of climate change, which is influenced by landscape and proximity to the melting zone of glaciers and permafrost. Some negative phenomena related to rainfall, floods, temperature changes are already felt quite clearly, including negative effects on environmental management and public health, but not yet perceived as catastrophic. Security feeling under climate change largely depends on demographic and economic factor, is ethnically determined. Meanwhile, existing regional plans and complexes of measures don't suppose any social intervention, which may increase awareness of population about climate policy and stimulate proactive behavior.

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References

Baldwin, A., Methmann, C., & Rothe, D. (2014). Securitizing 'climate refugees': the futurology of climate-induced migration. *Critical Studies on Security, 2*(2), 121–130. https://doi.org/10.1080/21624887.2014.943570

Bazilian, M., Bradshaw, M., Gabriel, J., Goldthau, A., & Westphal, K. (2020). Four scenarios of the energy transition: Drivers, consequences, and implications for geopolitics. *Wiley Interdisciplinary Reviews: Climate Change, 11*(2), e625. https://doi.org/10.1002/wcc.625

Beniston, M. (2005). The Risks Associated with Climatic Change in Mountain Regions. In U. M. Huber, H. K. M. Bugmann, & M. A. Reasoner (Eds.), *Global Change and Mountain Regions. Advances in Global Change Research*, (pp. 511–519). Springer. https://doi.org/10.1007/1-4020-3508-X_51

Chin-Yee, S. (2019). *Climate change and human security: case studies linking vulnerable populations to increased security risks in the face of the global climate challenge*. EUCERS.

Dankelman, I. (2012). Climate change, human security and gender. In I. Dankelman (Ed.), *Gender and climate change: An introduction* (pp. 83–105). Routledge.

Decree of the President of the Russian Federation, No. 812, Validating the Climate Doctrine of the Russian Federation (2023, October 26). https://leap.unep.org/en/countries/ru/national-legislation/presidential-decree-no-812-validating-climate-doctrine-russian

Decree of the Government of the Republic of Altai, No. 155, Validating the regional plan for adaptation to climate change in the territory of the Republic of Altai (2023, April 3). https://минэко04.рф/activity/sotsialno-ekonomicheskoe-razvitie/obespechenie-razvitiya-ekonomiki-v-usloviyakh-izmeneniya-klimata/

Decree of the Government of the Republic of Tyva, No. 714-p, Validating the regional plan for adaptation to climate change in the territory of the Republic of Tyva until 2030 (2023, December 18). http://www.npa.rtyva.ru/page/6919.html

Galkin, D. G. (2021). Стратегия и тактика адаптации сельского хозяйствак последствиям изменения климата: региональный аспект. *Grand Altai Research & Education, 1*, 31–35. https://ojs.altstu.ru/index.php/GAltai/issue/view/31/45

Ganyushkin, D., Chistyakov, K., Derkach, E., Bantcev, D., Kunaeva, E., Terekhov, A., & Rasputina, V. (2022). Glacier Recession in the Altai Mountains after the LIA Maximum. *Remote Sensing, 14*(6), 1508. https://doi.org/10.3390/rs14061508

Gemenne, F., Barnett, J., Adger, W.N., & Dabelko, G. D. (2014). Climate and security: evidence, emerging risks, and a new agenda. *Climatic Change, 123*(1), 1–9. https://doi.org/10.1007/s10584-014-1074-7

Herman, R. D. K. (2015). Traditional knowledge in a time of crisis: climate change, culture and communication. *Sustainability Science, 11*, 163–176. https://doi.org/10.1007/s11625-015-0305-9

Huggel, C., Carey, M., Clague, J. J., Kääb, A. (Eds.). (2015). *The High-Mountain Cryosphere: Environmental Changes and Human Risks*. Cambridge University Press.

Huntjens, P., & Nachbar, K. (2015). *Climate change as a threat multiplier for human disaster and conflict*. The Hague Institute for Global Justice. The Hague Institute for Global Justice Working Papers No. 9 https://static1.squarespace.com/static/61542ee0a87a394f7bc17b3a/t/61b8e67b32b0eb4c0fbb89a5/1639507580316/working-Paper-9-climate-change-threat-multiplier.pdf

Kakorin, V. A. (2020). Dinamika temperatury vozduha perigljacial'nyh oblastej-otrazhenie izmenenija klimata (na primere Kosh-Agachskogo rajona Respubliki Altaj) [Air temperature dynamics of the periculo-regions reflecting climate change (as in the Kosh-Agachsky district of the Republic of Altai)]. In A. M. Gareev (Ed.), *Fundamental and Applied Research in Hydrometeorology, Water Management and Geoecology: Proceedings of the V All-Russian scientific and practical conference (with international participation) dedicated to the International Water Day and the Day of the Hydrometeorological Service Worker and the celebration of the 75th anniversary of the Great Victory* (pp. 52–55). Bashkir State University. https://elibrary.ru/heuucq

Kocheeva, N. A., Bolbukh, T. V., Sukhova, M. G., & Zhuravlyova, O. V. (2012, August 20–24). *The topicality of ecologically oriented planning of economic activity in the arid areas in the conditions of climate change*. Vodnye i ehkologicheskie problemy Sibiri i Central'nojj Azii. Barnaul, Russia. http://www.eecca-water.net/file/barnaul2012-3.pdf

Kokorin, A.O. (ed.). 2011. *Assessment Report: Climate change and its impact on ecosystems, population and economy of the Russian portion of the Altai-Sayan Ecoregion*. WWF Moscow.

Koubi, V. (2019). Climate change and conflict. *Annual Review of Political Science, 22*, 343–360. https://doi.org/10.1146/annurev-polisci-050317-070830

Kumar, N., Poonia, V., Gupta, B. B., & Goyal, M. K. (2021). A novel framework for risk assessment and resilience of critical infrastructure towards climate change. *Technological Forecasting and Social Change, 1*;165, Article 120532. https://doi.org/10.1016/j.techfore.2020.120532

Kuular, Kh. B. (2015). Peculiarities of climate in the Tyva Republic in the 20th and 21st centuries. *Russian Meteorology and Hydrology*, *40*, 34–38 https://doi.org/10.3103/S1068373915010057

Levy, B. S., Sidel, V. W., & Patz, J. A. (2017). Climate change and collective violence. *Annual Review of Public Health, 38*, 241–257. https://doi.org/10.1146/annurev-publhealth-031816-044232

Martin, S. (2010). Climate change, migration, and governance. *Global Governance, 16*(3), 397–414. https://doi.org/10.1163/19426720-01603008

Maximova, N. B., Arnaut, D. V., & Morkovkin, G. G. (2016). Ocenka prodolzhitel'nosti klimaticheskih sezonov goda po agroklimaticheskim rajonam Altajskogo kraja v uslovijah menjajushhegosja klimata. *Bulletin of the Altai State Agricultural University, 11* (145), 48–53. https://www.asau.ru/files/vestnik/2016/11/048-053.pdf

McDonald, M. (2024). Climate change, security and the institutional prospects for ecological security. *Geoforum*, 155, Article 104096. https://doi.org/10.1016/j.geoforum.2024.104096

Omelchenko, D. A., Maximova, S. G., & Noyanzina, O. E. (2021). Social security in regional societies of the Russian borderland: individual and institutional factors. *Society and Security Insights, 4*(3), 13–37. https://doi.org/10.14258/ssi(2021)3-01

Pepin, N. C., Arnone, E., Gobiet, A., Haslinger, K., Kotlarski, S., Notarnicola, C., .Palazzi, E., Seibert, P., Serafin, S., Schoner, W., Terzago, S., Thornton, J. M., Vuille, M., & Adler, C. (2022). Climate changes and their elevational patterns in the mountains of the world. *Reviews of Geophysics, 60*(1), e2020RG000730. https://doi.org/10.1029/2020RG000730

Pérez de las Heras, B. (2020). Climate security in the European Union's foreign policy: addressing the responsibility to prepare for conflict prevention. *Journal of Contemporary European Studies*, *28*(3), 335–347. https://doi.org/10.1080/14782804.2020.1731438

Piguet, E., Pécoud, A., & De Guchteneire, P. (2011). Migration and climate change: An overview. *Refugee Survey Quarterly, 30*(3), 1–23. https://doi.org/10.1093/rsq/hdr006

Pomeroy, J. W, Fang, X. Whitfield, P. H, Rasouli, K., Harder, P., Siemens, E., & Pradhananga, D. (2016). Mountains, Climate Change and North American Water Security. *AGU Fall Meeting Abstracts*, H41B–1330. https://ui.adsabs.harvard.edu/abs/2016AGUFM.H41B1330P/abstract

Simpson, N. P., Orr, S. A., Sabour, S., Clarke, J., Ishizawa, M., Feener, R. M., Ballard, C., Mascarenhas, P. V., Pinho, P., Bosson, J. B., Morrison, T., Zvobgo, L. (2022). *Impacts, vulnerability, and understanding risks of climate change for culture and heritage*. ICOMOS.

Spies, M. (2020). Mixed manifestations of climate change in high mountains: insights from a farming community in northern Pakistan. *Climate and Development, 12*(10), 911–922. https://doi.org/10.1080/17565529.2019.1701974

Stone, P. B. (Ed.). (1992). *The State of the World's Mountains: A Global Report*. Zed Books.

Tang, Q., Liu, X., Zhou, Y., Wang, P., Li, Z., Hao, Z., Liu, S., Zhao, G., Zhu, B., He, X., Li, F., Yang, G., He, L., Deng, H., Wang, Z., Ao, X., Wang, Z., Gaffney, P. P. J., & Luo, L. (2022). Climate change and water security in the northern slope of the Tianshan Mountains. *Geography and Sustainability, 3*(3), 246–57. https://doi.org/10.1016/j.geosus.2022.08.004

Trombetta, M. J. (2014). Linking climate-induced migration and security within the EU: insights from the securitization debate. *Critical Studies on Security, 2*(2), 131–147. https://doi.org/10.1080/21624887.2014.923699

Trombetta, M. J. (2023). Climate change and the transformation of security: securitization and beyond. In M. J. Trombetta, (Ed.), *Handbook on Climate Change and International Security* (pp. 346–359). Edward Elgar Publishing. https://doi.org/10.4337/9781789906448.00030

Vinokurova, U. A. (2016). Fenomen cheloveka kriolitozony [Phenomenon of man from cryozone]. *Polar readings on the icebreaker "Krasin", 3*, 60–68. https://cyberleninka.ru/article/n/fenomen-cheloveka-kriolitozony/viewer

Wæver, O. (2011). Politics, security, theory. *Security dialogue, 42*(4–5), 465–480. https://doi.org/10.1177/0967010611418718

Wheeler, T., & Von Braun, J. (2013). Climate change impacts on global food security. *Science, 341*(6145), 508–513. https://doi.org/10.1126/science.1239402

Yanovsky, R. G. (2008). Socialnaja bezopasnost i patriotizm kak osnovanija konstruktivnoj dinamiki gumanitarnyh peremen [Social security and patriotism as a basis for constructive dynamics of humanitarian changes]. *Security of Eurasia, 3(33)*, 379–390. https://www.imemo.ru/files/File/ru/publ/2008/08060.pdf

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INVESTIGATION OF NATURAL HAZARD IMPACTS ON TECHNOLOGICAL SYSTEMS AND INFRASTRUCTURE

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Abstract: Hazardous natural processes and phenomena of various origins not only have a direct negative impact on the population and the economy, but also could act as a kind of "trigger" for the occurrence of accidents and emergencies in the technological systems and infrastructure facilities that they affect. Such types of accidents and emergencies, which are triggered by the impact of any natural hazard, are considered as natural hazard triggered technological accidents (so called Natechs). Especially dangerous social and environmental consequences have accidents resulting in releases of various pollutants. Accidents that disrupt the normal living conditions of the population create emergency situations. The paper presents the results of a long-term study of Natech events, their causes and consequences, temporal and regional distribution in the Russia. The observation period was 1991–2023. The main research method is the compilation of an electronic database (DB) of technological accidents, followed by statistical and geographical analysis. The information in the DB is collected in a structured form that allows searching and computer processing of the accumulated data. Data about previous dangerous events, collected in a DB over a sufficiently long period of time (more than 30 years in our case), can be interpolated to predict their future development, as well as to assess natural risks for the population. The author's DB contains information about accidents and emergencies at technological facilities that occurred in Russia since 1991, including those caused by the impact of natural hazards. The main types of Natechs are distinguished. The areas of the highest risk of their occurrences have been identified. The contribution of various natural factors to the formation of the identified types of Natechs has been studied. Almost half of all events (48%) were caused by the impact on technological objects of a whole complex of dangerous hydrological and meteorological processes and phenomena, which include unfavorable combinations of various climatic parameters and hazards, such as strong winds, liquid and solid precipitation, floods, hard frosts, heat waves, lightning strikes, and others.

Keywords: natural hazard; Natech; technological system; infrastructure; database; Russia

1. Introduction

Hazardous and unfavorable natural processes and phenomena of various geneses can not only lead to negative consequences for the population and the economy and cause significant material, social, and environmental damage, but also act as a kind of "trigger" for the creation of emergency situations at technological systems and the infrastructure. Hazardous natural processes can not only have a direct mechanical impact on the infrastructure facilities, industrial installations, vehicles, and other technological systems, leading to accidents or disruption of their normal functioning, but can also cause various failures in the operation of automatic and electronic systems. In the first case, the types of natural processes that are usually meant when speaking about natural disasters cause mechanical impacts. These types include natural hazards

of geological origin (earthquakes, volcanic eruptions, tsunamis), geomorphological origin (such as landslides, rockfalls, snow avalanches, debris flows, and other slope processes), hydrological and meteorological origin (hurricanes, cyclones, typhoons, floods, extreme precipitation and extreme high and low air temperatures, ice and rime phenomena, thunderstorms, hail, fog, etc.). Various types of solar and cosmic disturbances (often referred to in scientific literature as "space weather") and anomalies in geomagnetic fields can produce effects of the second type, leading to failures of automation and electronics. In addition, natural processes of the second type are capable of exerting an indirect influence on technological accidents, increasing the effect of the so-called "human factor" by affecting the nervous system and reducing the attention of vehicle drivers and operators of various technological systems, which can ultimately also lead to accidents (Myagkov, 1995). Particularly destructive consequences arise in cases of catastrophic manifestation of dangerous natural processes.

Accidents in the technosphere that arise as a result of hazardous natural impacts of various origins are usually called natural hazard triggered technological accidents (so called "natural-technological accidents" or Natechs; Krausmann & Cruz, 2008; Masys et al., 2014; Salzano et al., 2013; Showalter & Myers, 1994). Especially dangerous social and environmental consequences have accidents resulting in releases of various pollutants (Cruz & Okada, 2008; Cruz et al., 2006; Petrova & Krausmann, 2011; Showalter & Myers, 1992). The term "natural-technological risk" is understood by different authors to mean both a technogenically (anthropogenically) increased natural risk and a technological risk provoked by some natural events (Myagkov, 1995). Accordingly, accidents and emergency situations at technosphere facilities that are provoked or aggravated by the impact of various natural factors are understood as "natural-technological accident and emergency" (Natechs; Showalter & Myers, 1994). This paper discusses exactly these types of accidents and emergencies.

The purposes of this study are to identify and analyze natural factors of accidents and emergencies in the technosphere, to assess the contribution of natural factors among other causes of technological accidents, to identify the most significant types of natural processes and phenomena, and areas of greatest risk of accidents and emergencies of both natural and technological nature.

2. Methodology

2.1. Database of natural-technological accidents and emergencies

The main methodology used in this study is monitoring accidents and emergency situations that occur at Russian technosphere facilities as a result of exposure to hazardous natural processes and phenomena of various types, by recording these events in the author's electronic database (DB). On a regular basis, in continuous monitoring mode, information is entered into the DB, starting with the events of 1991 and up to the present time. The methodology for constructing an electronic DB, its relational structure, and features of use for the purposes of monitoring hazardous natural impacts on technological systems and infrastructure facilities are considered in more detail by Petrova (2020).

The main sources of initial information for filling the DB are daily operational reports of the Russian Emergencies Ministry, which are supplemented, if necessary, by reports from leading Russian news agencies. It is important to emphasize that all sources of information used and the data published by them are open.

2.2. The structure and tools of the DB

The information accumulated in the DB is structured in a certain way (by event date, accident type, region, etc.), which allows for the necessary computer processing in accordance with the goals and tasks of specific studies. The main auxiliary tools of the DB are search queries (by keywords) and data sorting. In addition to the continuous series of observations for the above-mentioned time interval (since 1991), the DB also records some events of the largest scale for an earlier period, but they are rather sporadic in nature.

The method of using an electronic DB is a fairly simple and effective tool for monitoring various events, providing very broad opportunities for storing, searching, processing, and analyzing various units of information. Using such long-term series of observation data on adverse and hazardous natural impacts on technological systems in some regions, it is possible to study the features of the formation and manifestation of these processes in space and time, assess average long-term frequencies of their occurrence, the severity of the consequences, and track spatial and temporal changes in various parameters. Information about the dynamics and distribution of adverse and hazardous events in the past, collected in the DB for a sufficiently long-term interval, can be interpolated for the future and used to predict the future development of the processes under study, as well as for the purposes of assessing natural and technological risks.

In the author's electronic DB, the entire array of collected information on natural and technological events is structured according to the following main parameters:

1. Date and time of the event;
2. Location of the event;
3. Type of emergency (fire and explosion, road accident, railway accident, air crash, water accident, accident in electrical, heat, water, and communication system, sudden collapse of building and structure, pipeline rupture, agricultural accident, etc.);
4. Social damage (number of victims and affected people);
5. Material and environmental damage (in monetary terms);
6. Triggers of the accident (if available) and other information; and
7. Source of information.

For the purposes of this study, information on accidents and emergency situations that occurred during the observation period from 1991 to 2023 at various objects of the Russian technosphere as a result of exposure to unfavorable and hazardous natural processes and phenomena was selected and analyzed from the DB. A statistical and geographical analysis of this information was carried out as described in the next section.

2.3. Search queries and statistical methods used

In order to assess the contribution of individual types of unfavorable and hazardous natural processes and phenomena to the occurrence of natural-technological emergency situations (NTES), the corresponding search queries were conducted among the entire array of information accumulated in the DB.

Each of these queries used different keywords (or their unchangeable parts, to eliminate the influence of morphological inflections) that best conveyed the names of the main types of natural hazards present in the DB. As the queries were executed, the list of keywords had

to be adjusted to more accurately match the topic. Special search queries were compiled for the following types of natural hazards:

- strong winds of various origins—hurricanes, typhoons, tornadoes, squalls, etc.—to search for the emergency situations they provoke, key words such as "wind", "squall", "hurricane", "typhoon" were used;
- heavy snowfalls and blizzards—keywords for search queries: "snow", "blizzard";
- heavy rains, showers, and hail—key words: "rain", "hail", "downpour", "shower", "precipitation";
- ice and rime phenomena—key words: "rime", "ice";
- floods;
- thunderstorms, lightning strikes;
- extreme high and low air temperatures;
- fogs;
- landslides;
- snow avalanches;
- debris flows;
- earthquakes; and
- volcanic eruptions.

All regions of Russia were ranked in descending order, depending on the number of natural hazards triggered technological accidents registered in them over the entire period under consideration: from the highest to the lowest value. Then, using statistical methods (based on calculating the average values—μ and standard deviation—σ), four groups of regions were identified based on the risk level of NTES occurrence. The risk level was assessed based on the frequency of Natechs in a given region over the observation period.

The group with the highest level of risk included those regions where the frequency of occurrence of NTES was higher than the value (μ+2σ). The high-risk group included regions in which the frequency of occurrence of NTES fluctuated between values from (μ+σ) to (μ+2σ). The medium risk group included regions where the frequency of occurrence of NTES remained in the range (μ±σ) and, finally, the low risk group included regions where the frequency of occurrence of NTES was below the value (μ-σ).

3. Results and discussion

3.1. Natural factors of technological accidents and emergencies

The DB contains the information about more than 26,6 thousand emergency events in the technosphere—technological and natural-technological emergencies that occurred in Russia from 1991 to 2023. More than 12% of all recorded events were caused by the impact of various natural factors, and they can be classified as NTES. The rest of the emergencies in the technosphere were caused by other factors (significant wear and tear of production assets, violation of technological processes and rules for the operation of facilities, design and construction errors, etc.), a more detailed discussion of which is beyond the scope of this paper.

As the analysis of the results obtained during the search queries showed, the largest number of all NTES registered in the DB (more than half of them) was caused by the simultaneous impact of a whole range of hazardous hydrological and meteorological processes and phenomena on technological systems and the infrastructure (Figure 1). This

complex of hydrometeorological hazards, as a rule, included the impact of strong gusty winds in combination with extreme precipitation of various types. Such a combination of natural factors is most dangerous for overhead power transmission lines. Breakage of overhead power wires, damage to their supports as a result of such natural impacts, is the most frequently recurring type of NTES in almost all regions of Russia (Petrova, 2021).

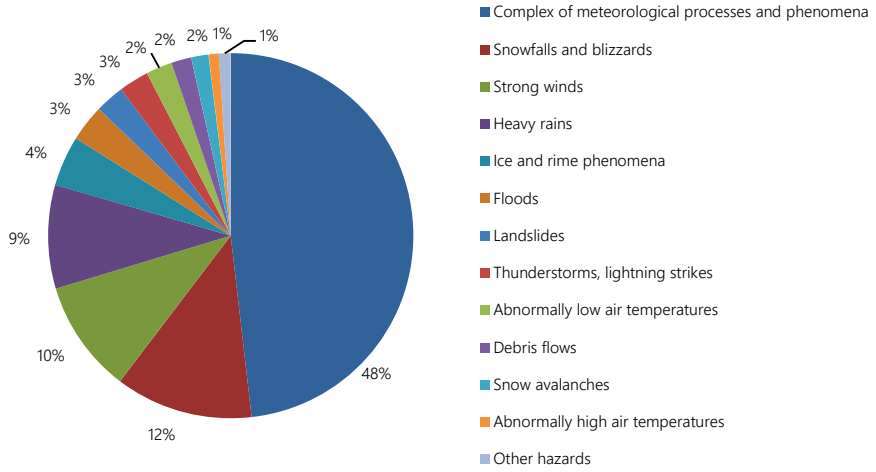

Figure 1. The ratio of the main natural factors of emergency situations in Russia for 1991–2023.
Note. Compiled by the author using the DB information.

An additional contribution to the occurrence of emergency situations was identified from certain types of processes and phenomena of a hydrometeorological nature, including:

- 12% of all emergency situations were caused by heavy snowfalls, snow drifts, and blizzards;
- 10% by various wind phenomena;
- 9% by heavy rains, showers, and hail;
- 5% by ice and rime phenomena; and
- 3% each by floods, thunderstorms, and abnormally low or high air temperatures.

Thus, in general, almost 93% of all Natechs recorded in the DB from 1991 to 2023 were caused by natural factors of a hydrometeorological nature. Among natural factors of other genesis, 3% of NTES were caused by landslides and various soil movements and ground subsidence, 2% by snow avalanches and debris flows; the share of other hazardous natural processes accounted for slightly more than 1% of all NTES (Figure 1).

3.2. Types of technological accidents due to natural factors

As a result of the conducted research, based on the information from the author's DB, 11 types of accidents in the technosphere caused by natural factors on the territory of Russia were identified for the study period:

- accidents in electrical, heat, and communication systems due to strong winds, cyclones and hurricanes, snowfalls, severe frosts, rain, hail, thunderstorms, snow avalanches and debris flows, as well as earthquakes (more than 50% of all emergency situations);

- accidents in water supply systems and other housing and communal services facilities as a result of severe frosts, rains, earthquakes, or ground subsidence;
- sudden collapses of buildings and structures due to strong winds, snowfalls, rain, severe frosts, flooding, or ground subsidence (about 6%);
- road accidents or disruptions to automobile communication caused by snowfalls and blizzards, ice, rain, fog, snow avalanches, and debris flows (24% of all NTES);
- water accidents caused by storms, cyclones, typhoons, and fogs;
- air crashes or disruptions to air traffic caused by adverse weather conditions and other natural factors;
- railway accidents or disruptions to railway communications as a result of snow drifts, rain, snow avalanches, debris flows, and rockfalls;
- fires and explosions caused by lightning strikes or extreme heat;
- pipeline ruptures as a result of strong winds, as well as various slope processes;
- agricultural accidents (crop loss) due to drought, frost, snowfall, rain, or storms (5% of NTES); and
- accidents involving the release of toxic substances as a result of floods or landslides.

3.3. Grouping of Russian regions by the level of risk of NTES occurrence

The group with the highest level of risk included the following regions of the Russia: Sakhalin, Novgorod and Leningrad regions, the Republics of Dagestan and North Ossetia (Alania), Krasnodar, Krasnoyarsk, Khabarovsk, Primorsky, Kamchatka, and Stavropol territories. In these regions, the impact of various natural factors on the technological facilities is most often.

The high-risk group included the following regions of the Russia: Altai Territory, Murmansk, Nizhny Novgorod, Rostov, Irkutsk, Tver, Orenburg, and Chelyabinsk regions. The results of grouping the regions of the Russia by the risk level of NTES are shown in Figure 2.

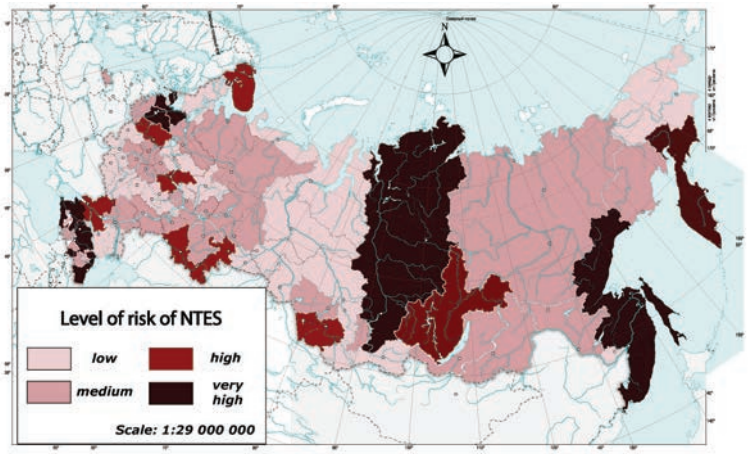

Figure 2. Grouping of Russian regions by level of risk occurrence of NTES.
Note. Compiled by the author using the DB information. Outline of the map is adapted from "Tekhnogennyye opasnosti. Opasnost' chrezvychaynykh situatsiy tekhnogennogo kharaktera" [Technogenic hazards. Danger of technological emergency situations], by E. G. Petrova, in *Ekologicheskiy atlas Rossii* (p. 311), 2017, Feoria.

4. Conclusions

Natural factors of various origins have significant impacts on technological systems and the infrastructure facilities, causing accidents at them and disrupting their normal functioning. Over the study period of 1991–2023, the greatest contribution to the occurrence of Natechs and emergencies in Russia was made by unfavorable and hazardous natural processes and phenomena of a hydrometeorological nature, such as strong winds, snowfalls and blizzards, rains, showers and hail, as well as some other types of natural hazards. The largest share (more than half) of all NTES in Russia is accidents in electrical, heat, and communication systems and power supply disruptions.

The highest frequency of occurrence of NTES is found in the Sakhalin, Novgorod and Leningrad regions, the Republics of Dagestan and North Ossetia (Alania), Krasnodar, Krasnoyarsk, Khabarovsk, Primorsky, Kamchatka, and Stavropol territories, which is associated with the most frequent manifestation of natural factors of technological accidents there. According to forecasts, in the near future the intensity and recurrence of dangerous natural processes of a hydrometeorological nature in Russia will increase due to the observed climate changes (Kislov et al., 2008; Malkhazova & Chalov, 2004), which makes the problem of studying natural and technological risks even more urgent.

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References

Cruz, A. M., & Okada, N. (2008). Consideration of natural hazards in the design and risk management of industrial facilities. *Natural Hazards*, *44*(2), 213–227. https://doi.org/10.1007/s11069-007-9118-1

Cruz, A. M., Steinberg, L. J., & Vetere-Arellano, A. L. (2006). Emerging Issues for Natech Disaster Risk Management in Europe. *Journal of Risk Research*, *9*(5), 483–501. https://doi.org/10.1080/13669870600717657

Kislov, A. V., Evstigneev, V. M., Malkhazova, S. M., Sokolikhina, N. N., Surkova, G. V., Toropov, P. A., Chernyshev, A. V., & Chumachenko, A. N. (2008). *Prognoz klimaticheskoy resursoobespechennosti Vostochno-Yevropeyskoy ravniny v usloviyakh potepleniya XXI veka* [Forecast of climatic resource availability of the East European Plain under warming conditions of the 21st century]. MAKS Press.

Krausmann, E., & Cruz, A. M. (2008). Preface. *Natural Hazards*, *46*(2), 139–141. https://doi.org/10.1007/s11069-008-9225-7

Malkhazova, S. M., & Chalov, R. S. (Eds.). (2004). *Geografiya, obshchestvo, okruzhayushchaya sreda. Tom 4. Prirodno-antropogennyye protsessy i ekologicheskiy risk* [Geography, society, environment. Vol. 4. Natural-anthropogenic processes and environmental risk]. Gorodets.

Masys, A. J., Ray-Bennett, N., Shiroshita, H., & Jackson, P. (2014). High Impact/Low Frequency Extreme Events: Enabling Reflection and Resilience in a Hyper-connected World. *Procedia Economics and Finance*, *18*, 772–779. https://doi.org/10.1016/S2212-5671(14)01001-6

Myagkov, S. M. (1995). *Geografiya prirodnogo riska* [Geography of natural risk]. Moscow State University.

Petrova, E. G. (2017). Tekhnogennyye opasnosti. Opasnost' chrezvychaynykh situatsiy tekhnogennogo kharaktera [Technogenic hazards. Danger of technological emergency situations]. In *Ekologicheskiy atlas Rossii* (p. 311). Feoria.

Petrova, E. (2020). Natural hazard impacts on transport infrastructure in Russia. *Natural Hazards and Earth System Sciences*, *20*(7), 1969–1983. https://doi.org/10.5194/nhess-20-1969-2020

Petrova, E. G. (2021). Issledovaniye opasnykh meteorologicheskikh vozdeystviy na vozdushnyye linii elektroperedachi v Rossii [Study of hazardous meteorological impacts on overhead power lines in Russia]. *GeoRisk*, *15*(2), 26–36.

Petrova, E. G., & Krausmann, E. (2011). Postface "From natural hazards to technological disasters". *Natural Hazards and Earth System Sciences*, *11*(11), 3063–3065. https://doi.org/10.5194/nhess-11-3063-2011

Salzano, E., Basco, A., Busini, V., Cozzani, V., Marzo, E., Rota, R., & Spadoni, G. (2013). Public awareness promoting new or emerging risks: industrial accidents triggered by natural hazards (NaTech). *Journal of Risk Research*, *16*(3–4), 469–485. https://doi.org/10.1080/13669877.2012.729529

Showalter, P. S., & Myers, M. F. (1992). *Natural disasters as the cause of technological emergencies: A review of the decade, 1980–1989.* Natural Hazards Research and Applications Information Center, Institute of Behavioral Science, University of Colorado.

Showalter, P. S., & Myers, M. F. (1994). Natural Disasters in the United States as Release Agents of Oil, Chemicals, or Radiological Materials Between 1980-1989: Analysis and Recommendations. *Risk Analysis*, *14*(2), 169–182. https://doi.org/10.1111/j.1539-6924.1994.tb00042

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MODELING OF DEBRIS FLOWS: A CASE STUDY OF THE GERKHOZHAN-SU RIVER VALLEY

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Abstract: The Gerkhozhan-Su river valley is one of the most prone in terms of debris flow formation in the North Caucasus Mountains. This work aimed to apply a chain of mathematical models to estimate debris flow characteristics. The simulation was carried out along the river from the upper reaches to the top of the debris flow cone. The choice to apply one model or another was based on the prevalence of the flow state in the particular section. Thus, the transport-shift model was used for debris flow source and sections, where intensification of the flow characteristics took place. The hydrodynamic FLO-2D model was used for transit and accumulation sections. Modeling was conducted for two scenarios: I – high-density flow and II – low-density flow. In the FLO–2D model, 5 cases of rheological parameters were used with different volume concentrations from 25 to 40%. Also, eight variants of loose material parameters in the transport-shift model were considered. According to the modeling results, the initial moisture of the material has the most significant influence on the maximum debris flow discharge. As for the input hydrological data, the results of the field survey, which was held right after the debris flow passage, were used for hydrograph construction. Modeling results included 12 hygrographs for each section. The comparison with field surveys and other modeled results showed the effectiveness of the modeling chain. Also, the causes and consequences of debris flow in 2000 and recent ones are given. The current state of the valley and possibilities of future debris flow formation based on field surveys are presented.

Keywords: debris flow; modeling; transport-shift model; FLO-2D; Gerkhozhan-Su

1. Introduction

Debris flow is a mixture of water and loose material, which occurred in a steep channel (Hungr et al., 2001). Necessary conditions for the formation of this type of flows are loose material, steep slopes, and sufficient amount of water (Rickenmann, 2016). Due to climate change, there is an increase of frequency and intensity of extreme precipitation (Intergovernmental Panel on Climate Change [IPCC], 2014; Chernokulsky et al., 2019; Sun et al., 2021; Wei et al., 2020). Climate change has also significantly influenced mountain glaciers and induced their mass loss as well as retreat (Huss & Hock, 2018; Hock & Huss, 2021;

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Motschmann et al., 2020; Xu et al., 2024). This coupled effect can lead to growth in terms of debris flow quantity and volume (Hirschberg et al., 2021; Zhou et al.,2024). The Caucasus region is also characterized by active glacier retreat (Tielidze & Wheate, 2018; Tielidze et al., 2022). At the same time, the territory of the North Caucasus is characterized by high debris flow activity (Perov et al., 2017). The Gerkhozhan-Su River is one of the most debris flow-prone and well-studied basins in the North Caucasus (Baranovsky 2004; Chernomorets, 2005; Chernomorets & Tutubalina, 2005; Dokukin et al., 2020a; Dokukin et al., 2020b; Fleishman et al., 1979; Gerasimov, 1980; Golubev & Labutina, 1968; Panov et al., 2001; Petrakov et al., 2004; Rubtsov & Seynova, 1968; Seynova & Zolotarev, 2001; Seynova et al., 2011; Zaporozhchenko, 2002; Zolotarev et al., 1982). Disastrous debris flows in the 20th century were recorded in 1937, 1960, 1961, 1962, 1977, 1999, 2000 and 2011.

The most catastrophic debris flows occurred between July 18 and 25, 2000. As a result of debris flow waves, a huge cone was formed at the river mouth. The cone was approximately 2 km long and 0.7 km^2 in area (Chernomorets, 2005). According to estimates (Petrakov et al, 2004), the debris flow volume was approximately 2.1 million m^3. The debris flow masses blocked the Baksan river. As a result, a dammed lake appeared (Seynova et al. 2011). The area of the lake was equal to 0.55 km^2, and the maximum depth was 12 m. According to the results of interpretation, 42 buildings and a number of small ones were flooded (Krylenko et al., 2004).

Attempts were made to estimate this debris flow characteristic. Thus, a one-dimensional two-phase model developed by Bozhinskii-Nazarov was used (Bozhinskii et al., 2004). The main equations of the model consist of motion and continuity. The input information for the modeling was specified using the Monte Carlo method (Bozhinskii, 2003). The output information included the change in the velocities over time in several main sections (Bozhinskii et al., 2004). Mikhailov and Chernomorets (2011) presented the results of modeling debris flow of 2000 using the DEBRIS model. The main equation of the model is Newton's second law for material point movement. The modeling results consisted of flow depth, velocity and debris flow volume.

The second major debris flow event was observed on August 14–15, 2017. The debris flow mass blocked again the Baksan River. As, a result a temporary dammed lake was formed. The debris flow deposits area was 195 thousand m^2, which is almost 2.7 times less than in 2000. The debris flow volume in 2017 was equal to 500–600 thousand m^3. The value of debris flow discharge was estimated as 700–800 m^3/s (Dokukin et al., 2018).

After catastrophic debris flows in 2000, instability of the Buzulgan landslide, which is located downstream, increased. This led to an increase of rockfalls in the adjacent massif on the right slope of the river. In 2020, the Buzulgan landslide moved (Bekkiev et al., 2020; Zerkal et al., 2023). As a result, the geomorphological conditions in this section changed. In the future, the volume of passing debris flow can increase by 200–300 thousand m^3 in this section (Bekkiev et al., 2020). Kurovskaia et al. (2022) presented the results of estimating the possible impact of a landslide on the movement and formation of debris flows using mathematical modeling. The transport-shift model was applied along the landslide for a potential debris flow source. Downstream modeling was performed using the FLO-2D model. The input data for modeling included DTM obtained from UAV images taken a month after the landslide movement. Works for the extraction of debris flow mass from the conduit began in the summer of 2021. Due to this, results obtained in the paper (Kurovskaia et al., 2022) represent

the worst situation, when the conduit capacity is limited. A similar situation took place in 2000, when the river channel in the city was almost filled with mass from the previous flow in 1999. The modeling was performed for the case of debris flow passage with a discharge similar to 2017. In addition, the change in velocities, depths, and flood area was considered in the case of the bridge blockage due to huge amount of debris flow mass (Zerkal et al., 2023). Also, consequences of formation and outburst of a dammed lake with a dam height of 20 and 40 m due to future landslide shifts were considered (Kurovskaia et al., 2022).

The last debris flow was observed on August 5, 2022. The debris flow discharge was approximately 800–900 m^3/s was estimated using video materials. The flow was concentrated only in the conduit, which could have been due to its clearing from deposits in 2021. The debris flow conduit was designed for the maximum debris flow discharge to be 800 m^3/s (Zaporozhchenko, 2002). However, debris flow mitigation measures in the valley have not yet been carried out. The debris flow hazard in this basin remains quite high due to unlimited reserves of loose material in the glacial-moraine complex. This work presents assessment of the relief dynamics based on field survey, photo, video materials for disastrous debris flows in 2000 and 2017 years. We applied mathematical models to estimate the main hydrodynamic characteristics for the most catastrophic debris flow. Due to the fact that data on the special features of debris flow passage are often limited, information on the event in 2000 year can still be used to adapt mathematical models and estimate their effectiveness.

2. Study area

The Gerkhozhan-Su River valley is located in the Central Caucasus. The upper reaches of the river take place from the north-eastern part of the Adyr-Su ridge. The river is 12 km long, the area of the basin is 76.3 km^2 (Zaporozhchenko, 2002). The Gerkhozhan-Su River itself starts in the confluence of the Kayaarty-Su and Saakashil-Su rivers at an altitude of 1665 m. The Gerkhozhan-Su River flows into the Baksan River 124 km from its mouth. Tyrnyauz city is located on a debris flow cone in the mouth area of the river. The length of the Saakashil-Su River is 10.3 km, the area of its watershed is 36.2 km^2 (Chernomorets, 2005; Zaporozhchenko, 2002). The average channel slope is 7°. The source of the Kayaarty-Su River is located at the West Kayaarty Glacier at an altitude of about 3400 m. The length of the Kayaarty-Su River is 9.5 km, the watershed area of the river is 19.9 km^2 (Chernomorets, 2005; Zaporozhchenko, 2002). The average channel slope is 10°.

The modern relief of the basin was formed largely due to the activity of glaciers and exogenous processes. The main exogenous processes in the valley are numerous debris flows. More than half of the annual precipitation falls between April and August (about 300 mm). The total precipitation from September to March is 150 mm. According to the weather station at Peak Terskol, the greatest amount of precipitation falls in July, about 81 mm. The debris flow hazard period for the Gerkhozhan-Su River basin is July–August. At this time, about 200 mm of precipitation can fall in the high-mountain zone, only 1/5 of which is solid precipitation (Rubtsov & Seynova, 1968). The Gerkhozhan-Su River is characterized by low water during autumn and winter and prolonged high spring–summer floods with rain floods. Maximum water discharges are observed in July–August. The average long-term flow discharge of the Gerkhozhan-Su is 1.11 m^3/s. However, in summer the water discharge often exceeds 5 m^3/s (Chernomorets, 2005).

After the debris flows in 1960, attempts were made to build a debris flow conduit. However, construction was not completed. In 1983 the conduit was reconstructed. According to the new design, transverse reinforced concrete beams were installed every 15 m. In 1987 construction of a dam made of reinforced concrete structures began. The dam was completed in 1999. However, in the very first summer season it was partially destroyed by a debris flow. In 2022, works were carried out to destroy the dam. Currently, there are no debris flow protection structures in the valley. After the debris flow in 2000 a new debris flow conduit was built in the city. The left wall of the conduit is 720 m long; the right wall is 1,325 m long together with the gabion extension (Dokukin et al., 2018). However, on the right bank of the river there is a gap in the wall, where debris flow mass can overflow. Also, conduit cleaning from debris flow material is carried out periodically, and not after each flow. Due to this, the debris flow hazard for city increases.

2.1. Debris flow processes in the in 21st Century

Catastrophic debris flows are formed periodically in the Kayaarty-Su River and cause significant damage to the city. The debris flow basin in the valley is a complex system of debris flow sources and transit zones, which developed as a result of the long-term evolution of glacial-geomorphological conditions. At the end of the 20th century, there was a sharp change in the glacial debris flow formation zone due to the advance of the Kayaarty glacier. This led to subsequent transformation of its subglacial drainage system. As a result, the ability to accumulate large volumes of water under the glacier in the upper cirque area appeared.

The upper cirque of the glacier is an accumulation area. Therefore, there are no conditions for the constant meltwater discharge onto the glacier bed within it. When a water drainage channel is formed under the glacier and connects to the subglacial drainage system in the ablation zone, an outburst flood occurs. However, outburst water pulses differ in the total water volume. The largest release of water was observed during the debris flow formation in 2000. The second largest occurred in 2017. The outburst flood is transformed into a debris flow in the upper moraine canyon due to lateral and deep erosion of its slopes and bottom. In 2000 mass collapse of soil and damming of the riverbed began with the formation of numerous debris flow waves during the week (July 18–25). The depth and width of the canyon increased more than two times (Chernomorets, 2005). According to our observations on July 27-29, 2000, there were about 30 blocks of icy soil with a total volume of 70-100 thousand m^3 in the bottom of the canyon. According to field surveys in 2022, the only thing needed for catastrophic debris flow is sufficient water (Figure 1a, b).

Further downstream the most intense erosion in 2000 was observed in the central section of the new source, between the Upper and Lower Gorges (Figure 1c). Earlier this section consisted of zones of material increment and accumulation zones. The total amount of removed solid material here in 2000 was about 1400 m^3 per meter (Chernomorets, 2005).

Further along the valley, the increment of solid material was observed in the Lower Gorge (Figure 1d). It is about 2.5 km long and has slopes up to 100 m high (Dokukin et al, 2018). The amount of solid material in this gorge is unlimited. The debris flow duration in this gorge varies from several hours to several days. The longest lasting debris flow formation was in 2000 due to intense incision of the riverbed up to 30 m and the activation of landslide

processes on the slopes. Subsequent debris flow increases the riverbed depth from 5–6 to 8–12 m (Dokukin et al., 2018). Therefore, only debris flow in 2017 lasted for two days.

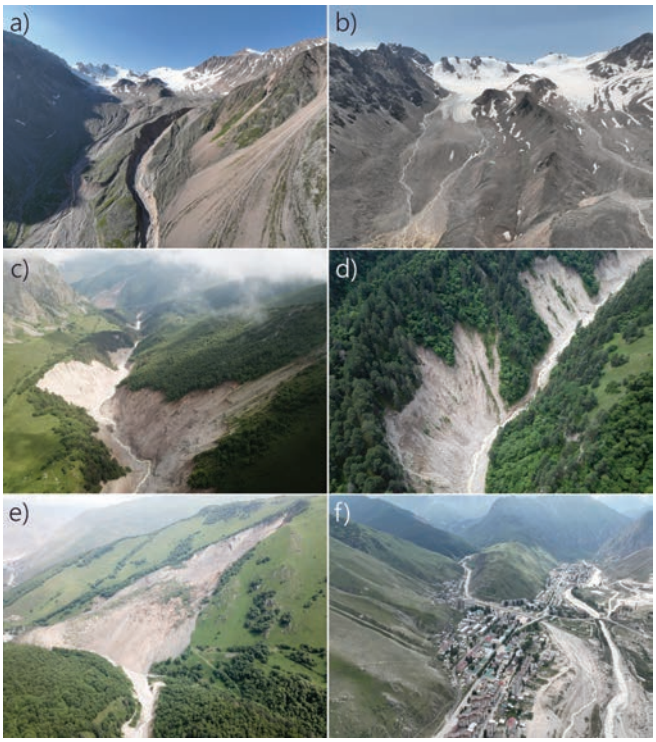

Figure 1. Photos from the UAV from July 14–16, 2022 by Chernomorets S.S.: a): Kayaarty glaciers, b): upper moraine canyon (the main the main debris flow source) and the accumulation field below, c): middle part of the Kayaarty-Su river valley, d): debris flow sources in the Lower Gorge, e): the Buzulgan landslide, f): Tyrnyauz city on the debris flow cone of the Gerkhozhan-Su river at its confluence with the Baksan river.

The next section of material increment is located along the Buzulgan landslide (Figure 1e) and up to the dam. The depth of the riverbed along the landslide in 2000, after the disaster reached 20 m. The width was up to 40 m (Chernomorets, 2005). According to the field surveys right after the disaster, this landslide is the last place along the river, where a dam can be formed. In 2000 the dam did not prevent debris flow movement downstream. After the Buzulgan landslide movement in 2020, a new debris flow source was formed right after the accumulation zone from the Lower Gorge. For subsequent debris flows, material increment can be caused due to involvement of deposits and landslide masses.

During debris flow movement in the conduit a temporary deposition of mass in the form of a solidified flow with preservation of the water component is possible. Subsequent debris flow waves can pass along the deposited mass and involve it in the process. Due to this, debris flow masses can go beyond the conduit with relatively low discharges.

The modern debris flow hazard assessment of the valley depends on the Kayarta glacier potential. The difficulties appear because of uncertainty in the presence or absence of conditions for water accumulation under the glacier in the upper cirque. Since the degradation of the glacier has accelerated and it is possible that the subglacial drainage system is already in a state of unimpeded passage of meltwater without its accumulation The difficulties of debris flow hazard assessment of the Kayarta glacier, on which the scale of the mudflow process depends, is characterized by the fact that there is uncertainty in the presence or absence of conditions for water accumulation under the glacier in the upper cirque, since the degradation of the glacier has accelerated and it is possible that the subglacial drainage system is already in a state of unimpeded passage of meltwater without its accumulation.

3. Materials and methods

Field surveys in this basin began in the 1960s after a series of debris flows in 1960, 1961 and 1962. Expeditions from Lomonosov Moscow State University were also organized. Field surveys were conducted in 2000 right after the disaster, 2001, 2009, 2015, 2021 and 2022. In recent years, UAV surveys have also been used to estimate relief dynamics. The condition of the debris flow conduit has been assessed annually since 2000.

Table 1. Initial materials

Materials	Data	Resolution, m/pix	Source, copyright holder
Topographic map	1950	1:25000	
Aerial photographs from UAV	May 2021, July 14–16, 2022		Chernomorets S.S., Iudina V.A.
Orthophotomap	May 2021, July 14–16, 2022	0.1	Chernomorets S.S., Iudina V.A.

The main difference of the debris flow in 2000 from all other flows was the riverbed changes including formation of new sources and accumulation zones. In addition to the main origination site, 6 debris flow sources were identified in the riverbed. Modeling in these sections was performed using the transport-shift model in the FLOVI program (Iudina et al., 2022c). The simulation of debris flow movement and accumulation between these sections were conducted using the FLO-2D model. The FLOVI program has previously been used to estimate debris flow characteristics in the North Caucasus (Kurovskaia et al., 2022) and Western Pamir (Iudina et al., 2022a; Iudina et al., 2022b). The debris flow lasted from 18th to 25th of July and consisted of a series of waves. In total of 4 large waves were recorded in Tyrnyauz: 1 – late in the evening of July 18th – morning of the 19th; 2 – afternoon of the 19th; 3 – afternoon of July 21st; 4 – on the night of July 24th to 25th. Due to the lack of data for construction of water hydrograph in the source, the modeling was carried out only for 1 debris flow wave using the maximum water discharge.

3.1. The transport-shift model

Modeling of debris flow formation and intensification in other sources was conducted in the transport-shift model using the FLOVI program (Iudina et al., 2022c). The equations of the model were compiled by Vinogradov using the data from the Chemolgan experiments. In

total, five experiments of reproducing debris flows were conducted from 1972 to 1978, the modeling results were close to the observed experimental data (Vinogradova & Vinogradov, 2017). Using this model, one can estimate changes in debris flow characteristics during its passage through the source. The model is based on the energy approach. The intensity of the loose material involvement in the process is proportional to the energy indicators of the water or debris flow (Vinogradova & Vinogradov, 2017). The main equation is as follows:

$$l = \frac{\left[\frac{Q\rho_0}{\zeta\rho_0+\rho}\ln\frac{Q\rho_0+(\zeta\rho_0+\rho)G}{Q\rho_0+(\zeta\rho_0+\rho)G_0} - \frac{Q}{\zeta-\theta_{pp}}\ln\frac{Q+(\zeta-\theta_{pp})G}{Q+(\zeta-\theta_{pp})G_0}\right]}{A\frac{tg\alpha}{tg\varphi}\,g\,Sin\alpha\left[Q\rho_0(\zeta-\theta_{pp})+Q(\zeta\rho_0+\rho)\right]} + l_0$$

where l is the distance along the thalweg of debris flow site, m; l_0 is the distance to the current sector, m; G is the solid material discharge, m^3/s; G_0 is the initial value of G for the certain sector and the previous upper sector (for the first upper sector $G_0 = 0$), m^3/s; α is the thalweg slope at the debris flow site, degrees; Q is the water discharge, m^3/s; φ is the static angle of internal friction of sediments, degrees; θpp is the ratio of the volume of water to the volume of solid material in the debris flow sediments at the liquid limit (in a stable immobile state); ζ is the ratio of the volume of water to the volume of solid material of debris flow sediments (dimensionless), g is the acceleration of gravity, m/s^2; ρ_0 is water density, kg/m^3; ρ is the density of debris flow sediments at the potential flow state, kg/m^3; and A is the coefficient of proportionality, $m/(s^2 \times kg)$ (Vinogradov & Vinogradova, 2010). According to scarce data of debris flow simulation under natural conditions, coefficient A was estimated to be in the range of 3–5 × 10–6 $m/(s^2 \times kg)$, closer to 3–5 × 10–6 $m/(s^2 \times kg)$ (Vinogradova & Vinogradov, 2017). The remaining equations are presented in detail in the following works (Iudina et al., 2022a; Vinogradova & Vinogradov, 2017).

3.2. The FLO-2D hydrodynamic model

The debris flow characteristic in the valley were obtained using the two-dimensional model FLO-2D (O'Brien et al., 1993). This model is hydrodynamic and is based on the Saint-Venant equations, the so-called shallow-water equations (Kjunzh & Holli, 1980). When modeling debris flow, it is assumed that it moves as a Bingham fluid (viscous-plastic fluid) (O'Brien et al., 1993). The input data for the model also includes rheological parameters such as the viscosity and plastic flow stress. An attempt was made to determine the rheological parameters for the valley in 2022 (Mirnyy & Iudina, 2022). The material was collected from the accumulation field after the source and from the debris flow conduit. A wide range of measured values requires special equipment such as viscometers of various designs, ranging from rotary for pulps and ending with triaxial compression

Table 2. Parameters for calculating the stress of plastic flow and viscosity as a function of sediment concentration (O'Brien & Julien, 1988)

Calculation variant	Parameters for calculating plastic friction stress		Parameters for calculating flow viscosity	
	α_2	β_2	α_1	β_1
a)	0.152	18.7	0.000136	28.4
b)	0.0345	20.1	0.00283	23.0
c)	0.0765	16.9	0.0648	6.20
d)	0.000707	29.8	0.00632	19.9
e)	0.00172	29.5	0.000602	33.1

and simple shear devices with kinematic loading (Mirnyy & Iudina, 2022). Thus, we applied parameters proposed by the authors of the model (Table 2) (O'Brien & Julien, 1988).

The authors of the model recommend parameter sets a) for low-density debris flows, and parameter e) for more viscous flows (FLO–2D user's manual, 2006). When modeling high-density flows, parameter sets b)–d) were used. In fact, these parameter sets, together with the volume concentration, significantly affect the transformation of model hydrographs along the length of the valley and especially on alluvial fans. Due to the lack of data, they are selected in model calculations based on the expected hydrograph shape using observation data. As a result, these parameters are actually calibration ones in the FLO–2D model.

3.3. Input data for modeling

One of the possible mechanisms of debris flow in 2000 could have been the discharge of intraglacial cavities (Chernomorets, 2005). A small stream was formed in the upper grotto, located 150 m above the edge of the Western Kayaarty Glacier. Then it traveled approximately 100 m along the open surface, after which it again went under the ice through a small cavern. After that the stream went along subglacial channels and then again emerged on the surface through the lower grotto at the end of the glacier. So, the blockage of the subglacial drainage channel could have led to the filling of intraglacial reservoirs and subsequent formation of a small, dammed lake of 10-30 thousand m^3 (Chernomorets, 2005). Traces of the lake were observed above the cavern in the form of terraces (Zaporozhchenko, 2002). The outburst discharge was estimated as 3–4 m^3/s (Chernomorets, 2005). These values were used to construct the input hydrograph for the FLOVI program. The maximum estimated water discharge was accepted to be 4 m^3/s.

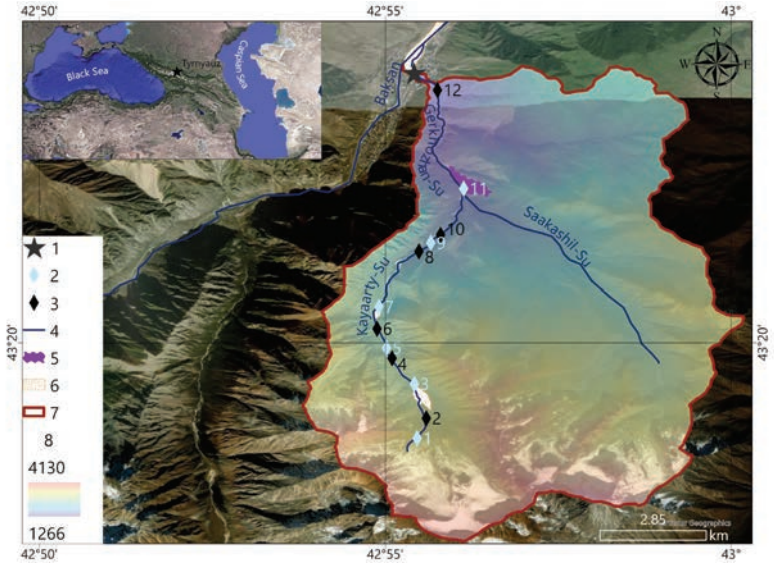

Figure 2. The Gerkhozhan-Su river watershed and estimation gauges. 1 – city of Tyrnyauz, 2 – gauges for the transport-shift model, 3 – gauges for the FLO-2D model , 4 – rivers, 5 – Buzulgan landslide, 6 – debris flow cones of 2000 event, 7 – the Gerkhozhan-Su watershed, 8 – altitude scalar, m.

In total, 6 sections of debris flow forming and intensification and 6 between them were identified in the Gerkhozhan-Su River bed (Figure 2): 1 – the main debris flow source, 2 – before the sections between sandrs, 3 – the area between the sandrs, 4 – sandrs, 5 – the Western Canyon, 6 – between canyon and gorge, 7 – the Upper Gorge, 8 – between gorges, 9 – the Lower Gorge, 10 – between the Lower Gorge and landslide, 11 – the Buzulgan landslide and the channel near the destroyed dam, 12 – the top of the debris flow cone.

Morphometric characteristics of zones such as length and slopes were obtained using a 1:25000 map reflecting the pre-debris flow relief in the valley. The data were revised in ArcMap 10.8 program and interpolated onto the computational grid of the model of 10 × 10 m. The average channel slope in the zones varied from 18° for the debris flow source to 6° along the Buzulgan landslide and the channel near the destroyed dam. Hydrographs obtained in the transport-shift model were applied as input hydrological information for the FLO-2D model. The volume concentration in the FLO-2D model for scenario I was equal to 33%, for scenario II (sedimentary) – 25%. The modeling was conducted with the usage of five variants of rheological parameters specified in Table 2. Additional modeling with the volume concentration of the flow of 40% was done for the variant parameters with the highest simulated discharges.

4. Modeling results

4.1. Debris flow formation in the source

Initial data for modeling includes the parameters of potential loose material, which will be involved in the flow. These parameters are initial moisture, density and static angle of internal friction. Measurements were carried out during field works held by OJSC Sevkavgiprovodkhoz (Zaporozhchenko, 2002). According to the same author (Zaporozhchenko, 2002), the static angle of internal friction was equal to 35°, and density of material was 2600 kg/m^3. Due to the fact that these were single measurements for the filler in the source, this data remains insufficient. Therefore, numerical experiments were made to analyze the influence of these parameters on the calculated maximum discharge (Table 3).

Table 3. Variants of parameters for loose material in the debris flow source

№ variants	1	2	3	4	5	6	7	8
Initial moisture, dimensionless	0	0	0.133	0.133	0.2	0.2	0	0
Static angle of internal friction,°	40	35	40	35	40	35	40	35
Density, kg/m^3	2600	2600	2600	2600	2600	2600	1600	1600
Maximum debris flow discharge, m^3/s	26	28	50	60	74	97	22	24

Note. The participants' responses; № variants 1, 5 and 7 from "Reconstruction of debris flow in the Gerkhozhan-Su river valley based on the chain modeling", by V. A. Iudina, S. S. Chernomorets I. N. Krylenko, T. A. Vinogradova, and E. V. Zaporozhchenko, 2023, E3S Web of Conferences, 415, p. 05007 (https://doi.org/10.1051/e3sconf/202341505007). CC BY-NC.

According to table 2, the parameter of material initial moisture has the most significant influence. With the moisture rise, the maximum discharge increases by about 2.5 times. A 5-degree decrease in the angle of internal friction leads to a growth of maximum discharge from 7 to 24% with an increase in the initial moisture. A decrease in the loose material density by 1000 kg/m^3 reduces the maximum flow discharge by approximately 15%. To simulate debris flow downstream, the 1 calculation variant was chosen for high-density debris flows because of the lowest debris flow discharge (I scenario). The 7th variant was used for the II scenario of less density debris flow. The flow density at the source outlet for scenario I was 2354 kg/m^3, for scenario II was equal to 1492 kg/m^3. The average flow velocity in the source for scenarios I and II was about 9.7 m/s. The same parameter assignment options were used for the zones of material increment located downstream for both scenarios. Hydrographs obtained from the simulation results in the FLO–2D model were used as input hydrological data for the next zones in the FLOVI program.

4.2. The debris flow movement in the valley

The output information of the model included hydrographs for all scenarios and each section. For sections 1, 3, 5, 7, 9, 11, the transport-shift model was applied. In section 3, between the outwash banks, maximum debris flow discharges increased from 18 to 39 m^3/s (Figure 3). For the Western Canyon (section 5), the maximum discharges growth varied from 52 to 98 m^3/s. In the Upper Gorge (section 7), the maximum increase in debris flow discharge was equal to 311 m^3/s approximately 3.6 times. According to the field survey of the valley after the disaster, the intense erosion and formation of a new channel were observed in this section (Chernomorets, 2005).

For the Lower Gorge (section 9), the difference in flow discharges compared to the previous section was 210 to 548 m^3/s. On average, the flow discharge in this section increased by about 1.9 times. In the last section of material increment (11), the flow discharge increased by about 2.14 times. The maximum flow discharge at the cone top was obtained for the Ie) with the volume concentration of 33% and was equal to 2149 m^3/s. The lag time for this scenario is on average 2.6 times longer than for the other parameter sets of the debris flow with the same volume concentration (Table 4). This difference can be explained by the rheological features of this parameter set. The authors of the model suggest using it for very viscous debris flow like liquid cement. The minimum flow discharge was also obtained for scenario Ie) and amounted to 676 m^3/s. For this case volume concentration was increased to 40%. The time lag for this simulation is the longest.

Table 4. Results of modeling for the debris flow source (1 section) and the top of debris flow cone (12 section)

№	Scenario	Debris flow discharge at the source outlet, m^3/s	Time lag, hours	Calculation variant for FLO-2D	Volume concentration in FLO-2D, %	Debris flow discharge at the debris flow cone, m^3/s	Time lag, hours
1	II	22	0.2	a)	25	1007	0.55
2	I	26	0.2	b)	33	1551	0.5
3				c)		1527	0.54
4				d)		1412	0.72
5				e)		2149	1.48
6					40	676	4.73

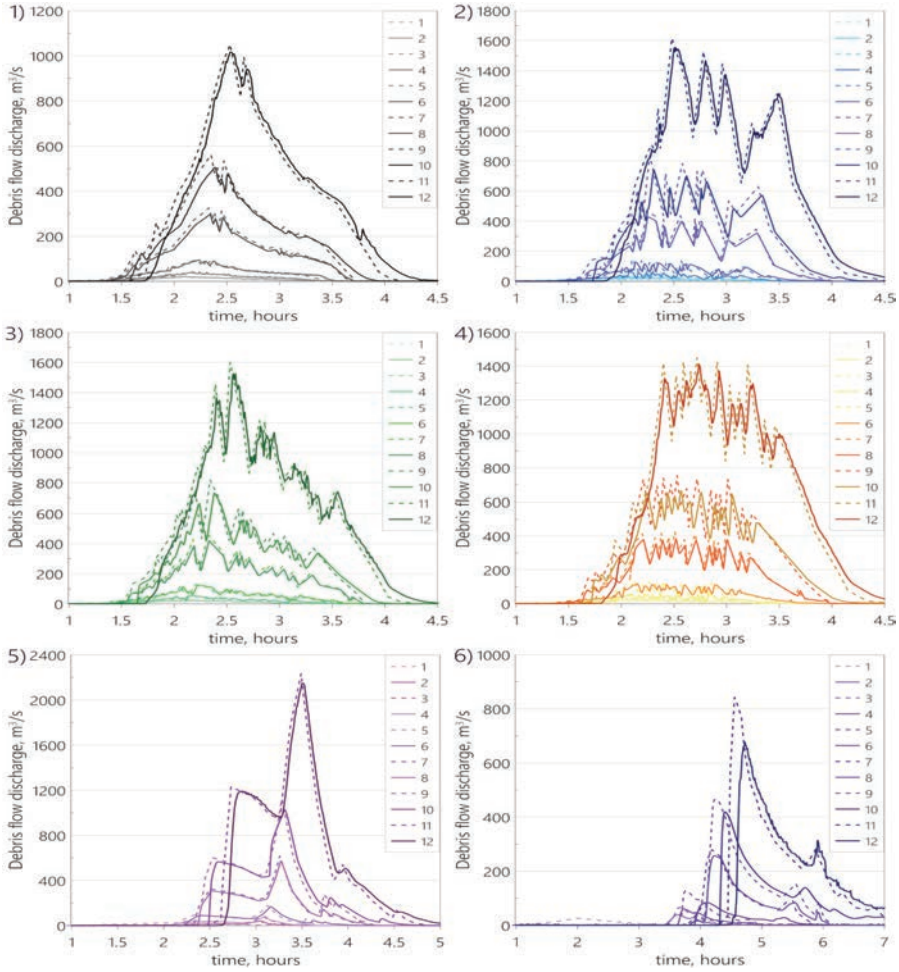

Figure 3. Results of modeling using the chain of mathematical models for 12 sections in the Gerkhozhan-Su river valley: 1): scenario IIa), 2): scenario Ib), 3): scenario Ic), 4): scenario Id), 5): scenario Ie) volume concentration 33%, 6): scenario Ie) volume concentration 40%

Note. The participants' responses; 1) from "Reconstruction of debris flow in the Gerkhozhan-Su river valley based on the chain modeling", by V. A. Iudina, S. S. Chernomorets I. N. Krylenko, T. A. Vinogradova, and E. V. Zaporozhchenko, 2023, E3S Web of Conferences, 415, p. 05007 (https://doi.org/10.1051/e3sconf/202341505007). CC BY-NC.

The average flow velocity determined from video material was 11.3 m/s, the maximum was equal to 14.7 m/s, and the lowest was 7.8 m/s. Debris flow discharges were obtained as products of the velocity and cross-sectional area of conduit with the maximum filling. Debris flow discharge for the average velocity was determined as 1356 m3/s, at the maximum velocity was equal to 1,764 m^3/s, and at the minimum velocity was 936 m^3/s (Bozhinsky et al., 2004). Mikhailov & Chernomorets (2011) estimated that the largest value of debris flow discharge was recorded on July 19, and it was about 2500 m^3/s.

According to the modeling results, discharges with the volume concentration of 33% at the top of the cone fall within the specified range of estimates. The relative error between the maximum discharge Ie) with a sediment concentration of 33% and the maximum value observed on 19 July was 14%. When comparing the calculated maximum discharges with a sediment concentration of 33% and a discharge value of 1356 m^3/s at an average velocity of 11.3 m^3/s, the relative error varies between 4 and 26%. When it is compared with a discharge of 1764 m^3/s obtained from the maximum velocity, the relative error is between 12 and 22%.

The relative error between the discharge obtained from the minimum velocity and the calculated discharge with a concentration of 25% is 8%. However, the flow velocities were calculated primarily for the most powerful waves of the first debris flow series for the period from 5:34 to 6:37 a.m. on July 19. The maximum debris flow discharge Ie) with a volume concentration of 40% could have been observed from July 18 to July 25 (Bozhinsky et al., 2004). Also, debris flow can also accumulate in the conduit while maintaining the flow consistency. Subsequent debris flow waves can pass over this mass. Hence, determining the flow velocities based on the traces of the highest debris horizons can be incorrect. Further waves can set in motion the existing masses in the conduit and facilitate their displacement.

In this work, modeling of debris flow passage through Tyrnyauz was not carried out due to the lack of relief data for the city territory. Debris flow velocities on the cone top varied from 6/8 m/s for scenario Ie) to 19.8 m/s for Ic). Average debris flow velocity was equal to 15 m/s. Average flow depth on the top of the cone was nearly 10 m. The simulated flow velocity in the city was equal to 10-12 m/s (Bozhinskii et al., 2004). The flow depth in the river channel reached 20 m. The lag time was a little bit less than simulated in this paper and was 0.4 hours. According to Mikhailov & Chernomorets (2011), the flow lag time from the edge of the Western Kayaarty Glacier to the Baksan River was the smallest and was equal to 0.2 hour. The wave velocity varied from 8 to 14 m/s. The flow depth changed from 5-15 m in gorges to 5-10 m on the alluvial fan and in the conduit.

It should be noted that the Bozhinsky-Nazarov model assumes the movement of a debris flow as a single wave. In reality, a typical debris flow consists of a series of waves and subsequent water floods. The DEBRIS model reflects the subsequent involvement of loose material in the flow and the formation of individual waves as a group of model particles. However, a debris flow consists not only of the loose material, and the water component plays a huge role in flow formation and movement. Considering a debris flow as a cluster of particles, simplifies the process since the connection of the flow and its density are not taken into account. However, the applied FLO-2D model does not include the movement of large boulders. The number of loose debris in the flow is specified only through the volume concentration and the debris flow discharge. Therefore, when using models, it is necessary to consider local features of the flow and specific tasks. In general, the obtained results correspond to generally accepted estimates (Chernomorets, 2005).

5. Conclusion

Due to the unlimited amount of solid material in the valley and active degradation of glaciers, the debris flow hazard remains quite high. The debris flow of 2000 significantly changed the relief in the valley due to the formation of several new sources in the riverbed. The paper also presents simulation results for the most disastrous debris flows in the

Gerkhozhan-Su River. Modeling was conducted with the chain of mathematical models such as the transport-shift and FLO-2D models. Simulation was carried out along the river and the choice of applying model was based on the prevalence of accumulation, transit or increment of the flow with material. Thus, transport-shift model was used for debris flow source and sections, where intensification of the flow characteristics took place. The FLO-2D model was used for other zones. As for input data, DEM obtained from the topographic map before the event was used. Modeling was conducted for two scenarios. In the I scenario, modeling was carried out for high-density debris flow. The II scenario was used for a low-density flow. In the FLO–2D model, 5 variants of rheological parameters were applied. Additionally, volume concentrations varied from 25 to 40%. The simulated maximum discharges at debris flow cone with different volume concentrations and variants of rheological parameters varied from 676 to 2149 m^3/s. In general, the obtained results fall within the range of debris flow estimates for 2000 based on video materials. The modeling results demonstrate the effectiveness of using the chain of models to estimate the debris flow characteristics.

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References

Baranovsky, A. F. (2004). *Debris flows of the year of 2000 in Gerkhozhan-Su river basin.* Proceedings of the Conference "Zashchita narodnokhozyaistvennykh ob''ektov ot vozdeistviya selevykh potokov" [Protection of economic facilities against debris flows]. 2, Pyatigorsk. 90–96.

Bekkiev, M. Yu, Anaev, M. A, Dokukin, M. D., Kalov, R. Kh., Malneva, I. V., & Viskhadzhieva, K. S. (2020). Anomalous movement of Buzulgan landslide in the Gerhozhan-Su River valley (Central Caucasus) in 2020. *GeoRisk World*, *14*(4), 44–54. https://doi.org/10.25296/1997-8669-2020-14-4-44-54

Bozhinskii, A. N. (2003). Modeling debris flow dynamics by Monte-Carlo method. *Vestnik Moskovskogo Universiteta. Seria 5, Geografia*, *5*, 28–31.

Bozhinskii, A. N., Vinogradova, N. N., & Krylenko, I. V. (2004). A mathematical model of the catastrophic 2000 debris flow in Tyrnyauz city. *Vestnik Moskovskogo Universiteta. Seria 5, Geografia*, *5*, 22–27.

Chernokulsky, A., Kozlov, F., Zolina, O., Bulygina, O., Mokhov, I. I., & Semenov, V. A. (2019). Observed changes in convective and stratiform precipitation in Northern Eurasia over the last five decades. *Environmental Research Letters, 14*, 045001. https://doi.org/10.1088/1748-9326/aafb82

Chernomorets, S. S. (2005). *Селевые очаги до и после катастроф* [Debris flow sources before and after catastrophes]. Nauchnyy mir Moskva.

Chernomorets, S. S., & Tutubalina, O. V. (2005). To the 40th anniversary of University debris flow expeditions in the Gerkhozhan-Su river basin (Caucasus). *Vestnik Moskovskogo Universiteta*, *Seria 5, Geografia*, *5*(2), 79–80.

Dokukin, M. D., Anaev, M. A., Bekkiev, M. Yu., Bogachenko, E. M., Zaporozhchenko, E. V., Kalov, R. H., Savernyuk, E. A., Chernomorec, S. S., Hadjiev, M. M., & Khatkutov, A. V. (2018, October 1–5). *Selevye potoki 14-15 avgusta 2017 g. v bassejne r. Gerhozhan-Su (Central'nyj Kavkaz): usloviya i prichiny formirovaniya, dinamika, posledstviya* [Mudflows on August 14-15, 2017 in the basin of the Gerkhozhan-Su river (Central Caucasus): conditions and causes of formation, dynamics,

consequences]. Proceedings of the 5th International Conference "Debris flows: disasters, risk, forecast, protection". Tbilisi, Georgia. 317–330.

Dokukin, M. D., Bekkiev, M. Yu., Kalov, R. H., & Hadjiev, M. M. (2020a). The mudflow dynamics of the river Gerkhozhan-Su in the section of the mudflow tray and mudslides protection of the city of Tyrnyauz (Central Caucasus). *E3S Web of Conferences*, *157*, 02018. https://doi.org/10.1051/e3sconf/202015702018

Dokukin, M. D., Bekkiev, M. Yu., Kalov, R. H., Savernyuk, E. A., Chernomorets S. S., & Bogachenko E. M. (2020b). *Glaciogeomorphological conditions for the Gerkhozhan-Su River debris flow formation (Central Caucasus)*. Proceedings of the 6th International Conference "Debris flows: disasters, risk, forecast, protection". Dushanbe–Khorog, Tajikistan, 1, 388–404. https://www.debrisflow.ru/wp-content/uploads/2020/12/DF20_Proceedings_Vol_1.pdf

Fleishman, S. M., Seinova, I. B., & Zolotarev, E. A. (1979). Formation of glacial debris flows of non-breakthrough genesis in the Gerkhozhan-Su river basin, Northern Caucasus. *Materialy Glyatsiol. Issl.*, *35*, 195–198.

FLO–2D Software, Inc. (2006). FLO–2D User's manual (Version 2006.01) [Model]. Nutrioso, AZ, USA.

Gerasimov, V. A. (1980). Debris flows of August 10 and 11, 1977, in the basin of Gerkhozhan-Su river (North Caucasus) and their formation conditions. Debris Flows, 4, 68–76.

Golubev, G. N., & Labutina, I. A. (1968). Moraine relief changes in the formation zone of glacial debris flows (by data of aerial photographs). *Materialy Glyatsiol. Issled*., *14*, 322–325.

Hirschberg, J., Fatichi, S., Bennett, G. L., McArdell, B. W., Peleg, N., Lane, S. N., Schlunegger, F., & Molnar, P. (2021). Climate change impacts on sediment yield and debris-flow activity in an Alpine catchment. *Journal of Geophysical Research: Earth Surface*, *126*(1), e2020JF005739 https://doi.org/10.1029/2020JF005739

Hock, R., & Huss, M. (2021). Chapter 9 - Glaciers and climate change. In T. M. Letcher (Ed.), *Climate Change (Third Edition)* (pp. 157-176). Elsevier. https://doi.org/10.1016/B978-0-12-821575-3.00009-8

Hungr, O., Evans, S. G., Bovis, M., & Hutchinson, J. N. (2001). Review of the classification of landslides of the flow type. *Environmental & Engineering Geoscience*, *7*(3), 221–238. https://doi.org/10.2113/gseegeosci.7.3.221

Huss, M., & Hock, R. (2018). Global-scale hydrological response to future glacier mass loss. *Nature Climate Change*, 8, 135–140. https://doi.org/10.1038/s41558-017-0049-x

IPCC (2014). Summary for Policymakers. In: T.F. Stocker, D. Qin, G.-K. Plattner, M. Tignor, S.K. Allen, J. Boschung, A. Nauels, Y. Xia, V. Bex and P.M. Midgley (Eds.), *Climate Change 2013: The Physical Science Basis. Working Group I Contribution to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change* (pp. 1–30). Cambridge University Press. https://doi.org/10.1017/CBO9781107415324.004

Iudina (Kurovskaia), V. A., Chernomorets, S. S., Krylenko, I. N., Vinogradova, T. A., Krylenko, I. V., Savernyuk, E. A., Gulomaydarov, A. G., Zikillobekov, I. I., Pirmamadov, U. R., & Raimbekov, Y. K. (2022a). Assessment of possible consequences of outburst floods: case study of the Bodomdara river valley (Tajikistan). *Earth's Cryosphere*, *26*(5), 14–28. http://dx.doi.org/10.15372/KZ20220502

Iudina, V. A., Chernomorets, S. S., Krylenko, I. N., Vinogradova, T. A., & Zaporozhchenko, E. V. (2023). Reconstruction of debris flow in the Gerkhozhan-Su river valley based on the chain modeling. *E3S Web of Conferences*, *415*, 05007. https://doi.org/10.1051/e3sconf/202341505007

Iudina, V. A., Chernomorets, S. S., Vinogradova, T. A., & Krylenko, I. N. (2022b). Modeling of debris flow triggered by snow melting: case study of the Barsemdara river, Tajikistan. *Earth's Cryosphere, 26*(3), 51–63. https://doi.org/10.15372/KZ20220306

Iudina, V. A., Iudin, N. E., & Vinogradova, T. A. (2022c). Program for calculation of outburst flood and debris flows (FLOVI). Certificate of state registration of the computer program no. 2022683748.

Kjunzh, F. A., & Holli, F. M. (1985). *Chislennye metody v zdachakh rechnoi gidravliki* [Numerical methods in tasks river hydraulics] (J. A. Cunge, F. M. Holly & A. Verwey, Trans). Moscow. Energoatomizdat. (Original work published 1980).

Krylenko, I. V., Petrakov, D. A., Tutubalina, O. V., Chernomorets, S. S., & Zhuravleva, P. G. (2004). Dinamika selevogo bassejna r. Gerhozhan-Su (Kabardino-Balkariya) posle katastrofy v iyule 2000 goda [Dynamics of the mudflow basin of the Gerkhozhan-Su river (Kabardino-Balkaria) after the disaster in July 2000]. *Glaciological Research Materials*, *96*, 159–166.

Kurovskaia, V. A., Chernomorets, S. S., Krylenko, I. N., Vinogradova, T. A., Dokukin, M. D., & Zaporozhchenko, E. V. (2022). Buzulgan rockslide: simulation of debris flows along Gerkhozhan-Su river and scenarios of their impact on Tyrnyauz town after changes in 2020. *Water Resources*, *49*(1), 58–68. https://doi.org/10.1134/S0097807822010110

Mikhailov, V. O., & Chernomorets, S. S. (2011). Matematicheskoe modelirovanie selei, obvalov i opolznei [Mathematical modeling of debris flows, collapses, and rockslides]. Saarbryukken: LAP Lambert.

Motschmann, A., Huggel, C., Carey, M., Moulton, H., Walker-Crawford, N., & Muñoz, R. (2020). Losses and damages connected to glacier retreat in the Cordillera Blanca, Peru. *Climatic Change*, *162*, 837–858. https://doi.org/10.1007/s10584-020-02770-x

Mirnyy A. Yu., Iudina V.A. (2022). *Disperse soil nonlinear viscosity determination experience*. Proceedings of the International Conference "Soil mechanics in geotechnics and foundation engineering". Novocherkassk, Russia, 1, 390–395.

O'Brien, J. S., & Julien, P. Y. (1988). Laboratory analysis of mudflow properties. *Journal of Hydraulic Engineering, 114*(3), 877–887. https://doi.org/10.1061/(ASCE)0733-9429(1988)114:8(877)

O'Brien, J. S., Julien, P. Y., & Fullerton, W. (1993). Two-dimensional water flood, debris flow simulation. *Journal of Hydraulic Engineering*, *119*(2), 244–259. https://doi.org/10.1061/(ASCE)0733-9429(1993)119:2(244)

Panov, V. D., Lur'e, P. M., & Zarudnev, V. M. (2001). Debris flows in Gerkhozhan-Su river basin (North Caucasus) in July 2000. *Meteorol. Hydrol*., 2, 89–97.

Perov, V., Chernomorets, S. S., Budarina, O., Savernyuk, E., & Leontyeva, T. (2017). Debris flow hazards for mountain regions of Russia: regional features and key events. *Natural Hazards*, *88*(1), 199–235. https://doi.org/10.1007/s11069-017-2841-3

Petrakov, D. A., Tutubalina, O. V., Chernomorets, S. S., & Krylenko, I. V. (2004). Method for monitoring a debris flow basin under the conditions of mountain cryolithozone: case study of the Gerkhozhan-Su river, Caucasus. *Earth's Cryosphere*, *8*(3), 57–67.

Rickenmann D. (2016). *Methods for the Quantitative Assessment of Channel Processes in Torrents (Steep Streams)*. CRC Press, London. https://doi.org/10.1201/b21306

Rubtsov, E. A., & Seynova, I. B. (1968). Integrated studies of debris flow-hazardous region near Tyrnyauz city, in debris flows and mountain channel processes. *Akademia Nauk USSR*, 297–303.

Seynova, I. B., & Zolotarev, E. A. (2001). *Ledniki i seli Priel'brus'ya. (Evolyutsiya oledeneniya i selevoi aktivnosti)* [Glaciers and debris flows in the Elbrus Region [Evolution of glaciation and debris flow activity]. Nauchnyy mir Moskva.

Seynova, I. B., Andreev, Y. B., Krylenko, I. N., & Chernomorets, S. S. (2011, June 14-17). *Regional short-term forecast of debris flow initiation for glaciated high mountain zone of the Caucasus*. In R. Genevois, D. L. Hamilton & A. Prestininzi (Eds.), Proceedings of 5th International Conference "Debris-flow hazards mitigation: mechanics, prediction, and assessment", Padua, Italy. 1003–1011. https://doi.org/10.4408/IJEGE.2011-03.B-109

Sun, Q., Zhang, X., Zwiers, F., Westra, S., & Alexander, L. V. (2021). A global, continental, and regional analysis of changes in extreme precipitation. *Journal of Climate*, *34*, 243–258. https://doi.org/10.1175/JCLI-D-19-0892.1

Tielidze, L. G., Nosenko, G. A., Khromova, T. E., & Paul, F. (2022). Strong acceleration of glacier area loss in the Greater Caucasus between 2000 and 2020. *The Cryosphere*, *16*, 489–504. https://doi.org/10.5194/tc-16-489-2022

Tielidze, L. G., & Wheate, R. D. (2018). The Greater Caucasus Glacier Inventory (Russia, Georgia and Azerbaijan). *The Cryosphere*, *12*, 81–94. https://doi.org/10.5194/tc-12-81-2018

Vinogradova, T. A., & Vinogradov, A. Y. (2017). The experimental debris flows in the Chemolgan river basin. *Natural Hazards*, *88*, 189–198. https://doi.org/10.1007/s11069-017-2853-z

Vinogradov, Yu. B., & Vinogradova, T. A. (2010). *Mathematical Modeling in Hydrology*. Moscow, Academy.

Wei, K., Ouyang, C., Duan, H., Li, Y., Chen, M., Ma, J., An, H., & Zhou, S. (2020). Reflections on the catastrophic 2020 Yangtze River Basin flooding in southern China. *The Innovation*, *1*(2), https://doi.org/10.1016/j.xinn.2020.100038

Xu, X., Zhang, H., Sun, Y., Xu, B., Li, J., Dong, G., & Pan, B. (2024). The effects of climatic change and inter-annual variability on glacier retreat from ~ 1850s AD moraines in the Kuoqionggangri peak region, southern Tibetan Plateau. *Climate Dynamics*, *62*, 2941–2951. https://doi.org/10.1007/s00382-023-07041-w

Zaporozhchenko, E. V. (2002). *Debris flows in the Gerkhozhan-Su river: manifestation history, formation conditions, energy characteristics*. Collected scientific articles of OJSC "Sevkavgiprovodhoz", 15, 80–148.

Zerkal, O. V., Chernomorets, S. S., Iudina (Kurovskaia), V. A., Dokukin, M. D., Krylenko, I. N., Savernyuk, E. A., Vinogradova, T. A., & Zaporozhchenko, E. V. (2023). The modern activity of the Buzulgan landslide and its Influence on the debris flow hazard for the Tyrnyauz City (Northern Caucasus, Russia). *Progress in Landslide Research and Technology*, *2*(1), 227–235. https://doi.org/10.1007/978-3-031-39012-8_10

Zhou, B., Zou, Q., Jiang, H., Yang, T., Zhou, W-T., Chen, S-Y., & Yao, H-K. (2024). Process-driven susceptibility assessment of glacial lake outburst debris flow in the Himalayas under climate change. *Advances in Climate Change Research*, *15*(3), 500–514. https://doi.org/10.1016/j.accre.2023.11.002

Zolotarev, E. A., Popovnin, V. V., & Seinova, I. B. (1982). Regime of the Kayarty glacier in the Central Caucasus—an active debris flow source. *Mater. Glyatsiol. Issled.*, 43, 69–75.

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FACTORS AFFECTING MOTOR VEHICLE POLLUTION IN CAPITAL CITIES: A CASE STUDY OF MOSCOW

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Abstract: The change in the volume of emissions from Moscow's motor transport and its territorial proportions was the result of the combined effect of transformational and inherited factors (path dependency). The key among the inherited factors was the transport network and the radial-ring layout, which leads to low network connectivity. Transformational factors are, first of all, the growth of the number of cars, improvement of fuel, and engine. However, in recent years, on the contrary, the number of cars and the structure of the fleet have become a conservative factor, and the city's development strategies have focused on the construction and reconstruction of roads, strengthening the connectivity of the network and the development of public transport. The construction of roads and the intensive reconstruction of urban transport arteries significantly improve the nature of traffic, reduce the intensity of congestion, but at the same time create new areas of pollution. Emission reduction is achieved only for light trucks on gasoline and heavy trucks on diesel. The main trend in recent years has been the increasing uniformity of pollution from motor vehicles. New housing construction programs and large-scale projects for the transformation of Moscow districts lead to an increase in the connectivity of the city and, at the same time, to the equalization of the density of motor vehicle pollution. The balance of these factors changes over time (if at the beginning of the post-Soviet period the main factors were inherited, then in recent years these are mainly positive transformational factors) and in space: industrial zones have been preserved only on the outskirts of the city, and railway stations are being moved there; the changing topology of the network has not only increased connectivity, but also created a vacuum effect in the center. Based on field observations and calculations, it has been proven that the construction of new highways and interchanges provides a temporary effect of reducing pollution as a result of the redistribution of traffic but stimulates new traffic and creates new areas of pollution.

Keywords: motor transport; pollution; transport network; urban ecology; Moscow

1. Introduction

Important changes took place in post-Soviet capital cities, in which, in addition to various demographic and urbanization processes, a powerful wave of deindustrialization of the economy took place, planning and urban planning conditions changed, the factor of the real market value of urban land appeared, and the pace of motorization accelerated. This has significantly affected the level and nature of anthropogenic impact (AI) on the urban environment and its ecological state. The speed and quality of the changes that have

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occurred were due to both new and inherited development factors. At the same time, new factors are most clearly manifested in capital cities as centers of various innovations.

In the post-Soviet period, against the backdrop of fleet growth and crisis deindustrialization, motor transport has become the leading source of air pollution, its contribution to emissions in 2018 exceeded 50% in half of the regions and in 3/4 of the cities of Russia before the change in accounting methods (Bityukova & Mozgunov, 2019). In many cities, the contribution of vehicles to total emissions exceeds 90%. These are mainly southern regional centers, where industry is represented by "clean" industries (Nazran, Nalchik, Elista, Rostov-on-Don, Stavropol, Krasnodar, Kaluga, and Voronezh), the recreational center of Sochi, as well as Moscow and St. Petersburg (90–95%). In 2019, the methodology for accounting for transport emissions changed by taking into account the class of vehicles. As a result, the volume of emissions in Russia decreased by 3 times. At the same time, regardless of the methodology, Moscow always ranks first in terms of emissions into the atmosphere not only among all cities, but also among regions of the country (980 thousand tons before 2019 and about 330 thousand tons after).

2. Current studies of the topic

The study of motor transport as one of the leading factors of territorial differentiation of the quality of the urban environment faces the problem of the lack of statistical and empirical data (Parsaev et al., 2018). Estimates of territorial differentiation of atmospheric emissions in the context of individual streets, blocks, and districts are based on data on the intensity and average speed of traffic, the source of information for which can be GIS data on traffic (Petrovska & Stevanovic, 2015), field observations (Bityukova et al., 2022), or traffic flow modeling (Jacyna et al., 2017).

Calculating the volume of emissions from individual street sections is the basis for modeling the dispersion area of emissions from mobile sources. For example, a model of dispersion of pollutants in the atmosphere under variable wind conditions (CFD VADIS) (Rafael et al., 2018), and a transport emission model for linear sources (TREM) (Borrego et al., 2004). For a more comprehensive analysis that takes into account the effects of many changing factors, combinations of similar models or simulation models are used (Phung et al., 2020). The amount of non-exhaust particles in the atmosphere can only be estimated based on numerical modeling, since almost all non-exhaust emissions from vehicles (brake wear, tire wear, road wear, and suspended particles, as well as volatile organic compounds (VOC) from vehicle maintenance) occur regardless of the vehicle type and its fuel mode (Grigoratos & Martini, 2015; Wahid, 2018). Emissions from solvents in windscreen cleaners and deicers now dominate VOC emissions from road traffic in the UK and have a very different VOC emission profile (Harrison et al., 2021). There are a large number of models of distribution and diffusion of emissions from mobile sources. However, there are practically no studies that would consider the transformation of the territorial structure of emissions from motor vehicles (Revich, 2018).

Another line of assessment is based on monitoring data, including concentration analysis of, for example, PM_{10} and NO_x. Pollution levels are determined based on direct (Kerimray et al., 2020; Sam, 2021) or point measurements (Deak et al., 2020; Gis et al., 2021). The levels of

salinity, heavy metal, and metalloid pollution near highways with different traffic intensities and in courtyards with parking lots are analyzed (Kosheleva et al., 2018).

Among the factors of pollution formation, the optimization of the transport system is considered as a factor in reducing the number of emissions while reducing congestion and increasing the capacity of intersections (Janarthanan et al., 2021; Phung et al., 2020; Zhou et al., 2021). In historically established urban environments, where physical changes to transport routes are difficult, significant attention is paid to the redistribution of transport along existing streets (Wang & Sun, 2019). Many researchers note the need for the development of public transport (Chavez-Baeza & Sheinbaum-Pardo, 2014; Silva et al., 2012). The example of European countries shows the effectiveness of establishing stricter state regulatory requirements for fuel and cars themselves. In addition, the importance of not only direct but also indirect measures (educational, advertising, and awareness-raising) is noted, facilitating the adoption of new political decisions by the population concerning transport. Urban planning that reduces the number of trips (Chien, 2020; Mueller et al., 2020), landscaping that absorbs noise and emissions (Rafael et al., 2018; Morillas et al., 2018), are considered as a factor in changing emissions from motor vehicles. However, high traffic intensity contributes to an increase in emissions, as does new housing construction, terrain, the presence of bridges, road width, the presence of transit transport, etc.

3. Materials and methods

The dynamics and structure of emissions from motor vehicles are largely determined by changes in the methodology for calculating the indicator. The calculation of the indicator of emissions into the atmosphere from motor vehicles is carried out in accordance with the methodological recommendations of the Federal Service for Supervision of Natural Resources. Since 2019, the methodology has been changed. The justification for a significant reduction in specific standards was the data on a significant improvement in the structure of the vehicle fleet. The main changes in the emission calculation method were introduced at the level of changing the flow structure, the Euro 5 standard was added, the proportions between engine types changed, and the standard mileage for trucks and buses increased. As for the change in mileage emissions, the standard has been increased for a number of items, for example, for CO, while the standard for sulfur compounds has been reduced. For Euro 4 diesel vehicles, the standard has been reduced for all substances except non-methane volatile organic compound (NMVOC) (Table 1). In general, the most significant changes were made to the standards for diesel engines. For buses and trucks, the increase in the standard occurred for C, CO, NO_x, NMVOC, a significant reduction (several times) for SO_2, and somewhat less for CH_4.

The information base used was database of Federal Service for Supervision of Natural Resources (Rosprirodnadzor, 2023) on the volume of emissions from mobile sources in the city as a whole, the Federal Tax Service of Russia (2023) database on the structure of the vehicle fleet in the context of municipalities, municipal statistics on the population and the length of the road network, Analytical Center of the Central Real Estate Information Agency on the area of new housing construction, Espar-analytics, and field observations on traffic intensity and flow structure in the context of individual street sections (about 90 thousand

sections), and for the Ochakovo-Matveyevskoye district – 186 sections with monthly traffic for the period March 2023–March 2024.

Table 1. Change in specific emissions of pollutants for passenger cars when driving in cities with a population of more than one million people (2013–2019)

Ecological Class	Fuel	Pollutants g/km (methodology 2013/methodology 2019)						
		CO	NO_x	C	SO_2	CH_4	NMVOC	NH_3
Euro 0	P	**20.1/ 22.8**	*1.7/ 1.5*	—	*0.034/ 0.021*	*0.092/ 0.04*	**3.375/ 3.86**	0.002
	DF	0.7	**3.2/3.6**	**0.2/ 0.25**	*0.192/0. 073*	0.005/ —	**0.145/0.2**	0.001
Euro 1	P	7.4	0.9	—	0.019	0.015	0.365	0.07
	DF	**0.4/0.5**	**0.68/ 0.74**	**0.06/ 0.07**	*0.173/0. 065*	*0.005/-*	**0.075/ 0.09**	0.001
Euro 2	P	**4.5/5.2**	**0.35/ 0.36**	—	*0.03/0. 019*	*0.04/ 0.01*	**0.053/ 0.08**	**0.070**
	DF	0.5	0.74	0.07	0.065	—	0.09	0.001
Euro 3	P	**2.4/2.7**	*0.15/ 0.14*	—	*0.03/0. 018*	0.004	*0.053/ 0.046*	*0.07/ 0.06*
	DF	**0.4/0.5**	**0.52/0. 57**	**0.04/ 0.05**	*0.115/0. 062*	*0.005/-*	**0.001/ 0.07**	0.001
Euro 4	P	0.3	0.08	—	0,018	0.003	0.017	0.06
	DF	*0.4/0.3*	*0.52/ 0.31*	*0.04/ 0.015*	*0.115/ 0.062*	*0.005/ —*	**0.001/ 0,04**	0.001
Euro 5	P	0.3	0.06	—	0,018	0.003	0.017	0.06
	DF	0.3	0.25	0,002	0.062	—	0.04	0.001

Note. E: Euro; F: fuel; P: petrol; DF: Diesel Fuel; bold values: increase in mileage emissions; italic values: reduction of mileage emissions; regular values: no change; Calculation based on Federal Tax Service of Russia (2023) and Rosprirodnadzor (2023) databases

The calculation of emissions of pollutants into the atmosphere by moving traffic on a motorway (or its section) with a fixed length *L* (km) is determined by the formula:

$$\mathrm{M}_{L_i} = \frac{L - L_0}{3600} \sum_{1}^{K} M_{K.i}^{\Pi} \cdot G_K \cdot k_C \cdot r_{V_{K.i}} \cdot g/s \qquad (1)$$

where $\mathrm{M}_{\mathrm{K}.i}^{\Pi}$– specific mileage emission of the i-th harmful substance by vehicles of the *K*-th group for urban operating conditions, g/km; *K* – number of vehicle groups; G_K– average daily traffic intensity; k_C– a correction factor that takes into account the operation of the vehicle's climate control systems, road conditions and grip; $r_{V_{K.i}}$– correction factor taking into account the average speed of the traffic flow (V, km/h) on the selected section of the motorway; 1/3600 – conversion factor "hour" to "sec."; *L* – length of the motorway section, km; L_0 – the length of the queue of cars in front of a red traffic light and the length of the corresponding intersection zone, km.

4. Results and discussion

The volume of emissions from Moscow's motor vehicles increased by 10 thousand tons or 1% in 2012-2018, but in 2015–2016, a temporary increase in emissions amounted to 66 thousand tons, which is comparable in scale to the emissions of all stationary sources in the city, which is possible as a result of the active integration of New Moscow. In New Moscow, the volume of emissions from motor vehicles is 6% of the city's total emissions. This volume is rapidly increasing, the growth rate of emissions from motor vehicles is the highest in the city.

After the change in the methodology, emissions gradually decreased from 334 to 319 thousand tons in the period 2019–2022, which was facilitated by many positive changes. The same changes caused differences in the dynamics of emissions of individual substances, the structure of which changes little over the period under review. O emissions increased by 7% in 2017 compared to 2016 to almost 800 thousand tons. CO has always dominated the structure of emissions from transport: in 2012, it accounted for 80.8% (77% of the average emissions in the country). The mileage emission of CO is reduced only for the Euro 4 environmental class and for diesel, so the change is related to the fleet structure. According to the new methodology, it was CO that provided the maximum reduction in emissions by 3 times: from 750 to 240 thousand tons. As a result, the contribution to the total emission decreased by almost 10% compared to the beginning of the period. Emissions of VOCs amounted to 92 thousand tons in 2016–2017. After 2019, the volume decreased by 3 times to 27–28 thousand tons, and the share decreased to 8.5% and VOCs dropped to third place. The volume of NOx emissions decreased at a slower rate, to 43–45 thousand tons, because of which its contribution increased by 6–7%.

Due to different rates of reduction of emissions of different pollutants, the structure did not change fundamentally, CO retained its dominant position despite the reduction of its contribution, NO_2 increased its contribution and took second place, VOCs, on the contrary, dropped to third place, in total the share of these three substances slightly decreased from 98.8% to 97.2–97.4%. NH_3 emission even increased by 2 times from 1.8–1.9 thousand tons according to the old method to 4.4 thousand tons according to the new one, because of the fact that according to the new method the mileage emission was reduced only for the Euro 3 fuel standard, but its share increased more than three times. The volume of SO_2 emissions decreased by two times, which was a consequence of positive changes in the structure of the fleet and improved fuel quality, soot remained virtually unchanged, as a result the share increased by two times. CH_4 emissions decreased by more than seven times, and the share decreased to 0.2%. All these three components together now give less than 3% (Figure 1).

The dynamics of emissions from motor vehicles and their territorial proportions depend not only on the number of vehicles, but also on the nature of their movement, determined by the combined effect of multidirectional factors and conditions. High traffic intensity, planning structure and new housing construction, relief, presence of bridges, road width, low network connectivity, presence of transit transport, etc., contribute to an increase in emissions. Renewal of the vehicle fleet, improvement of fuel quality, expansion of the road network, strengthening its connectivity, reduction of barriers, i.e., everything that reduces specific emissions (per 1 km of run), which is determined by the technical properties of the vehicle and its ability to move at an optimal speed, contribute to a decrease in emissions.

All these factors in different periods of the city's development either contribute to changing the situation or, on the contrary, preserving it. Until the 2010s, the leading transformation factors were the growth of the vehicle fleet, changes in its structure, the introduction of new standards, and the inherited ones were the planning features of the transport network, while in recent years, on the contrary, the dynamics and structure of the fleet have stabilized, the factors of transformation have become the construction of roads, changes in the network topology and a fundamentally new approach to the development of public transport.

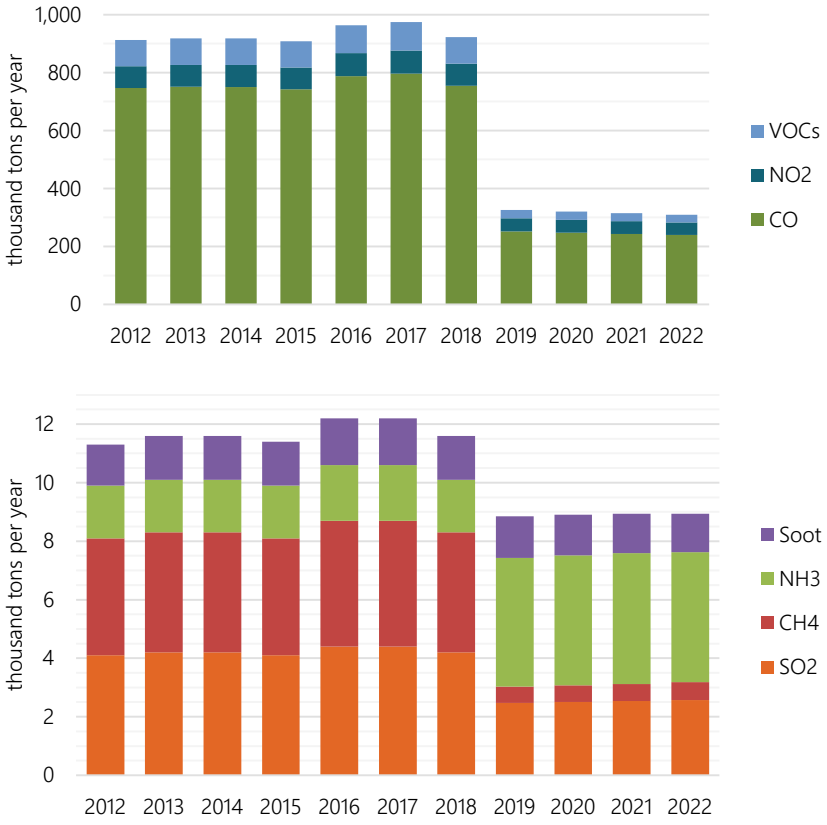

Figure 1. Volume of emissions of harmful (polluting) substances into the atmosphere from motor transport in 2012–2022. *Note*. Calculation based on Rosprirodnadzor database (2023).

Among the pollution factors, the leading one is the growth of motorization in the post-Soviet period. The capital is in third place after Primorye and Sakhalin in terms of motorization, it contains 10% of the Russian vehicle fleet (about 4.6 million units, together with the Moscow region over 7 million cars). As of the beginning of 2023, the vehicle fleet of Moscow numbered 4,607.5 thousand units, of which 89.8% are passenger cars, 9.2% are trucks, 1.0% are buses. Significant fluctuations in the dependence (up to a change in sign) of

emission volumes on motorization are explained by both objective reasons (engine quality, fuel, traffic patterns, and number of cars) and statistical ones.

Until the end of the 1980s, the emissions into the atmosphere grew at approximately the same rate as the level of motorization. In 1990–1996, the level of motorization initially changed little, and the volume of emissions increased by 12%; nevertheless, the correlation coefficient between them is statistically significant (0.61), because the share of freight transport in the flow structure is the highest for the entire period, exceeding 20%. The high growth rates of the Moscow vehicle fleet do not change the general trend towards its rapid aging, and, consequently, the increase in specific emissions. During the period of economic and population income growth (1997–2008), the number of newer cars increased, road construction and reconstruction of the transport network began. The correlation coefficient between the increase in the number of cars and the volume of emissions into the atmosphere decreases to 0.42. As a result, since 2007, the intensive growth of the car fleet in Moscow has ceased to be accompanied by an increase in the volume of pollutants.

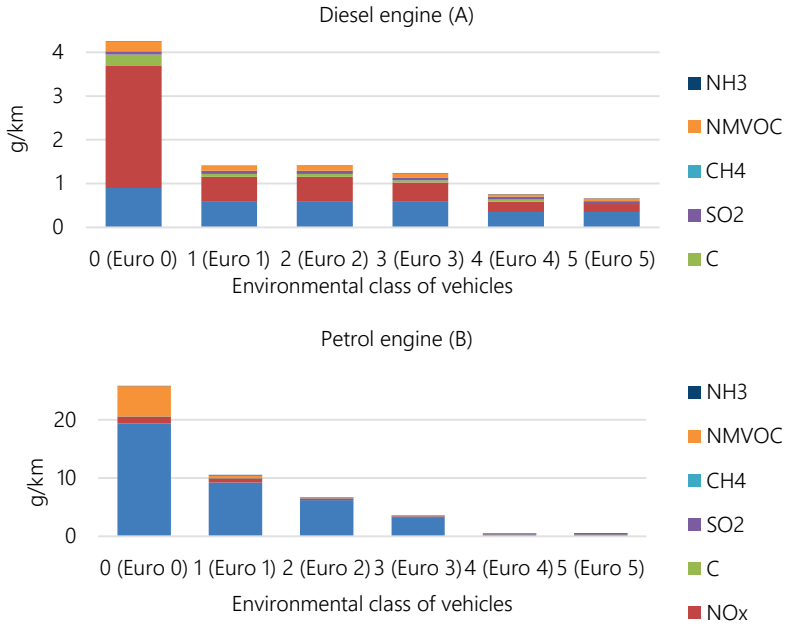

Figure 2. Specific emission of pollutants g/km traveled with different fuel standards (A-Diesel engine, B-Petrol engine). *Note.* Based on Ministry of Justice of Russia (2019).

Between 2009 and 2018, gross emissions from vehicles decreased by almost 400 thousand tons, from 1,342 to 934 thousand tons. Improved gasoline quality and vehicle fleet structure led to a fourfold reduction in specific emissions (g/vehicle*km). In the fleet structure, Euro 1 and lower vehicles have already made up a smaller part (38%), Euro 2 and 3 – 43%, Euro 4 and higher – 19%, and the correlation coefficient becomes negative for the

first time. In 2019–2022 period, the trends changed significantly: vehicle fleet growth actually stopped, and the volume of emissions also stabilized.

Changes in the vehicle fleet structure have a multidirectional impact on the emission dynamics. On the one hand, the growth of higher environmental classes of engines occurs at a rate of 2–3% per year, the share of trucks decreased by 2 times in 1991–2006, which contributes to the improvement of the environmental parameters of motor transport. Since 2013, a ban on the use of a standard below Euro 4 was introduced, and since January 2016 below Euro 5. The effect of the transition from class 3 motor fuels to 4 is a decrease in emissions of sulfur dioxide by 79%, benz(a)pyrene by 22.7%, solids by 13.5%, nitrogen oxides and carbon monoxide by 4% each (Figure 2).

On the other hand, fuel consumption is not decreasing fast enough, since the share of cars with 150–250 hp engines in the capital's fleet structure is three times higher than the national average, and their growth is the highest (47% growth in the period 2012–2018), and even in recent years, against the background of a 12% reduction in the fleet, the number of cars with an engine capacity of 200–250 hp has increased by 12%. In general, the fleet structure is skewed towards cars with increased fuel consumption compared to the average Russian characteristics according to the Federal Tax Service of Russia (2023, Figure 3).

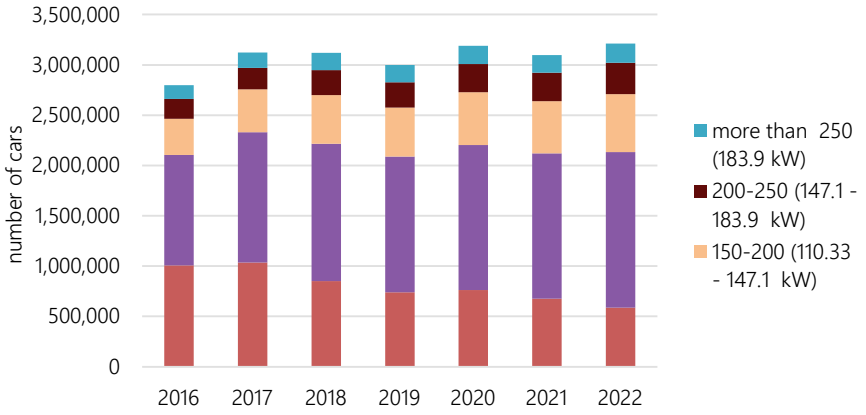

Figure 3. Changes in the structure of the passenger car fleet of the city of Moscow by engine types, 2016–2021. *Note.* Based on the Federal Tax Service of Russia (2023).

New housing construction is an important factor in both the growth of motorization (since new areas are often not fully equipped with public transport) and the redistribution of traffic flows. With the current planning structure and capacity of roads, it additionally increases the load on the Moscow Ring Road (MKAD) and main radial highways. During the period 2012–2022, 29 million m² of housing were commissioned in Moscow within the 2012 border (Makhrova, 2022), the majority of which is located in those areas of the city where the population and development density were somewhat lower, in the zone between the Third Transport Ring and the MKAD. The localization of large complexes stimulates the use of the city's radial highways, which, according to our calculations, are also characterized by a uniform distribution of emission densities from mobile sources.

However, an increase in population density in a city can be considered not only as a factor in increasing the load, but also as a potential for changing the form of organization of the urban transport system, since it is known from world practice that cities with a high population density are more inclined to choose intermodal transport systems with an emphasis on public transport. Therefore, the most progressive development of public transport has occurred in the center of Moscow. Together with several economic and prohibitive measures, this has allowed the city center to be significantly relieved in recent years, as a result of which the volume of emissions from motor vehicles has decreased by 10–20% in the central areas and the creation of new underground transport lines (MCC, new metro lines). Public transport should compete with private transport, which will reduce the departure rate, especially during rush hours, and reduce the volume of emissions into the atmosphere. The renewal and electrification of the bus fleet, the development of the metro, the use of internal railways, and dedicated lanes for public transport make it as competitive as possible compared to private transport.

The density of the street and road network (SDN) is one of the most controversial factors: road construction creates new areas of pollution, but at the same time, cars with internal combustion engines, when the speed of movement decreases below the optimal (50–60 km/h) in traffic jams before the significant changes in the structure of the vehicle fleet, emitted 30% more pollutants than in the established mode of movement. Therefore, for a long time it was believed that pollution decreases as the road network develops observations (Bityukova et al., 2011).

However, road construction in capital cities can almost never keep up with the growth rate of the car park. On the contrary, when new roads are built, this stimulates both the growth of motorization and the exit coefficient (the share of cars simultaneously in motion). In addition, the construction of new highways only exacerbates the degree of traffic congestion on the streets that connect the highway with residential areas.

Moscow's experience shows that not only the construction of new roads matters, but also planning features, increasing the connectivity of the road network. Therefore, at the present stage, it is very important to consider the impact of changes in this extremely inertial structure, which is formed over a long period of time and is a product of the evolutionary development of the city and previously adopted planning decisions.

Moscow has about seven thousand km of roads (Federal Road Agency, 2023). The density of the road network in Moscow has a pronounced center-periphery character. In the central areas of the city, it ranges from eight to 24 km/km^2. For a long time, when the construction and reconstruction of ring roads was carried out, this only preserved the radial-ring (Yakshin, 1975). In fact, modern chord construction is the implementation of this strategy.

A distinctive feature of the last decade is the intensive reconstruction of the city's transport network. The increase in the density of the road network in 2011–2018 occurred precisely in those areas where the density was slightly below the city average. The highest growth rates of the road network were characteristic of areas stretching along the city's largest transport arteries, especially at their intersections with the MKAD and other chord highways, where new roads and interchanges connecting the transport network were built. The result of planning and developing roads in problem areas of the center, the

southwestern sector of the middle belt (between the Garden Ring and the Third Transport Ring), as well as in the northern part of the areas adjacent to the MKAD was a more uniform density of the road network. A decrease in emissions was observed precisely in these areas, where the density of roads increased, or in areas of the center due to restrictions on entry (Bityukova & Mozgunov, 2019).

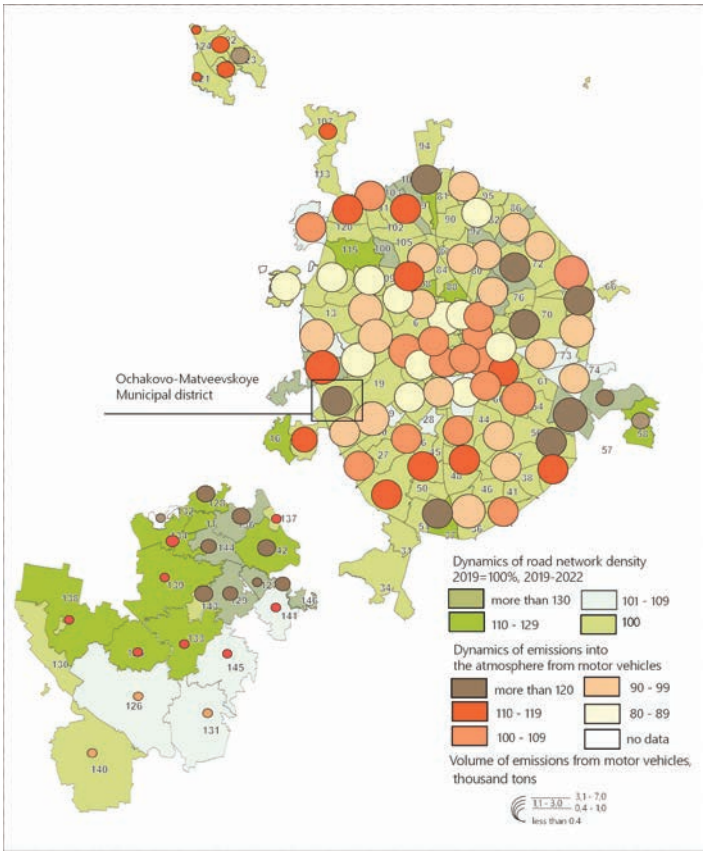

Figure 4. Change in the density of the street and road network by municipalities in 2019-2022.
Note. Authors' calculations based on Rosprirodnadzor (2023) and Federal State Statistics Service [Rosstat] (2023) databases.

In 2019–2022, the growth rate of the road network length slowed down slightly, and their territorial structure changed: if in 2012–2018 the main increase was typical for some areas of the center, the middle belt and some interchanges on outbound highways, then in 2019–2022 the main increase shifted to the New Moscow zone and certain areas near the MKAD. The increase was 347 km or 26% compared to the 2019 level. Every year, 80–10 km of roads is built in Moscow, which significantly reduces the excess mileage of vehicles. But the construction of bridges and overpasses plays a special role in reducing the number of traffic jams (29 were commissioned in 2022). In 2022, the main section of the Moscow High-Speed

Diameter (MSD), a 68–kilometer–long highway that connects the North–Eastern (SVH) and South–Eastern Chords (SVH), began operating. The main pattern of increasing UDS density forms a line from north to east and the second one from the southwest to New Moscow. An increase of 10–30% was observed in the areas of projects to increase the connectivity of the railway station zone and new internal commuter trains with the city's motor transport system (Figure 4).

However, in the period 2019–2022, not only did the network construction strategy changed, but most importantly, the degree of influence of the traffic pattern on the volume of emissions into the atmosphere. Modern cars are equipped with a start-stop system, i.e., a technology designed to automatically turn off and restart the engine during a temporary stop (for example, at a traffic light) to save fuel, reduce pollutant emissions and noise levels by reducing the engine's idling time, including in traffic jams. Calculations show that with an increase in traffic on new highways, the effect of increased pollution at low speeds disappears completely for cars with gasoline and diesel engines and remains only for light trucks on gasoline and heavy trucks on diesel (at a speed of 30 km/h, i.e., the average speed of movement in traffic jams, the specific emission increases by approximately 1.5 times, and then decreases again). Therefore, compared to the previous period, the greatest increase in emissions is observed in road construction areas (Figure 5).

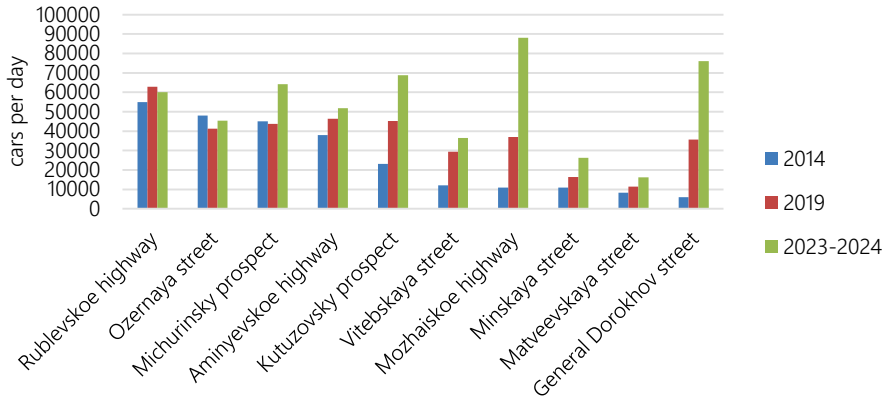

Figure 5. Change in the average daily number of cars in certain areas of the Ochakovo-Matveyevskoye district and its environs, 2014–2024. *Note.* Calculation based on field observations.

One of the striking examples of changes in the density of the road network and, as a consequence, the intensity of vehicle traffic is the transformation of the transport system in the Ochakovo-Matveyevskoye district. In total, the district and the adjacent territories contain sections marked in Figure 6 (below) in red (Michurinsky Prospekt–Mozhayskoye Shosse, Aminyevskoye Shosse–Generala Dorokhova St.–MKAD) of the construction of the North–West Chord (NWCH), which has led to quite serious changes in the road network over the past 10 years. In addition to the construction of more than six km of a radial highway on an overpass, part of the chord roads near the MKAD, but a significant part of

the new construction (37%) falls on interchanges on the MKAD (13%), the largest radial highway Kutuzovsky Prospekt (19%) and the chord Minskaya Street (4.8%).

Changes in the road network have led to a redistribution of the traffic load on the territory of the district. The most congested sections, according to data for 2014, have increased their capacity, while the number of traffic jams has decreased, and the speed of passing the highway has increased by 2019. The most significant changes in the average daily traffic intensity are observed on Mozhaiskoe Highway (reconstruction was completed at the end of 2014) and included the construction of several overpasses and side roads. Traffic light-free travel on the new overpass of Mozhaiskoe Highway significantly accelerated the speed of passing this section of the highway. The increase in the capacity of Vitebskaya Street and General Dorokhov Street is associated with the completion of the construction of the North–West Chord. However, by 2024, new highways, reconstructed sections of highways, parallel toll roads were characterized by the greatest increase in traffic— from one and a half times to twice.

According to the Moscow Government (Moscow Motor Transport, 2023), the measures taken were supposed to increase the capacity of these routes by an average of 25%, but field observation data indicate a more significant increase in traffic flow. As a result of the increase in the average speed of movement in the area, the connectivity of the network increased, the total mileage decreased, and the mileage emissions decreased. As a result, the effect of reducing emissions in the area for the period 2012–2018 amounted to 460 tons per year (3%) with an increase in the population and the volume of commissioned multi-story housing of 460.5 thousand m^2.

Until 2010, the main congestion in Moscow was on radial avenues, however, it was the construction of parallel roads, the organization of traffic lights-free traffic and new public transport systems, such as trunk buses, that led to the fact that the speed of traffic on radial directions increased, and the main problems were concentrated on chord highways. After the modernization of the network and some redistribution of flows, the flows on radial and chord highways began to differ (using the example of the Ochakovo-Matveyevskoye district) by 30%, although previously the difference was 50%. Bus traffic also almost equalized, the difference was only 22%. The contribution of radial and chord highways to traffic was 44% and 31% respectively, since another 25% of traffic shifted to new highways and interchanges. This happened very quickly, since if the increase in traffic on old roads was 6% over the past year, then on new roads it was 38%.

The share of freight transport is minimal on radial roads. The Ochakovo-Matveyevskoe district is characterized by the presence of a large industrial zone, which determines the increased share of freight transport, primarily along chord routes, as well as along the new overpass, which is laid along the edge of the Ochakovo industrial zone. New highways have the highest share of trucks (5.1%), since they largely use interchanges on the MKAD. For the same reasons, there is a minimal number of buses on new highways.

The average flow speed on new highways is almost equal to that on radial avenues, while on chord roads it remains 13% lower (on average 28 km/h). And since it is at this speed that gasoline light trucks are characterized by increased emissions, the contribution of chord roads to pollution is two percentage points higher than in passenger car traffic and five and a half percentage points higher than in truck traffic. The share of new highways in

the formation of the volume of emissions into the atmosphere is slightly lower than in traffic, but it is likely that with such rates of growth in traffic intensity, a decrease in the average speed can be predicted in the near future, which, given the high share of freight transport, will contribute to an outstripping growth in pollution. This once again confirms that the construction of new roads produces effects only for a certain class of cars, the emissions of which will decrease when the optimal speed is reached. In fact, new roads with a higher capacity are being built outside the center, on which the average speed increases and the emission density decreases. In general, the volume of emissions is largely proportional to traffic: the share of emissions from passenger vehicles coincides with the share of traffic for radial highways, for freight transport the shares coincide on chord streets (Table 2).

Table 2. Changes in traffic and emissions from different types of roads in the Ochakovo-Matveyevskoye district in the period March 2023 – March 2024

Indicators	Streets			
	Radial	Chord	Newly built	Total
Traffic (cars per day)	3,254,600	2,316,200	1,838,100	7,408,900
Average traffic (cars per day on 1 street)	61,408	41,361	45,953	—
Maximum traffic (cars per day)	314,200	349,400	172,100	—
Minimum traffic (cars per day)	240,000	1,400	1,900	—
Buses (average traffic, (buses per day on 1 street))	582	454	148	—
Trucks (average traffic, (trucks per day on 1 street))	2,457	2,259	2,413	—
Share in traffic, %	44	31	25	100
Share of bus traffic, %	50	41	9.9	100
Share of freight traffic, %	37	36	27	100
Share of trucks in traffic, %	4.16	4.9	5.1	4.8
Traffic index, % March 2023=100%	106.6	106	138	108
Flow speed (km/h)	32	28	31	30
Volume of emissions from passenger vehicles on all streets (t/year)	7,253	5,243	3,324	15,820
Emissions from trucks and buses on all streets (t/year)	1,097	1,142	518	—
Share of emissions from passenger vehicles, %	45.8	33.2	21	100
Share of emissions from trucks and buses, %	39.8	41.4	19	100.2

Note. Calculation based on Espar-analytics data, field observations of monthly traffic on 162 street sections in the Ochakovo-Matveevskoye district

The most important infrastructure project in this area is the construction of the North–West Chord, a high-speed, traffic-light-free highway in the north–east–south–west directions. To assess the role of changes in the road network density as a result of the construction of the North–West Chord, a high-speed, traffic-light-free highway in the north–east–south–west directions, which has led to quite significant changes in the road network over the past five years, observations of the structure and intensity of traffic flows were conducted on a model section at the intersection of Ozernaya and Nikulinskaya Streets, northwest of Michurinsky Prospekt. For full monitoring of the road situation, six observation sites were selected in order to identify patterns in changes in the structure of flows not only during the day, but also to identify the relationship between the structure and direction in

the context of weekends and the work week, as well as the role of the load on the exits from the highway.

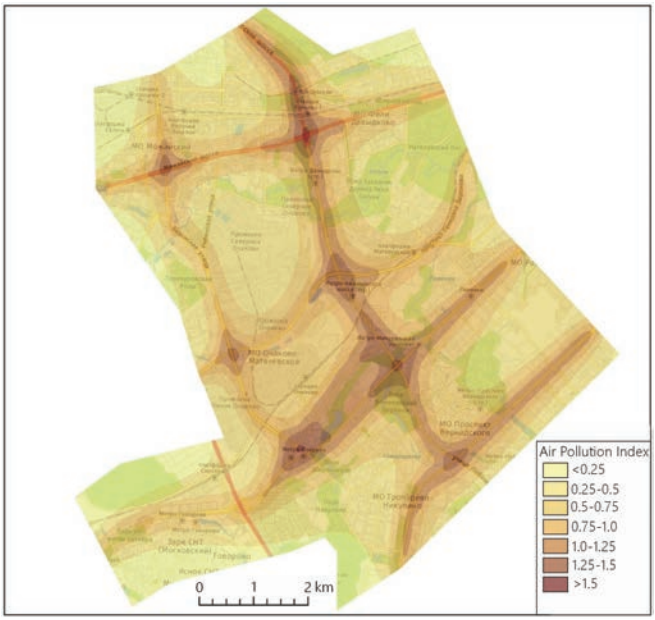

Figure 6. Air pollution index calculated based on data for 2023–2024.

As a result, field observations have shown that the construction of highways does not reduce the pollution level as a result of reducing emissions in "traffic jams", while it creates:

- A new area of air pollution, which is relatively isolated from residential areas, since highways are laid at some distance and with the appropriate infrastructure that creates additional barriers. With an increase in traffic speed from 90 to 120 km/h, which usually occurs at the initial stages of operation of new highways, when the flow intensity decreases, with an average structure of the traffic flow, the specific emission of CO increases by 1.91 times, NOx by 2.1 times, hydrocarbons by 30%, and suspended particles by 10%.
- "Traffic jam" zones and areas of high emission density at exits and entrances to the highway, maximum in the morning at the exit point to the highway and at the exit point from it, starting from 6 p.m.

As an integral indicator of pollution by the pollutants considered, the air pollution index (API) was constructed (Bityukova & Mozgunov, 2019). In 2019, within the study area, the API value of the index varies from 0.1 to 1.55 with an average value of 0.54, which corresponds to a low intensity of impact (Figure 6).

At intersections of major highways, the API increases by 2–2.5 times. Since 2010, the value of this index has been gradually decreasing and by 2019 the maximum value is only 0.03, which indicates low air pollution from these sources. However, by 2024, the API has grown again, although at a slower rate than traffic, the growth is also associated with the

construction of the north–west chord, where there was no area before and in the areas of interchanges, where the share of freight transport has increased. The spatial distribution of the index is closest to the distribution of nitrogen oxide concentrations, since it is this pollutant that makes a decisive contribution to its value. According to the Moscow Government (Moscow Motor Transport, 2023), the measures taken should have increased the capacity of these highways by an average of 25%, but at the same time, field observation data indicate a more significant increase in traffic flow.

5. Conclusion

An important consequence of the city's post-industrial development was the growth of the vehicle fleet, increased mobility of personal transport, reconstruction of industrial zones, formation of a new network topology, and a new transport policy. A multi-scale analysis of trends in the dynamics of emissions into the atmosphere from Moscow's motor transport for the period 2012–2024 showed:

- The balance of factors determining the impact of motor transport on the quality of atmospheric air in Moscow has changed significantly in recent years: in the 2000s, against the backdrop of growing motorization, there was a reduction in pollution due to an improvement in the quality of the vehicle fleet and fuel. In the 2010s, the size and structure of the fleet became conservative factors, and an increase in the density of the road network and a change in its configuration became modernizing factors.
- New construction in combination with measures to increase the connectivity of the road network and develop the public transport system had the greatest effect in 2014–2019. A study in the Ochakovo–Matveyevskoye district showed that the effect of infrastructure development is temporary, since it largely stimulates the use of personal transport; the increase in traffic on new highways in 2023–2024 leveled out the positive effect of the redistribution of flows and created new areas of pollution.
- The main reduction in emissions is observed in the center and in the middle belt of the city, where there is intensive construction of new roads and interchanges, and the development of public transport. However, one of the highest rates of growth of the street and road network in the area of intersection of the main outbound highways of the city with the MKAD has not yet produced an environmental effect.
- The territorial structure of pollution in the city is gradually leveling out, which will lead, on the one hand, to the disappearance of local pollution maxima in the city center, and on the other hand, to the approach and increase of pollution in residential areas. The very creation of intercepting parking lots, the reconstruction of the MKAD and even the construction of new overpasses transfers the impact to those zones where it was localized.
- Territorial differences have somewhat decreased, since emissions have decreased precisely in those areas where they were very high; in New Moscow, the opposite trend is observed: very high rates of growth of emissions, an increasing level of their localization in the near belt and in the main construction areas. At present, almost all areas of increased density of pollutants entering the atmosphere are located only within the influence of motorways; a decrease in the amplitude of fluctuations in the density of

emissions into the atmosphere is observed (by 1.5 times), which allows us to speak about the leveling of differences in the pollution of the atmosphere of the city districts.

Acknowledgments

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References

Bityukova, V. R., Kasimov, N. S., & Vlasov D. V. (2011). Ekologicheskij portret rossijskix gorodov. *Ekologiya i promyshlennost' Rossii*, *4*, 6–18.

Bityukova, V. R., & Mozgunov, N. A. (2019). Spatial Features Transformation of Emission from Motor Vehicles in Moscow. *Geography, Environment, Sustainability*, *12*(4), 57–73. https://doi.org/10.24057/2071-9388-2019-75

Bityukova, V. R., Mozgunov, N. A., & Gapizzhanuly G. (2022). Assessing the Impact of Road Construction on the Environment in Moscow: Microgeographical Analysis. *InterCarto. InterGIS*, *28*(1), 115–128. https://doi.org/10.35595/2414-9179-2022-1-28-115-128

Borrego, C., Tchepel, O., Salmim, L., Amorim, J. H., Costa, A. M., & Janko, J. (2004). Integrated modeling of road traffic emissions: Application to Lisbon air quality management. *Cybernetics and Systems*, *35*(5–6), 535–548. https://doi.org/10.1080/0196972049051904

Chavez-Baeza, C., & Sheinbaum-Pardo, C. (2014). Sustainable passenger road transport scenarios to reduce fuel consumption, air pollutants and GHG (greenhouse gas) emissions in the Mexico City Metropolitan Area. *Energy*, *66*(1), 624–634. https://doi.org/10.1016/j.energy.2013.12.047

Chien, Y.-C., Hu, W.-H. (2020) Low-Carbon and Sustainable Urban Bike Lane Labelling System-A Case Study of Taichung. *IOP Conference Series: Earth and Environmental Science*, *581*, Article 012035. https://doi.org/10.1088/1755-1315/581/1/012035

Deak G., Raischi N., Matei M., Boboc M., Cornateanu G., Raischi M., Matei S., & Yusuf S. Y. (2020). Meteorological parameters and air pollution in urban environments in the context of sustainable development. *IOP Conference Series: Earth and Environmental Science*, *616*, Article 012003. https://doi.org/10.1088/1755-1315/616/1/012003

Federal Road Agency [Rosavtodor]. (2023). [Dataset]. https://rosavtodor.gov.ru/avtomobilistam

Federal Service for Supervision of Natural Resources [Rosprirodnadzor]. (2023). [Dataset]. https://rpn.gov.ru/

Federal State Statistics Service [Rosstat]. (2023). Municipality Indicators [Dataset]. https://eng.rosstat.gov.ru/folder/75924

Federal Tax Service of Russia. (2023). Report on the tax base and structure of charges for transport tax. https://www.nalog.ru/related_activities/statistics_and_analytics/forms/

Gis, W., Gis, M., Wisniowski, P., & Taubert, S. (2021). Initial assessment of the legitimacy of limiting the maximum permissible speed on highways and motorways based on tests in real traffic conditions. *IOP Conference Series: Earth and Environmental Science*, *642*, Article 012016. https://doi.org/10.1088/1755-1315/642/1/012016

Grigoratos, T., & Martini, G. (2015). Brake wear particle emissions: a review. *Environmental Science and Pollution Research*, *22*, 2491–2504. https://doi.org/10.1007/s11356-014-3696-8

Harrison, R. M., Allan, J., Carruthers, D., Heal, M. R. Lewis, A. C., Marnerf, B., Murrells, T., & Williams, A. (2021). Non-exhaust vehicle emissions of particulate matter and VOC from road traffic: A review. *Atmospheric Environment*, *262*, Article 118592. https://doi.org/10.1016/j.atmosenv.2021.118592

Jacyna, M., Wasiak, M., Lewczuk, K., & Karoń, G. (2017). Noise and environmental pollution from transport: Decisive problems in developing ecologically efficient transport systems. *Journal of Vibroengineering*, *19*(7), 5639–5655, https://doi.org/10.21595/jve.2017.19371

Janarthanan, R., Partheeban, P., Somasundaram, K., & Navin Elamparithi, P. (2021). A deep learning approach for prediction of air quality index in a metropolitan city. *Sustainable Cities and Society, 67*, Article 102720. https://doi.org/10.1016/j.scs.2021.102720

Kerimray, A., Azbanbayev, E., Kenessov, B., Plotitsyn, P., Alimbayeva, D., & Karaca, F. (2020). Spatiotemporal Variations and Contributing Factors of Air Pollutants in Almaty, Kazakhstan. *Aerosol and Air Quality Research*, *20*(6), 1340–1352. https://doi.org/10.4209/aaqr.2019.09.0464

Kosheleva, N. E., Dorokhova, M. F., Kuzminskaya, N. Yu., Ryzhov, A. V., & Kasimov N. S. (2018). Vliyanie avtotransporta na ekologicheskoe sostoyanie pochv v zapadnom administrativnom okruge Moskvy. *Moscow University Bulletin*, 5(2), 16–27.

Makhrova, A. G. (2022). The Moscow capital region: An example of accelerated development. *Regional Research of Russia*, *12*(1), 105–122. https://doi.org/10.1134/S2079970522700381

Ministry of Justice of Russia. (2019). Order of the Ministry of Natural Resources of Russia dated 27.11.2019 N 804 "*On approval of the methodology for determining emissions of pollutants into the atmospheric air from mobile sources for conducting consolidated calculations of atmospheric air pollution*" (Registered in the Ministry of Justice of Russia on 24.12.2019 N 56957).

Moscow Motor Transport (Moscow Government Information Resource). (2023). [Dataset]. https://transport.mos.ru/mostrans/all_news/17178

Morillas, J. M. B., Gozalo, G. R., González, D. M., Moraga, P. A., & Vílchez-Gómez, R. (2018). Noise Pollution and Urban Planning. *Current Pollution Reports*, 4, 208–219. https://doi.org/10.1007/s40726-018-0095-7

Mueller, N., Rojas-Rueda, D., Khreis, H., Cirach, M., Andrés, D., Ballester, J., Bartoll, X., Daher, C., Deluca, A., Echave, C., Milà, C., Márquez, S., Palou, J., Pérez, K., Tonne, C., Stevenson, M., Rueda, S., & Nieuwenhuijsen, M. (2020). Changing the urban design of cities for health: The superblock model. *Environment International*, *134*, Article 105132. https://doi.org/10.1016/j.envint.2019.105132

Parsaev, E. V., Malyugin, P. N., & Teterina, I. A. (2018). Methodology for the calculation of emissions for non-stationary transport flow. *The Russian Automobile and Highway Industry Journa*l, *15*(5), 686–697. https://doi.org/10.26518/2071-7296-2018-5-686-697

Petrovska, N., & Stevanovic, A. (2015). Traffic Congestion Analysis Visualisation Tool. *2015 IEEE 18th International Conference on Intelligent Transportation Systems*, pp. 1489-1494, https://doi.org/ 10.1109/ITSC.2015.243

Phung, P. T. K., Thi, N. T., Cuc, V. T. K. (2020). A Study on Urban Traffic Congestion Using Simulation Approach. *Proceedings of 2020 5th International Conference on Green Technology and Sustainable Development, GTSD*, 555–561. https://doi.org/10.1109/GTSD50082.2020.9303130

Rafael, S., Vicente, B., Rodrigues, V., Miranda, A. I., Borrego, C., & Lopes, M. (2018). Impacts of green infrastructures on aerodynamic flow and air quality in Porto's urban area. *Atmospheric Environment*, *190*, 317–330. https://doi.org/10.1016/j.atmosenv.2018.07.044

Revich, B. A. (2018). Fine suspended particles in the atmospheric air and their impact on the health of residents of megacities. *PEMME, 29*(3), 53–78. http://downloads.igce.ru/journals/PEMME/PEMME_2018/PEMME_2018_3/Revich_B_A_PEMME_2018_3.pdf

Sam, R. (2021). Assessment and Characterization of Air Pollution Due to Vehicular Emission Considering the AQI and LOS of Various Roadways in Kolkata. In S. Kumar, A. Kalamdhad, & M. Ghangrekar (Eds.) *Sustainability in Environmental Engineering and Science. Lecture Notes in Civil Engineering* (Volume 93, pp. 198–208). Springer. https://doi.org/10.1007/978-981-15-6887-9_23

Silva, C. B. P. da, Saldiva, P. H. N., Amato-Lourenço, L. F., Rodrigues-Silva, F., & Miraglia, S. G. E. K. (2012). Evaluation of the air quality benefits of the subway system in São Paulo, Brazil. *Journal of Environmental Management*, *101*, 191–196. https://doi.org/10.1016/j.jenvman.2012.02.009

Wahid, S. M. S. (2018). Automotive brake wear: a review. *Environmental Science and Pollution Research, 25*, 174–180. https://doi.org/10.1007/s11356-017-0463-7

Wang, Q., & Sun, H. (2019). Traffic Structure Optimization in Historic Districts Based on Green Transportation and Sustainable Development Concept. *Advances in Civil Engineering*, *1*, 1–18. https://doi.org/10.1155/2019/9196263

Yakshin, A. M. (1975). *Perspektivy` razvitiya seti gorodskix magistralej*. Stroyizdat.

Zhou, S., Ng, S. T., Yang, Y., & Xu, J. F. (2021). Integrating computer vision and traffic modeling for near-real-time signal timing optimization of multiple intersections. *Sustainable Cities and Society*, 68. Article 102775. https://doi.org/10.1016/j.scs.2021.102775

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CHEMICAL COMPOSITION OF ROAD DUST AS AN INDICATOR OF THE ECOLOGICAL STATE OF URBAN LANDSCAPES (BY THE EXAMPLE OF THE CENTRAL ADMINISTRATIVE OKRUG OF MOSCOW)

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Abstract: An indicator of urban environmental pollution can be road dust, which is formed by the participation of many anthropogenic sources. For Moscow, the main source of heavy metals and metalloids (HMMs) is motor transport which emissions are toxic. Pollutants in fine fractions of road dust are easily blown into the air, then enter the human body and pose a health risk. This work is devoted to assessing the spatial distribution and environmental hazard of HMMs accumulation in road dust and its fine fractions $PM_{1\text{-}10}$ and PM_1 in the Central Administrative Okrug (CAO) of Moscow based on field data for 2023. The list of priority pollutants coming with technogenic emissions in the CAO includes Sb, Zn, Cu, and Cd, as well as Sn, Pb, Mo, and W. In fine fractions, the mean content of these HMMs is an order of magnitude higher; its variability is lower, while the differences in the contents of the elements in dust from roads with various traffic intensities become more contrasting. Differences between the roads are caused by intensity, average speed, and mode of the traffic, as well as by the composition of the vehicle fleet and the frequency of traffic jams. Extremely high and dangerous pollution in the PM_1 fraction was found in about 85% of samples; the average for the okrug total pollution index for this fraction is 1.4 times higher than for the $PM_{1\text{-}10}$ fraction.

Keywords: particle size fractions; enrichment; non-exhaust emissions; microparticles; pollution

1. Introduction

Currently, about half of the world's population lives in cities, and by 2050, the share of urban population will increase to 68% (Our World in Data, 2023). For residents of many cities, the quality of the urban environment is becoming one of the priority indicators of the standard of living. It is controlled by many factors, the most important of which is the ecological and geochemical state of urban landscapes. Geochemical studies are especially relevant in large cities, where a large number of man-made sources of pollution are concentrated. The most informative indicators of the ecological state of the urban environment include road dust, which is formed with the participation of many sources, including emissions from vehicles, industry, urban construction projects, the fuel and energy complex, as well as particles of contaminated roadside soils and aerosols coming from neighboring regions by atmospheric

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transfer (Amato et al., 2011; Haynes et al., 2020; Wang et al., 2021). Unlike urban soils, which accumulate pollutants over many years and even decades, the chemical composition of road dust characterizes the impact of modern pollution sources affecting the ecological state of urban landscapes (Acosta et al., 2015; Long et al., 2021). At the same time, the chemical composition of road dust is significantly influenced by roadside soils and atmospheric precipitation accumulated in the snow cover, as indicated by the common parageneses of heavy metals and metalloids (HMMs) in these landscape components (Kasimov et al., 2023).

Particle-size fractions of road dust are enriched with pollutants in different ways (Kong et al., 2012; Lanzerstorfer, 2018). The finest fractions of solid particles, which are not captured by industrial filters and have a high sorption capacity for toxic chemical elements, such as HMMs, usually enter the environment with emissions from transport and industrial enterprises (Alves et al., 2018; Amato et al., 2016; Ivaneev et al., 2024). Therefore, the chemical composition of PM_1, $PM_{2.5}$, and PM_{10} road dust particles (the number shows the maximum diameter of particles in micrometers), which are easily blown into the air, thus creating a threat to the human respiratory system, is the most actively studied (Golokhvast et al., 2015; Ramírez et al., 2019; Revich, 2018; Tager, 2004).

In Moscow, the largest and northernmost megalopolis in Europe, studies of the contents of HMMs in road dust were carried out in individual districts of Moscow (Ivaneev et al., 2023; Kasimov et al., 2020; Ladonin & Mikhailova, 2020; Ladonin & Plyaskina, 2009; Vlasov et al., 2022, 2023). The most complete survey of Moscow roads was carried out in 2017 when the contents of 23 HMMs were determined in 220 samples of road dust and its PM_{10} fraction collected in 9 districts of Moscow on roads with different traffic intensities and in courtyards with parking lots (Vlasov et al., 2021).

Owing to the developing street and road network and public transport, as well as due to improving fuel quality, emissions from motor vehicles in Moscow tend to decrease; from 2012 to 2022, they decreased by 2.9 times (Kulbachevsky, 2023). Nevertheless, motor vehicles remain an important source of many HMMs: fuel combustion products emit Sb, Zn, Cu, Pb, and Mo into the atmosphere; road surface abrasion, Zn, As, W, Cr, V, and Co; tire wear, Sb, Cd, Zn, Pb, Cu, Co, Ni, and Cr; brake pad wear, Sb, Zn, Cu, Pb, Ni, W, and Cr (Fussell et al., 2022; Grigoratos & Martini, 2015; Vlasov et al., 2023). In terms of emissions from motor vehicles (318.5 thousand tons per year), Moscow holds the first place among Russian cities, while emissions from industrial enterprises are lower and amount to 66.7 thousand tons per year (Kulbachevsky, 2023). Significant supplies of dust particles to the urban environment are due to construction works, including the construction of new highways and the modernization of old highways, as well as the implementation of the housing stock renovation program. Therefore, the task of assessing and monitoring the polluting impact of anthropogenic sources on urban landscapes in the Moscow megalopolis remains very relevant.

Of particular interest is the Central Administrative Okrug (CAO) of Moscow, which has the highest density of the street and road network and traffic intensity. Owing to the large number of cars and traffic jams, the most severe pollution of road dust and its PM_{10} fraction is observed in the CAO compared to other administrative okrugs of Moscow (Vlasov et al., 2021). The purpose of this work is to assess the current pollution of the transport zone in the

CAO of Moscow by HMMs and its environmental hazard based on the chemical composition of road dust and its fine fractions PM_{1-10} and PM_1. The particular objectives of the study were:

– to determine the bulk contents of HMMs in PM_{1-10} and PM_1 fractions of road dust on the roads with different traffic intensities and in the courtyards with parking lots in the CAO of Moscow;
– to identify priority HMM pollutants and their possible sources; and
– to assess the environmental hazard of pollution of bulk road dust samples and their fine fractions on the roads of CAO.

The information basis for this study was obtained during the geochemical survey of the CAO in the summer of 2023.

2. Study area

The CAO is the historical and cultural center of Moscow megalopolis; it has a permanent population of 775,000 people and is annually visited by about 25 million tourists (Department of the Federal State Statistics Service for Moscow and the Moscow Region, 2024). The CAO area is 66,000 km^2.

A larger part of the CAO is located on the low spurs of the Smolensk–Moscow Upland, which is an accumulative-erosional plain with flat areas composed of glaciofluvial sediments alternating with gentle moraine hills (Ishkov & Ilyin, 2000). The southern and southwestern part of the CAO occupy the floodplain and the first, second, and third terraces of the Moskva River. Small areas to the east of the Yauza River in the eastern part of the CAO are attributed to the Meshchera Lowland with glaciofluvial sediments. In the territory of the CAO, native soils have been preserved only in small areas in parks and forest parks; due to the anthropogenic loads, most of the soils have been significantly transformed into anthropogenic soils, mainly Urbic Technosols (Gerasimova et al., 2003).

The CAO of Moscow is characterized by a moderately continental climate with mean monthly temperatures of –4.7°C in February and +18.2°C in July and the mean annual precipitation of 650–700 mm (Ishkov & Ilyin, 2000). In 2023, Moscow received 150 mm of precipitation above the climatic norm (Department of Nature Management and Environmental Protection of the City of Moscow, 2024). A "heat island" often forms over the CAO with temperature contrasts between the city center and the suburbs of about 1.5–2°C due to fuel combustion in the winter, as well as changes in the albedo of the underlying surface in the summer (Alekseeva et al., 2017; Varentsov et al., 2018). The location of the CAO at the junction of two physiographic regions, the boundaries of which are the valleys of the Moskva and Yauza rivers, and the absence of natural orographic barriers and low-rise historical buildings in the city center contribute to the active transfer of air masses and the dispersion of pollutants.

Compared to other okrugs of Moscow, the CAO is characterized by the highest density of roads with high traffic intensity (Bityukova & Mozgunov, 2019), such as the Third Ring Road, Garden Ring, and radial highways with 2–3 lanes in each direction. On 55% of the roads in the CAO, vehicles emit from 100 to 500 t/km^2 of pollutants, while the density of transport emissions of 3000–5000 t/km^2 is recorded on 10% of the roads from the total pavement area, mainly on the Third Ring Road (Bityukova & Mozgunov, 2019; Popov et al., 2016). There are also six railway stations and railway infrastructure facilities on the territory of

the CAO, which are potential sources of pollutants. This makes transport the main supplier of emissions in the CAO (about 95% of the total emission of pollutants into the atmosphere).

Significant deindustrialization and reorganization of 15 industrial zones in the CAO led to the placement of residential complexes, business centers, educational, cultural, and social institutions on their territory (Official website of the Mayor of Moscow, 2020; Saulskaya, 2018). However, some industrial zones and thermal power plants, such as combined heat and power plant (CHPP-7), hydroelectric power plant (HEPP-1), Mezhdunarodnaya thermal electric power station, and district heating plants Pereyaslavskaya and Krasnaya Presnya remain on the territory of the CAO. In the northeastern part of the CAO, there is the Mitkovskaya Vetka industrial zone, which includes the Babaevsky confectionery concern, Dollezhal Design Institute of Power Engineering, and warehouses; in the eastern part, the Tupolev aircraft plant, the Mosgaz enterprise, the Pluton enterprise for the production of vacuum tubes within the Kurskaya industrial zone, and automobile repair and maintenance shops in the Magistralnye Ulitsy industrial zone. In the southern part of the CAO, a part of the Paveletskaya industrial zone (refrigeration plant and warehouses) and the Udarnitsa confectionery factory are located. Depending on weather conditions, wind rose, and wind speed, the territory of the CAO may be affected by emissions from industrial enterprises adjacent to the CAO borders, mainly from the southeast, east, and northeast.

3. Materials and methods

Road dust samples in the CAO were collected in August 2023 on roads of various sizes, as well as in the courtyards of residential buildings with parking lots (Figure 1). In accordance with the width of the roadway and the number of lanes, all roads were divided into four categories with different traffic intensities: the Third Ring Road (TRR); large highways with 3–4 lanes in one direction; medium highways with two lanes; and small highways with one lane in one direction. Sampling was carried out in dry weather, at least 24 hours after rain. Samples were collected along the curb on both sides of the road using a plastic scoop and a brush in 3–5 replicates with sampling points spaced apart at 3–10 m from one another; one mixed sample was prepared from them. On the TRR and large highways, samples were collected from the dividing strip, courtyards, and parking areas. A total of 25 samples were taken, including three samples from the TRR, seven samples from highways, nine samples from medium roads, three samples from small roads, and three samples from courtyards with parking lots.

Particle-size distribution in road dust samples was determined at the Ecological and Geochemical Center of the Lomonosov Moscow State University using a laser particle sizer Analysette 22 MicroTec plus (Fritsch). Ultrasonic dispersion of dust samples was used to isolate the $PM_{1\text{-}10}$ and PM_1 fractions, followed by centrifugation (Bezberdaya et al., 2023). The resulting solutions were filtered through membrane filters with a pore diameter of 0.45 μm (EMD Millipore) on a vacuum filtration unit.

The contents of Al, As, Ba, Be, Bi, Cd, Co, Cr, Cu, Fe, La, Mn, Mo, Ni, Pb, Rb, Sb, Sc, Sn, Sr, V, W, and Zn were determined in $PM_{1\text{-}10}$ and PM_1 fractions and the bulk road dust samples using mass-spectrometry (ICP-MS) and atomic emission spectrometry (ICP-AES) with inductively coupled plasma on an iCAP Qc (Thermo Scientific) mass spectrometer and an Optima-4300 DV (Perkin Elmer) atomic emission spectrometer, respectively. The analysis

was carried out in the laboratory of the N.M. Fedorovsky All-Russia Research Institute of Mineral Resources (VIMS) using certified methods (NSAM 499-AES/MS, 2015), standard reference samples, and blank samples. The VIMS laboratory is accredited by the International Accreditation System Analytics (AAC.A.00255), and the International Organization for Standardization (ISO 17034:2016 and ISO/IEC 17025:2017).

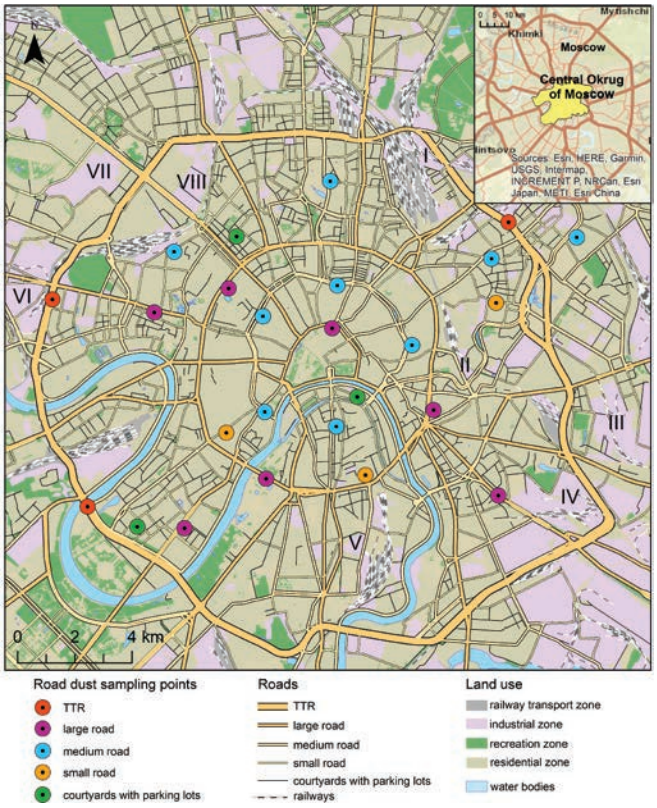

Figure 1. Land use zoning of the CAO and location of sampling plots. Industrial zone: I – Mitkovskaya Vetka, II – Kurskaya, III – Hammer and Sickle, IV – Volgogradsky Prospekt, V – Paveletskaya, VI – Magistralnye Ulitsy, VII – Botkin passage, VIII – Pravda Street..
Note: The maps are based on the authors' own analytical data.

The contents of HMMs in bulk samples of road dust (C_{bulk}) and in the fine particulate matter fractions (C_{PM}) were compared to modern data (Rudnick & Gao, 2014) on the abundances of elements in the upper continental crust (UCC) and relative abundances of elements (pollution index, *PI*) were calculated as $PI = C_{bulk(PM)}/UCC$. The crustal abundances were used as a comparison standard due to the lack of a background analogue for road dust, which is a specific technogenic object. The total pollution with HMMs was judged from the total pollution index $TPI = \Sigma PI - (n - 1)$, where n is the number of chemical elements with $PI > 1.0$. The *TPI* index has five gradations: <16 – low, non-hazardous, 16–32 – medium,

moderately hazardous, 32–64 – high, hazardous, 64–128 – very high, very hazardous, >128 – maximum, extremely hazardous pollution (Kasimov et al., 2016).

The contribution of particulate matter fractions to the overall dust pollution was determined by the ratio between C_{PM} and C_{bulk}. The coefficient $Dx = C_{PM}/C_{bulk}$ was calculated as an indicator of particle-size fractionation of HMMs in the road dust.

The influence of technogenic sources of HMMs on the chemical composition of individual fractions and bulk samples of road dust was assessed using the enrichment factor $EF = (C_i/C_{ref})/(K_i/K_{ref})$, where C_i and C_{ref} are the contents of the i-th and reference (normalizing) elements in the sample, and K_i and K_{ref} are the abundances (clarkes) of these elements in the upper part of the continental crust, respectively. The normalizing element Al was chosen because of its minimal participation in technogenic processes in the study area. There are no generally accepted gradations of the *EF* indicator. We used *EF* gradations according to (Sutherland, 2000) that are widely applied in the study of road dust pollution: < 2 – minimal enrichment and, accordingly, minimal pollution, 2–5 – moderate, 5–10 – significant, 10–50 – very high, and ≥ 50 – extremely high enrichment and pollution.

The danger of road dust and its particulate matter contamination with HMMs was assessed by calculating the frequency *P* (%) of the excess of maximum permissible concentration (MPC_i) or tentatively permissible concentration (TPC_i) and the coefficients of environmental hazard of individual elements $Ko = C_i/MPC(TPC)_i$. In the absence of standards for road dust, calculations were carried out for MPC and TPC standards established in the Russian Federation for eight elements in soils (SanPiN 1.2.3685-21, 2021). For V and Sb, the MPC values of 150 and 4.5 mg/kg were taken, respectively; for the remaining six elements, the TPC values established for loamy or loamy sandy (depending on the texture of the sample) neutral soils with pH > 5.5 were used: As (10 and 2 mg/kg), Cd (2 and 0.5), Ni (80 and 20), Pb (130 and 32), Cu (132 and 33), and Zn (220 and 55).

Visualization of geochemical data was performed in the ArcGIS 10 package. Data from the OpenStreetMap project were used as the cartographic basis for geochemical maps. The size of the roads was determined by analyzing Yandex street panorama photographs.

4. Results and discussion

4.1. Bulk contents and distribution of HMMs by particle-size fractions of road dust in the CAO

The polluting impact of motor vehicles and other anthropogenic sources on road dust in the CAO was manifested in the high total content of Sb (*PI* = 7.5), Zn (5.7), Cu (3.8), Cd (2.8), Sn, Pb and Bi (2.5–1.6) relative to the average composition of the upper part of the continental crust. The contents of W, Fe, and V were close to clarke values, while the contents of the remaining elements in Moscow road dust were lower than in the upper part of the continental crust (Table 1). Many HMMs are characterized by a strong variability in their contents in road dust (*Cv* > 50%), especially those whose content is significantly higher than the global clarke, which attests to a significant contribution of technogenic sources and to the spatial heterogeneity of the technogenic load. For HMMs with contents less than the clarke values, the variation coefficients are significantly smaller; for most of these elements, the *Cv* is within 15–30%.

Table 1. The contents of HMMs in road dust and its PM_1 and PM_{1-10} fractions in the CAO of Moscow in 2023

Element	PM_1 fraction				PM_{1-10} fraction			Bulk samples of road dust					UCC, mg/kg
	mean	min–max	*PI*	Cv, %	mean	min–max	*PI*	Cv, %	mean	min–max	*PI*	Cv, %	Dx_1	Dx_2	
	mg/kg				mg/kg				mg/kg						
Sb	35	3.1–301	**89**	**162**	25.9	2.6–192	**65**	**141**	2.8	0.49–9.7	**7.1**	**74**	**12.5**	**9.2**	0.4
Zn	3205	1024–11747	**47**	**72**	2254	735–9075	**34**	**80**	380	91–1168	**5.7**	**77**	**8.4**	**5.9**	67
Cd	2.4	0.86–9.0	**27**	**87**	1.86	0.56–9.57	**21**	**118**	0.26	0.07–1.56	**2.8**	**122**	**9.6**	**7.3**	0.09
Sn	41	9.89–85	**20**	48	27	9.3–45	**13**	35	5.1	1.99–11.2	**2.4**	51	**8.1**	**5.3**	2.1
Bi	2.52	0.65–5.2	**16**	44	1.81	0.42–3.9	**11**	43	0.26	0.01–0.88	**1.6**	**71**	**9.9**	**7.1**	0.16
Pb	254	89–401	**15**	33	158	64–380	**9.3**	45	37	14.3–98	**2.2**	53	**6.9**	**4.3**	17
Cu	370	104–952	**13**	60	302	91–844	**11**	60	107	12.8–396	**3.8**	**97**	**3.5**	**2.8**	28
Mo	13.2	2.5–95	**12**	**138**	10	1.85–63	**9.1**	**119**	2.78	0.98–5.8	**2.5**	46	**4.8**	**3.6**	1.1
W	16.3	3.83–33	**8.6**	44	17.4	6.3–37.8	**9.2**	41	2.3	0.79–6.4	1.2	**79**	**7.0**	**7.5**	1.9
As	8.6	3.58–14.6	**1.8**	36	8.6	2.8–14.5	**1.8**	35	1.99	0.82–3.7	0.4	39	**4.3**	**4.3**	4.8
Ni	78	50–114	**1.7**	22	66	45–113	1.4	20	26	12.3–47	0.6	32	**3.0**	**2.5**	47
Fe	61441	36319–115958	**1.6**	26	61406	29790–115268	**1.6**	27	28473	10522–48265	0.7	33	**2.2**	**2.2**	39200
Cr	143	69–257	**1.6**	28	105	49–138	1.1	22	56	19.1–93	0.6	37	**2.5**	1.9	92
V	149	109–205	1.5	19	136	97–201	1.4	16	75	21.8–160	0.8	47	2.0	1.8	97
Co	22	12.6–33	1.3	20	22.2	11.5–35.6	1.3	25	8.9	2.8–16	0.5	35	**2.5**	1.5	17.3
Mn	847	646–1152	1.1	16	837	696–1201	1.1	13	422	251–651	0.5	24	1.9	1.9	774
La	29	22–47	0.9	20	28	22–52	0.9	21	13	8.0–22	0.4	21	**2.2**	**2.1**	31
Ba	516	330–733	0.8	22	539	359–733	0.9	18	304	226–359	0.5	10	1.7	1.8	624
Sc	11.5	8.1–17.5	0.8	21	12.5	7.6–19.7	0.9	20	6.9	2.5–13.3	0.5	37	1.7	1.8	14
Rb	66	43–101	0.8	23	61	45–102	0.7	22	31	23–50	0.4	18	**2.1**	2.0	84
Be	1.41	0.94–2.1	0.7	22	1.4	1.01–2.3	0.7	18	0.62	0.47–0.92	0.3	18	**2.3**	**2.2**	2.1
Al	48618	34634–73156	0.6	18	48988	37097–62290	0.6	13	25810	17046–34577	0.3	14	1.9	1.9	81529
Sr	140	98–299	0.4	26	175	128–216	0.5	12	154	112–217	0.5	16	0.9	1.1	320

Note. Elements with $PI > 1.5$, $Cv > 60\%$, and $Dx > 2$ are highlighted in bold. Elements are ranked in descending order according to *PI* in the PM_1 fraction. Dx_1 and Dx_2 are the values of the coefficient *Dx* for fractions PM_1 and PM_{1-10} of road dust in the CAO. The indicators presented in the table were obtained by processing the original analytical data.

Particulate matter particles PM_1 and PM_{1-10} have increased sorption capacity compared to road dust as a whole (Jayarathne et al., 2017; Khademi et al., 2020; Ramírez et al., 2019). The elements accumulating most intensively in the PM_{1-10} particles are the same as in the bulk road dust samples, but the accumulation intensity is significantly higher, with *PI* in the range of 11–65 (Table 1). In addition, W (*PI* = 9.2) and Mo (9.1) are added to the list of accumulating elements. The most contrasting values relative to the bulk content with *Dx* = 9.2–5.3 are Sb, W, Cd, Bi, Zn, and Sn; for another five elements (Pb, As, Mo, Cu, and Ni), the *Dx* coefficients are quite high (2.5 to 4.3); the remaining HMMs weakly accumulate in the $PM_{1–10}$ fractions.

The variability in the contents of HMMs, except for Mo, Sb, and Ba, in the PM_{1-10} fraction is slightly less than that in the bulk samples of road dust, which can be explained by the more uniform composition of particles coming mainly from motor vehicles. At the same time, the bulk samples of road dust are distinguished by a more variegated composition: coarse fractions consist mainly of quartz grains, feldspars, carbonates, and asphalt fragments, while fine fractions contain carbon compounds, fragments of paint, glass, plastic, brick, and other substances (Prokofieva et al., 2015; Seleznev et al., 2021).

Fraction PM_1 is characterized by an even more significant accumulation (*PI* from 89 to 8.6) of the same elements as in the fraction $PM_{1-10.}$ The differences in the levels of accumulation of these elements in the bulk road dust samples and in the PM_1 fraction (*Dx* values) are within 7.0–12.5. At the same time, the variability of concentrations of most of HMMs (except for Sb, Sn, and Mo) in PM_1 particles remains at the same level or becomes smaller than that in PM_{1-10} particles, which indicates a high homogeneity of fines particles, most likely coming only from emissions of motor vehicles.

This is confirmed by data on the size distribution of particles forming during the movement of vehicles: brake pad wear produces particles with an average size of 0.8–2.2 μm; tire wear, 2–4 μm; road surface abrasion, 6–7 μm, and more than 12 μm (Harrison et al., 2021). Road dust particles released into the air when blown out (resuspended) by moving vehicles are larger than particles formed during the wear of tires and brake pads (Tanner et al., 2008). Their average diameter is about 5 microns, and some particles exceed 10 μm (Rienda & Alves, 2021). At the same time, in the total emissions of PM_{10} and $PM_{2.5}$ particles, non-exhaust emissions from motor vehicles currently predominate, accounting for 67% and 49%, respectively, in the EU countries (Harrison et al., 2021).

4.2. Accumulation of priority pollutants on roads with different traffic intensities

The average bulk content of HMMs in road dust on roads with different traffic intensities varies slightly. The highest contents of HMMs are observed on small roads, where the speed of traffic is low, and the traffic regime is intermittent because of a large number of traffic lights, pedestrian crossings, and public transport stops (Table 2). The lowest contents of HMMs are noted on large roads and in courtyards with parking lots. The group of HMMs with maximum accumulation (*PI* 11–4) in the road dust includes three elements: Zn, Sb, and Cu; Pb, Cd, and Mo accumulate moderately; and Sn and Bi, weakly.

Table 2. Pollution of road dust and its PM1 and PM1-10 fractions with HMMs on different types of roads

Object	Road type	*PI* levels				*TPI*
		> 20	10–20	5–10	2–5	
PM_1 fraction	TRR	$Sb_{66}Zn_{29}Cd_{25}$	$Cu_{13}Bi_{13}Sn_{12}Pb_{12}$	Mo_9W_6	$As_2Fe_2Ni_2V_2Cr_2$	173
	LR	$Sb_{114}Zn_{34}Sn_{29}Bi_{23}$	$Cd_{17}Mo_{16}Cu_{14}Pb_{12}W_{12}$	–	$As_2Fe_2Ni_2V_2Cr_2$	267
	MR	$Zn_{42}Sb_{41}Cd_{38}$	$Sn_{18}Pb_{17}Bi_{14}Cu_{13}$	W_8Mo_7	$As_2Fe_2Ni_2$	192
	SR	$Sb_{273}Zn_{119}Mo_{33}Cd_{31}Pb_{21}$	$Sn_{19}Cu_{18}Bi_{15}$	W_7	$As_2Fe_2Ni_2Cr_2$	522
	CY	$Zn_{55}Sb_{22}$	$Cd_{15}Pb_{11}$	$Sn_9Bi_8W_7Cu_7$	$Mo_4As_2Ni_2$	132
	CAO	$Sb_{90}Zn_{47}Cd_{27}Sn_{20}$	$Bi_{16}Pb_{15}Cu_{13}Mo_{12}$	W_9	$As_2Fe_2Ni_2V_2Cr_2$	24 3
PM_{1-10} fraction	TRR	$Sb_{70}Zn_{19}$	$Cd_{14}Sn_{14}Cu_{13}Bi_{10}$	$Pb_7Bi_7Mo_7W_7$	As_2Fe_2	154
	LR	$Sb_{77}Zn_{20}$	$Bi_{16}Sn_{14}W_{12}Mo_{12}Cu_{11}Cd_{10}$	Pb_6	Fe_2	173
	MR	$Sb_{94}Cd_{34}Zn_{30}$	$Sn_{18}Pb_{12}Cu_{11}Bi_{10}$	W_8Mo_6	As_2Fe_2	152
	SR	$Sb_{175}Zn_{82}Cd_{22}Mo_{22}$	$Pb_{14}Cu_{14}Sn_{12}Bi_{11}$	W_8	As_2	35 4
	CY	Zn_{40}	$Sb_{14}Sn_{10}$	$Cd_9Bi_8Pb_6W_6Cu_5$	Mo_2As_2	92
	CAO	$Sb_{65}Zn_{34}Cd_{21}$	$Sn_{13}Bi_{11}Cu_{11}$	$Pb_9W_9Mo_9$	As_2Fe_2	175
Bulk sample	TRR	–	Sb_{11}	Cu_6	$Zn_4Mo_2Sn_2Bi_2Cd_2Pb_2$	24
	LR	–	–	Sb_7	$Mo_4Zn_4Cu_3Sn_2Bi_2$	17
	MR	–	–	Sb_7Zn_5	$Cd_4Cu_3Sn_3Pb_2Mo_2$	22
	SR	–	Zn_{11}	Sb_9Cu_7	$Pb_2Cd_3Sn_3Bi_2Mo_2$	34
	CY	–	–	Zn_8	$Sb_3Cu_2Sn_2Cd_2Bi_2Pb_2$	16
	CAO	–	–	Sb_7Zn_6	$Cu_4Mo_3Cd_3Sn_2Bi_2Pb_2$	21

Note. The indicators presented in the table were obtained by processing the authors' own analytical data. The *PI* values are given in subscripts. Dashes mean the absence of an indicator fitting the accepted grade (only the elements with $PI \geq 2$ are shown). Road types: TRR – Third Ring Road, LR – large roads, MR – medium roads, SR – small roads. CY – courtyards with parking lots; CAO – average for the whole okrug.

In the $PM_{1\text{-}10}$ fraction of road dust, the contents of HMMs increase several times; in the PM_1 fraction, by an order of magnitude, and the differences in the contents of priority pollutants on roads with different traffic intensities become more contrasting. The list of priority pollutants is complemented with W. Extremely high concentrations of HMMs are observed on small roads and relatively low concentrations on the TRR and medium-sized roads. Courtyards with parking lots are distinguished by minimal accumulation of HMMs in the fine fractions of road dust. Differences between the roads are due to the intensity, average speed, and mode of the traffic, as well as due to the structure of the vehicle fleet and the likelihood of traffic jams. On large highways, high average speed promotes the blowing out of the most polluted fine particles from road dust, in which coarse fractions of weakly sorbing HMMs predominate (Kasimov et al., 2019; Vlasov et al., 2021).

4.3. Sources of HMMs in road dust and its fine fractions

Heavy metals and metalloids in the fine fractions of road dust can be clearly divided into four groups according to the enrichment factor values (Table 3, Figure 2). The first group with a pronounced anthropogenic impact and an extremely high enrichment level (*EF* > 50) includes $Sb_{162}Zn_{88}$ in the PM_1 fraction and $Sb_{112}Zn_{60}$ in the PM_{10} fraction (subscripts are average *EF* values). The second group with a very high enrichment level consists of Cd, Sn, Bi, Pb, Cu, Mo, W (10 < *EF* < 50); for these elements, the enrichment levels in the PM_1 fraction are 1.3–1.6 times higher than those in the PM_{10} fraction, except for W with *EF* = 15 in both fractions. All these elements get into the road dust of the CAO with exhaust and non-exhaust emissions of motor vehicles.

Table 3. Mean and maximum enrichment factors in the PM_1 and PM_{1-10} fractions and in the bulk road dust mass

Element	PM_1 fraction		PM_{1-10} fraction		Bulk road dust mass	
	*EF*mean	*EF*max	*EF*mean	*EF*max	*EF*mean	*EF*max
Sb	162	1566	112	935	23	88
Zn	88	365	60	264	19	66
Cd	49	236	36	178	9.4	65
Sn	34	73	22	37	7.8	19
Bi	27	49	19	38	5.0	18
Pb	26	45	16	32	7.0	18
Cu	23	71	18	49	12	44
Mo	22	179	16	112	7.8	14
W	15	28	15	27	3.9	9.8
As	3.0	4.8	3.0	4.7	1.4	3.,1
Ni	2.9	4.6	2.3	3.9	1.8	3.2
Fe	2.7	5.6	2.6	4.8	2.3	3.6
Cr	2.7	5.3	1.9	2.5	1.9	2.9
V	2.6	3.5	2.3	2.9	2.4	4.5
Co	2.2	3.6	2.1	3.3	1.6	2.7
Mn	1.9	3.4	1.8	2.5	1.7	2.3
La	1.6	2.3	1.5	2.4	1.3	2.3
Ba	1.4	2.2	1.4	2.2	1.6	1.8
Sc	1.4	1.6	1.5	1.9	1.5	2.2
Rb	1.3	1.7	1.2	1.8	1.2	1.9
Be	1.1	1.5	1.1	1.5	0.9	1.4
Sr	0.7	1.4	0.9	1.4	1.5	2.2

Note. The indicators presented in this table were obtained by processing the authors' own analytical data.

The third and fourth groups of HMMs in the PM_1 and PM_{1-10} fractions are characterized by moderate (As, Ni, Fe, Cr, V, Co) and minimum (Mn, La, Ba, Sc, Rb, Be, Sr) enrichment levels. The presence of elements from the third group in the fine fractions of road dust in the CAO is caused by mixed natural and human-made sources, such as building materials and dust and particles of contaminated soils. Elements of the fourth group are mainly derived from natural sources: particles of soil-forming rocks, various mixtures used to replace contaminated roadside soils, etc.

The enrichment of the bulk samples of road dust in the CAO with metals from the first two groups remains very high, although 3.3–4.7 times lower than in the fine fractions, which

confirms the supply of these elements from technogenic sources. The differences in the *EF* for the third and fourth groups of HMMs in the bulk samples and fine fractions are insignificant. All of them are characterized by low values, i.e., the concentrations of these elements are determined mainly by natural sources with a weak participation of technogenic emissions.

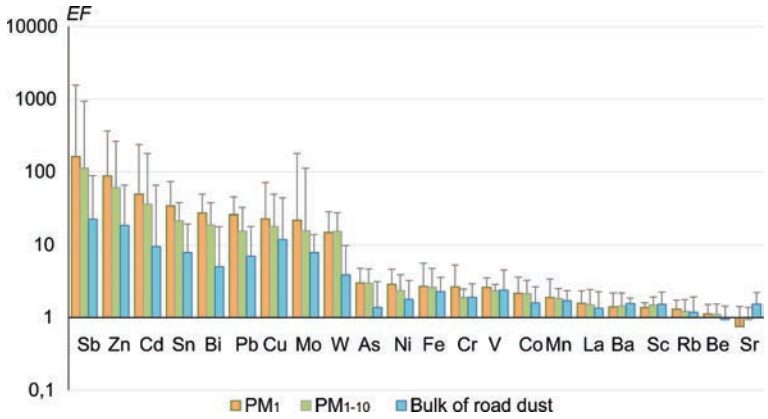

Figure 2. Enrichment of bulk samples of road dust and their PM_1 and PM_{10} fractions with HMMs. Vertical lines indicate maximum *EF* for each HMM; boxes indicate mean *EF* values.
Note: The graph is based on the authors' own analytical data.

4.4. Environmental hazards of pollution of road dust with HMMs in the CAO

The assessment of the environmental hazard of road dust pollution with HMMs via comparison with the MPC/TPC values for individual elements showed the most frequent excess of the permissible concentrations (*P*) in the PM_1 fraction (Table 4). In this fraction, the frequency of excesses of MPC/TPC values for Sb, Zn, Cu, and Pb is close to 100%, while Zn is in the lead in terms of the mean (39.5) and maximum (214) values of the environmental hazard coefficient *Ko*. Sb is in the second place with *Ko* 8.2 and 66.7, respectively. For two other metals – Cu and Pb – the average excesses of the TPC are 7.4 and 5.3, and the maximum excesses are 28.9 and 12.5. For Cd and Ni, the frequency *P* = 72%; and for As and V, 64 and 52%, respectively. The average *Ko* value varies from 1.1 for V to 4.1 for Cd, and the maximum *Ko*, from 1.4 for V to 17.0 for Cd. On different types of roads, the *P* and *Ko* indicators vary quite significantly, reaching maximum values for most elements on small roads and decreasing to minimum values on the TRR.

In the PM_{1-10} fraction, the frequency and multiplicity of exceeding the permissible concentrations generally decrease. Frequencies *P* close to 100% are noted for three elements: Zn, Sb, and Cu, with the mean *Ko* of 27.7, 6.2, and 6.1 and maximum *Ko* of 165, 42.7 and 25.5, respectively. Zn still leads in terms of the mean and maximum *Ko* values. The second group of elements – Pb, As, Cd, and Ni – has a frequency *P* varying from 52 to 72%, the mean *Ko* is from 3.3 to 4.2, and the maximum *Ko* is from 5.7 to 19.1. The last place belongs to V, which has an excess frequency *P* = 28% with the mean *Ko* = 1.1, and the maximum *Ko* = 1.3. Just as for the PM_1 fraction, among the different types of roads, small roads with the highest indicators of environmental hazard stand out, while the most favorable situation is observed on the TRR, where significant excesses of permissible concentrations both in frequency and in magnitude were found only for Zn, Sb, and Cu.

Table 4. Mean and maximum values of environmental hazard coefficients *Ko* for the bulk content of HMMs in the road dust and for its PM_1 and PM_{1-10} fractions in the CAO

Fraction	Zn	Sb	Cu	Cd	Pb	As	Ni	V
				Mean *Ko*				
PM_1	39.5	8.2	7.4	4.1	5.3	3.9	3.2	1.1
PM_{1-10}	27.7	6.2	6.1	4.1	4.2	3.8	3.3	1.1
Bulk sample	5.1	1.7	3.3	1.2	1.7	1.5	1.6	1.04
				Maximum *Ko*				
PM_1	214	66.7	28.9	17.0	12.5	6.8	5.7	1.4
PM_{1-10}	165	42.7	25.6	19.1	11.9	7.3	5.7	1.3
Bulk sample	17.5	2.2	10.1	1.4	3.1	1.9	2.4	1.1

Note. The indicators presented in the table were obtained by processing the authors' own analytical data.

The contents of HMMs in the bulk mass of road dust are characterized by a further decrease in the frequency of exceeding the MPC/TPC values for all elements, except for Zn with the mean *Ko* = 5.1, and the maximum *Ko* = 17.5. The second group includes Cu (*P* = 60%), Pb (32%) and Ni (40%) with the mean *Ko* 3.3, 1.7, and 1.6 and maximum *Ko* 10.1, 3.1, and 2.4, respectively. The third group consists of As (*P* = 24%), Sb (12%), Cd (8%), and V (8%), with the mean *Ko* values of 1.04–1.7 and maximum *Ko* values of 1.1–2.4. Among all road types, the maximum excesses of the MPC/TPC values for Zn, Cu, Sb and Cd were recorded on small roads; Ni and As dominate in the pollution of courtyards with parking lots, and Sb dominates on the TRR.

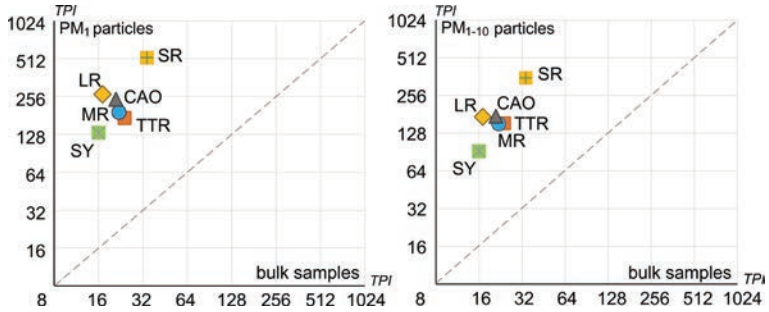

Figure 3. The ratio of the total pollution index *TPI* of road dust and its fractions PM_{1-10} and PM_1 on different types of roads in the CAO of Moscow. Road types: TRR–Third Ring Road, LR–large roads, MR–medium roads, SR–small roads. CY–courtyards with parking lots; CAO–average for the whole okrug.
Note: The graphs are based on the authors' own analytical data.

The integral indicator (*TPI*) for the association of toxic elements in the road dust and its PM_1 and PM_{1-10} fractions has been used to assess the degree of contamination and the environmental hazard of HMMs contained in the road dust and its fine fractions. The most dangerously polluted PM_1 fraction is characterized by high *TPI* values on all types of roads: the average *TPI* in this fraction for the CAO is 243, which is 11.6 and 1.4 times higher than the *Zc* values for the bulk mass of road dust (Figure 3) and for the PM_{1-10} fraction, respectively. Extremely high, extremely hazardous contamination of the PM_1 fraction was detected in

approximately 85% of samples, and the most dangerous environmental situation (*TPI* = 1137) was identified in the historical part of Moscow on Prechistenka Street (Figure 4a, small road).

The total pollution of the PM_{1-10} fraction with HMMs on all types of roads is at the maximum, extremely hazardous level; on small roads, it is more than two times higher than the pollution on other types of roads (Figure 3). Courtyards with parking lots are an exception: the total accumulation of HMMs in the PM_{10} fraction of road dust corresponds to a very high, very hazardous level. The contrast of all anomalies in the PM_{1-10} fraction decreases in comparison with the contrast characteristic of the PM_1 fraction. An extremely high pollution level was noted in 70% of samples. The center of the anomaly with an extremely high, extremely hazardous level of contamination of the PM_{1-10} fraction (*TPI* = 763) is located in the same place as the center of the anomaly for PM_1 (Figure 4b).

The intense accumulation of pollutants in fine dust fractions on this street is explained by the prevalence of passenger cars and passenger vehicles with relatively low speeds and intermittent traffic patterns, which contributes to an increase in the amount of pollutants entering the atmosphere. The main pollutants here are Sb and Zn, which enter the dust as part of fine particles formed by the wear of tires and brake pads; their contents are more than 100 times higher than the abundance of these elements in the upper part of the continental crust.

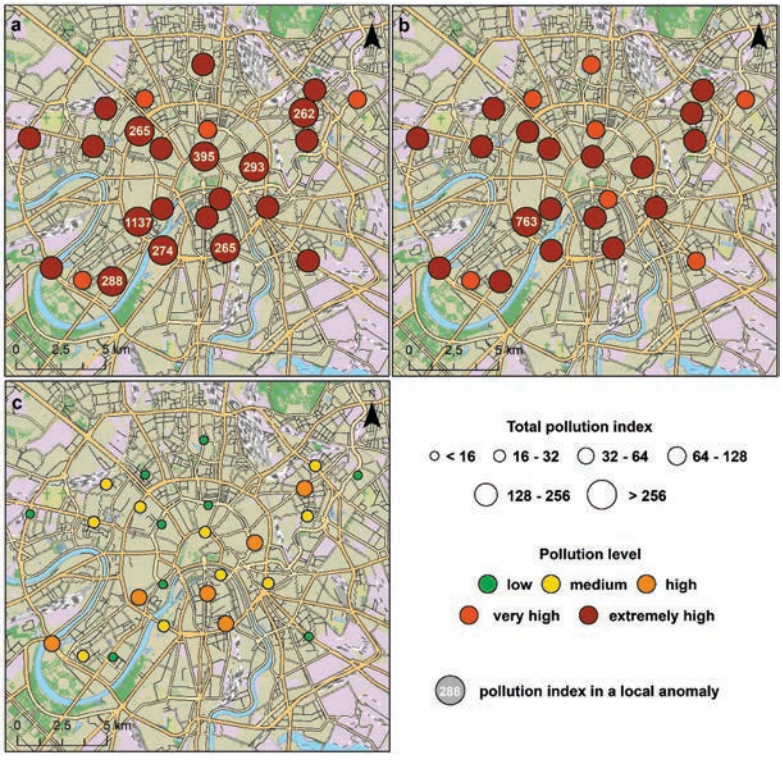

Figure 4. Spatial distribution of the total pollution index (*TPI*) of the (a) PM_1 fraction, (b) PM_{1-10} fraction, and (c) bulk mass of road dust in the CAO of Moscow.
Note: The maps are based on the authors' own analytical data.

With respect to a decrease in the average values of *TPI* in fine fractions, road types are arranged in the following sequence: SR > LR > MR ≥ TRR, i.e., except for small roads, fine fractions are heavily polluted on large roads. They compose the Garden Ring with very high traffic intensity. This sequence ends with parking lots in courtyards (Figure 3); there the traffic intensity is minimal, but the degree of road dust pollution is only slightly inferior to that on the roads. This can be explained by dense, albeit low-rise residential blocks, which often form so-called closed courtyards–wells with favorable conditions for the deposition of fine dust particles (Kosheleva et al., 2018).

Thus, the integral contamination of PM_1 and PM_{1-10} particles is an order of magnitude higher than that of road dust as a whole and is manifested in the formation of a large number of highly contrasting local multielemental anomalies.

The total pollution of road dust in the CAO with HMMs is generally low and not hazardous, except for small roads, where the total content of HMMs reaches a moderately hazardous level. The greatest contribution to the total pollution is made by Sb and Zn, as well as by Cu and Cd. In descending order of average *TPI* values in the bulk road dust mass, road types form the following sequence: SR > TTR > MR > LR. About 75% of the samples of bulk road dust mass have a low, non-hazardous, and moderate, moderately hazardous level of total pollution (Figure 4c). In the remaining 15% of sampling points, high, hazardous pollution is noted. Road sections with extremely hazardous and very hazardous levels of pollution of road dust have not been detected.

5. Conclusions

A comprehensive analysis of the chemical composition of the road dust and its fine particulate matter fractions PM_{1-10} and PM_1 in the Central Administrative Okrug of Moscow allows us to draw the following conclusions. Road dust in the okrug is characterized by moderate accumulation of Sb, Zn, Cu, Cd, Mo, Sn, Pb, and Bi relative to the upper part of the continental crust with significant variability in the contents of these elements due to the participation of many anthropogenic and natural sources, including roadside soils and atmospheric fallout, in the formation of road dust. In the fine fractions, the contents of these elements are, on average, an order of magnitude higher, and the spatial variability is lower. A greater enrichment of fine fractions of road dust with HMMs can be explained by their high sorption capacity, and the reduction in variability can be explained by a greater homogeneity of particles coming predominantly from vehicle emissions.

The priority pollutants accumulating in the road dust are Sb, Zn, Cu, and Cd; for fine fractions, this list is expanded by Mo, Sn, Bi, Pb, and W. All of these elements are undoubtedly of technogenic origin, as indicated by the high values of the enrichment factor *EF*, and come primarily from non-exhaust and exhaust emissions of motor vehicles. The presence of As, Ni, Fe, Cr, V, and Co in road dust has a mixed natural-technogenic genesis (building materials and dust, particles of contaminated soils). Minimum enrichment of road dust with Mn, La, Ba, Sc, Rb, Be, and Sr indicates the predominance of natural sources of these elements (particles of soil-forming rocks, various mixtures used to replace contaminated soils, etc.).

The differences in the bulk contents of HMMs in the road dust sampled from the roads with different traffic intensities are small and are manifested only for elements entering

mainly with vehicle emissions. The highest concentrations of HMMs are observed on small roads, the lowest on large roads, and in courtyards with parking lots. In the PM_{1-10} fraction of road dust, the contents of HMMs increase several times in the road dust and by an order of magnitude in in the PM_1 fraction, while the differences in the content of priority pollutants on the roads with different traffic intensities become more contrasting due to the intensity, average speed, traffic mode, vehicle fleet, and the frequency of traffic jams.

The greatest environmental hazard is represented by the PM_1 fraction of road dust, in which the highest frequencies *P* and the highest rates of excess of sanitary and hygienic standards (*Ko*) were detected for individual elements. On different types of roads, the *P* and *Ko* indicators vary quite significantly, reaching maximum values for most elements on small roads and decreasing to minimum values on the Third Ring Road. In the PM_{1-10} fraction, the frequency and multiplicity of exceeding the MPC/TPC generally decrease, but not significantly. The content of HMMs in the bulk road dust mass is characterized by a further decrease in the environmental hazard.

The contamination of fine fractions PM_1 and PM_{1-10} is an order of magnitude higher than that of road dust as a whole and manifests itself in the formation of high-contrast multielemental anomalies on small and large roads. The PM_1 fraction is most dangerously polluted with the association of toxic elements; extremely high and extremely hazardous contamination of the PM_1 fraction was found in about 85% of samples, the average integral pollution index *TPI* value for the okrug is 1.4 times higher than that of the PM_{10} fraction. In the road dust as a whole, only 25% of samples have a high, hazardous level of the integral contamination. The dust on large roads is the least polluted due to the high speed of movement, which contributes to the blowing out of small fractions.

The obtained results showed the importance of monitoring the chemical composition of road dust and its fine fractions in large cities, which gives an integral characteristic of the quality of the urban environment that reflects the influence primarily of non-exhaust and exhaust emissions of motor vehicles. A comparison of the contents of HMMs in the road dust as a whole and in its fine particulate matter fractions revealed a significantly, by order of magnitude, higher accumulation of pollutants in the latter, which indicates the need to control their trace element composition of fine particles.

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References

Acosta, J.A., Gabarrón, M., Faz, A., Martínez-Martínez, S., Zornoza, R., & Arocena, J.M. (2015). Influence of population density on the concentration and speciation of metals in the soil and street dust from urban areas. *Chemosphere*, *134*, 328–337. https://doi.org/10.1016/j.chemosphere.2015.04.038

Alekseeva, L.I., Varentsov, M.I., Gorbarenko, E.V., Gorlach, I.A., Eremina, I.D., Zhdanova, E.Yu., Kirsanov, A.A., Kislov, A.V., Konstantinov, P.I., Korneva, I.A., Lokoshchenko, M.A., Nezval, E.I., Revokatova, A.P., Rivin, G.S., Samsonov, T.E., Soshinskaya, I.V., Chubarova, N.E., & Shilovtseva, O.A. (2017). *Climate of Moscow in the Context of Global Warming.* Moscow University Publishing House. (in Russian)

Alves, C.A., Evtyugina, M., Vicente, A.M.P., Vicente, E.D., Nunes, T.V., Silva, P.M.A., Duarte, M.A.C., Pio, C.A., Amato, F., & Querol, X. (2018). Chemical profiling of PM_{10} from urban road dust. *Science of the Total Environment*, *634*, 41–51. https://doi.org/10.1016/j.scitotenv.2018.03.338

Amato, F., Alastuey, A., Karanasiou, A., Lucarelli, F., Nava, S., Calzolai. G., Severi, M., Becagli, S., Gianelle, V.L., Colombi, C., Alves, C., Custódio, D., Nunes, T., Cerqueira, M., Pio, C., Eleftheriadis, K., Diapouli, E., Reche, C., Minguillón, M.C, … Querol, X. (2016). AIRUSE–LIFE+: A harmonized PM speciation and source apportionment in five southern European cities. *Atmospheric Chemistry and Physics*, *16*, 3289–3309. https://doi.org/10.5194/acp-16-3289-2016

Amato, F., Pandolfi, M., Moreno, T., Furger, M., Pey, J., Alastuey, A., Bukowiecki, N., Prevot, A.S.H., Baltensperger, U., & Querol, X. (2011). Sources and variability of inhalable road dust particles in three European cities. *Atmospheric Environment*, *45*, 6777–6787. https://doi.org/10.1016/j.atmosenv.2011.06.003

Bezberdaya, L.A., Enchilik, P.R., Kosheleva, N.E., Vasilchuk, Dzh. Yu., Semenkov, I.N., Vlasov, D.V., & Kasimov, N.S. (2023, December 5–7). *Metodika vydeleniya granulometricheskikh fraktsiy pochv i pyli metodom tsentrifugirovaniya* [Methodology for isolating granulometric fractions of soils and dust by centrifugation]. International Symposium "Engineering Ecology-2023". Moscow, Russia. https://istina.fnkcrr.ru/publications/article/604546285/

Bityukova, V.R., & Mozgunov, N.A. (2019). Spatial features transformation of emission from motor vehicles in Moscow. *Geography, Environment, Sustainability*, *12*(4), 57–73. https://doi.org/10.24057/2071-9388-2019-75

Department of Nature Management and Environmental Protection of the City of Moscow. (2024). Doklad o sostoyanii okruzhayushchey sredy v Moskve v 2023 godu [Report on the state of the environment in Moscow in 2023]. https://www.mos.ru/upload/content/files/6232cd0cea91794c6250a02e8c371737/Gosdoklad2023_0507.pdf

Department of the Federal State Statistics Service for Moscow and the Moscow Region. (2024). Otsenka chislennosti naseleniya Moskvy na 1 yanvarya 2024 goda i srednyaya za 2023 god [The estimate of the population of Moscow as of January 1, 2024 and the average for 2023]. https://77.rosstat.gov.ru/folder/64634

Fussell, J.C., Franklin, M., Green, D.C., Gustafsson, M., Harrison, R.M., Hicks, W., Kelly, F.J., Kishta, F., Miller, M.R., Mudway, I.S., Oroumiyeh, F., Selley, L., Wang, M., & Zhu, Y. (2022). A Review of Road Traffic-Derived Non-Exhaust Particles: Emissions, Physicochemical Characteristics, Health Risks, and Mitigation Measures. *Environmental. Science and Technology*, *56*, 6813–6835. https://doi.org/10.1021/acs.est.2c01072

Gerasimova, M. I., Stroganova, M. N., Mozharova, N. V., & Prokof'eva, T. V. (2003). Antropogennye pochvy: genezis, geografiya, rekul'tivatsiya. [Anthropogenic soils: genesis, geography, and reclamation]. Smolensk, Oykumena (in Russian).

Golokhvast, K.S., Vitkina, T.I., Gvozdenko, T.A., Kolosov, V.P., Yankova, V.I., Kondratieva, E.V., Gorkavaya, A.V., Nazarenko, A.V., Chaika, V.V., Romanova, T.Yu., Karabtsov, A.A., Perelman, Yu.M., & Kiku, P.F. (2015). Impact of atmospheric microparticles on the development of oxidative stress in healthy city industrial seaport residents. *Oxidative Medicine and Cellular Longevity*, *2015*(1), Article 412173. https://doi.org/10.1155/2015/412173

Grigoratos, T., & Martini, G. (2015). Brake wear particle emissions: a review. *Environmental Science and Pollution Research*, *22*, 2491–2504.

Harrison, R.M., Allan, J., Carruthers, D., Heal, M.R., Lewis, A.C., Marner, B., Murrells, T., & Williams, A. (2021). Non-exhaust vehicle emissions of particulate matter and VOC from road traffic: A review. *Atmospheric Environment*, *262*, Article 118592. https://doi.org/10.1016/j.atmosenv.2021.118592

Haynes, H.M., Taylor, K.G., Rothwell, J., & Byrne, P. (2020). Characterisation of road-dust sediment in urban systems: a review of a global challenge. *Journal of Soils and Sediments*, *20*, 4194–4217. https://doi.org/10.1007/s11368-020-02804-y

International Organization for Standardization (2016). ISO 17025:2017 - General requirements for the competence of testing and calibration laboratories. Edition 3.

International Organization for Standardization (2016). ISO 17034:2016 - General requirements for the competence of reference material producers. Edition 1.

Ishkov, A.G., & Ilyin, I.N. (2000). *Ecological Atlas of Moscow*. ABF. (in Russian)

Ivaneev, A., Brzhezinskiy, A., Karandashev, V., Fedyunina, N., Ermolin, M., & Fedotov, P. (2024). Nanoparticles of dust as an emerging contaminant in urban environments. *Environmental Geochemistry and Health*, *46*, Article 367. https://doi.org/10.1007/s10653-024-02139-4

Ivaneev, A.I., Brzhezinskiy, A.S., Karandashev, V.K., Ermolin, M.S., & Fedotov, P.S. (2023). Assessment of s ources, environmental, ecological, and health risks of potentially toxic elements in urban dust of Mo scow megacity, Russia. *Chemosphere*, *321*, Article 138142. https://doi.org/10.1016/j.chemosphere.202 3.138142

Jayarathne, A., Egodawatta, P., Ayoko, G.A., & Goonetilleke, A. (2017). Geochemical phase and particle size relationships of metals in urban road dust. *Environmental Pollution*, *230*, 218-226. https://doi.org/10.1016/j.envpol.2017.06.059

Kasimov, N.S., Kosheleva, N.E., Popovicheva, O.V., Vlasov, D.V., Shinkareva, G.L., Erina, O.N., Chalov, S.R., Chichaeva, M.A., Kovach, R.G., Zavgorodnyaya, Yu.A., & Lychagin, M.Yu. (2023). Moscow megacity pollution: Monitoring of chemical composition of microparticles in the atmosphere–snow–road dust–surface water–soil system. *Russian Meteorology and Hydrology*, *48*(5), 393–403. https://doi.org/10.3103/S1068373923050011

Kasimov, N.S., Kosheleva, N.E., Vlasov, D.V., Nabelkina, K.S., & Ryzhov, A.V. (2019). Physicochemical properties of road dust in Moscow. *Geography, Environment, Sustainability*, *12*(4), 96–113. https://doi.org/10.24057/2071-9388-2019-55

Kasimov, N.S., Vlasov, D.V., & Kosheleva, N.E. (2020). Enrichment of road dust particles and adjacent environments with metals and metalloids in eastern Moscow. *Urban Climate*, *32*, Article 100638. https://doi.org/10.1016/j.uclim.2020.100638

Kasimov, N.S., Vlasov, D.V., Kosheleva, N.E., & Nikiforova, E.M. (2016). *Geochemistry of Landscapes of Eastern Moscow*. APR Moscow. (in Russian)

Khademi, H., Gabarrón, M., Abbaspour, A., Martínez-Martínez, S., Faz, A., & Acosta, J.A. (2020). Distribution of metal(loid)s in particle size fraction in urban soil and street dust: influence of population density. *Environmental Geochemistry and Health*, *42*, 4341–4354. https://doi.org/10.1007/s10653-020-00515-4

Kong, S., Lu, B., Ji, Y., Zhao, X., Bai, Z., Xu, Y., Liu, Y., & Jiang, H. (2012). Risk assessment of heavy metals in road and soil dusts within PM2.5, PM10 and PM100 fractions in Dongying City, Shandong Province, China. *Journal of Environmental Monitoring*, *14*, 791–803. https://doi.org/10.1039/c1em10555h

Kosheleva, N.E., Vlasov, D.V., Korlyakov, I.D., & Kasimov, N.S. (2018). Contamination of urban soils with heavy metals in Moscow as affected by building development. *Science of the Total Environment, 636*, 854–863. https://doi.org/10.1016/j.scitotenv.2018.04.308

Kulbachevskii A.O. (Ed.). (2023). *Report on the State of the Environment in Moscow in 2022*. Department of Nature Management and Environmental Protection of Moscow Government. (in Russian)

Ladonin, D.V., & Mikhaylova, A.P. (2020). Heavy metals and arsenic in soils and street dust of the Southeastern administrative district of Moscow: Long-term data. *Eurasian Soil Science, 53*(11), 1635–1644. https://doi.org/10.1134/S1064229320110095

Ladonin, D.V., & Plyaskina, O.V. (2009). Isotopic composition of lead in soils and street dust in the Southeastern administrative district of Moscow. *Eurasian Soil Science, 42*(1), 93–104. https://doi.org/10.1134/S1064229309010128

Lanzerstorfer, C. (2018). Heavy metals in the finest size fractions of road-deposited sediments. *Environmental Pollution*, *239*, 522–531. https://doi.org/10.1016/j.envpol.2018.04.063

Long, Z., Zhu, H., Bing, H., Tian, X., Wang, Z., Wang, X., & Wu, Y. (2021). Contamination, sources and health risk of heavy metals in soil and dust from different functional areas in an industrial city of Panzhihua City, Southwest China. *Journal of Hazardous Materials*, *420*, Article 126638. https://doi.org/10.1016/j.jhazmat.2021.126638.

NSAM № 499 AES/MS. (2015). *Determination of the elemental composition of rocks, soils and bottom sediments by atomic emission and mass spectral methods with inductively coupled plasma*. VIMS, Moscow, Russia (in Russian)

Official website of the Mayor of Moscow. (2020, February 25). *Redevelopment of the industrial zone in the Central Administrative District allowed almost 600 thousand square meters of real estate to be put into operation*. https://www.mos.ru/news/item/70057073/

Our World in Data (2023). Share of the population living in urban areas [Interactive Maps]. Retrieved from https://ourworldindata.org/grapher/urban-population-share-2050

Popov, A.A., Saulskaya, T.D., & Shatilo, D.P. (2016). The Industrial Zones as a Factor of Ecological Situation and Housing Prices Variation in Moscow. *Ecology and Industry of Russia*, *20*(2), 32–38. https://doi.org/10.18412/1816-0395-2016-2-32-38

Prokofieva, T.V., Shishkov, V.A., Kiryushin, A.V., & Kalushin, I.Yu. (2015). Properties of solid (dust and aerosol) fallout in roadside areas in Moscow. *Izvestiya Rossiiskoi Akademii Nauk. Seriya Geograficheskaya*, *3*, 107–120. https://doi.org/10.15356/0373-2444-2015-3-107-120 (in Russian)

Ramirez, O., Sánchez de la Campa, A.M., Amato, F., Moreno, T., Silva, L.F., & de la Rosa, J.D. (2019). Physicochemical characterization and sources of the thoracic fraction of road dust in a Latin American megacity. *Science of the Total Environment, 652*, 434–446. https://doi.org/10.1016/j.scitotenv.2018.10.214.

Revich, B.A. (2018). Fine suspended particles in the atmospheric air and their impact on the health of residents of megacities. *Problems of Ecological Monitoring and Ecosystem Modeling*, *29*(3), 53–78 (in Russian).

Rienda, I.C., & Alves, C.A. (2021). Road dust resuspension: A review. *Atmospheric Research*, *261*, Article 105740. https://doi.org/10.1016/j.atmosres.2021.105740

Rudnick, R.L., & Gao, S. (2014). Composition of the continental crust. In H.D. Holland, & K.K. Turekian (Eds.), *Treatise on Geochemistry* (pp. 1-51). Elsevier Science.

SanPiN 2.1.3684-21. (2021). Hygienic Standards and Requirements for Ensuring the Safety and (or) Harmlessness of Environmental Factors for Humans. p.990 (In Russian).

Saulskaya, T.D. (2018). Renovation of industrial zones in Moscow and its environmental assessment. *Izvestiya Rossiiskoi Akademii Nauk. Seriya Geograficheskaya*, *1*, 63-74. https://doi.org/10.7868/S258755661801006X

Seleznev, A., Ilgasheva, E., Yarmoshenko, I., & Malinovsky, G. (2021). Coarse Technogenic Material in Urban Surf ace Deposited Sediments (USDS). *Atmosphere*, *12*(6), Article 754. https://doi.org/10.3390/atmos12060754

Sutherland, R.A. (2000). Bed sediment-associated trace metals in an urban stream, Oahu, Hawaii. *Environmental geology, 39*(6), 611–627. https://doi.org/10.1007/s002540050473

Tager, I.B. (2004). Health effects of aerosols: Mechanisms and epidemiology. In L.S. Ruzer, & N.H. Harley (Eds.), *Aerosols Handbook: Measurement, Dosimetry, and Health Effects* (pp. 565-637). CRC Press.

Tanner, P.A., Ma, H.-L., & Peter, K.N.Yu. (2008). Fingerprinting Metals in Urban Street Dust of Beijing, Shanghai, and Hong Kong. *Environmental Science and Technology*, *42*, 7111–7117.

Varentsov, M., Wouters, H., Platonov, V., & Konstantinov, P. (2018). Megacity-Induced Mesoclimatic Effects in the Lower Atmosphere: A Modeling Study for Multiple Summers over Moscow, Russia. *Atmosphere*, *9*(2), Article 50. https://doi.org/10.3390/atmos9020050

Vlasov, D., Kosheleva, N., & Kasimov, N. (2021). Spatial distribution and sources of potentially toxic elements in road dust and its PM10 fraction of Moscow megacity. *Science of the Total Environment, 761*, Article 143267. https://doi.org/10.1016/j.scitotenv.2020.143267

Vlasov, D.V., Kukushkina, O.V., Kosheleva, N.E., & Kasimov, N.S. (2022). Levels and factors of the accumul ation of metals and metalloids in roadside soils, road dust, and their PM10 fraction in the western ok rug of Moscow. *Eurasian Soil Science*, *55*(5), 556–572. https://doi.org/10.1134/S1064229322050118

Vlasov, D.V., Vasilchuk, J.Yu., Kosheleva, N.E., & Kasimov, N.S. (2023). Contamination levels and source apportionment of potentially toxic elements in size-fractionated road dust of Moscow. *Environmental Science and Pollution Research*, *30*, 38099–38120. https://doi.org/10.1007/s11356-022-24934-1

Wang, H.-Z., Cai, L.-M., Wang, Q.-S., Hu G.-C., & Chen L.-G. (2021). A comprehensive exploration of risk assessment and source quantification of potentially toxic elements in road dust: A case study from a large Cu smelter in central China. *Catena*, *196*, Article 104930. https://doi.org/10.1016/j.catena.2020.104930

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DYNAMICS OF MOTORIZATION AND FACTORS OF LOCAL TERRITORIAL DISTRIBUTION OF THE RUSSIAN VEHICLE FLEET: THE CASE STUDY OF THE CITY OF MOSCOW

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Abstract: Road transport is one of the largest sources of atmospheric pollution. In recent years, there has been an increase in the passenger car fleet in Russia, while Moscow is one of the motorization leaders. Data from the Federal Tax Service of Russia were used to analyze the local distribution of the fleet. As of 2023 the new settlements of Moscow (territories integrated in 2012 in the south–west with an area of 1,480 km^2) are distinguished by the highest levels of motorization for all land vehicles. This is due to the population living in the suburban area, as well as the relatively weak development of public transport. Among the districts of Moscow in previous period (until 2012), the center and adjacent districts of the capital were distinguished by the level of motorization. According to the number of trucks, the central districts of Moscow differ, which is due to the accumulation of places of registration of legal entities (including branches of SUE Mosgortrans and other carriers). Thus, the distribution of the fleet on the territory of Moscow depends on the following factors: the population and its income, the degree of development of public transport (for passenger vehicles), registration of legal entities, owners of cars, and the distribution of transportation infrastructure.

Keywords: motorization, vehicle fleet, territorial distribution, Moscow

1. Introduction

Motorization is one of the main features of modern urban development. The spread of motor transport leads to increased mobility of urban residents and accelerated economic growth, however, it also has negative consequences. Higher levels of motorization lead to an increased impact on infrastructure. The increase in car use exceeding the development of road infrastructure is associated with an increase in the prevalence of road accidents, which is confirmed by the examples from Indonesia (Soehodho, 2007), Oman (Islam & Al Hadhrami, 2012), Iran (Naghavi et al., 2009), the countries of the European Union (Peleckiene et al., 2022), certain regions of Russia (Pechatnova & Kuznetsova, 2019). Motorization, combined with the process of post-industrialization of the economy, leads to an increase in the impact of motor transport on the environmental situation in cities. In particular, in three-quarters of Russian cities, motor transport accounts for more than half of atmospheric emissions (Bityukova, 2019), and in Moscow it accounts for over 93% (Bityukova & Mozgunov, 2019). The total economic damage from cars is estimated at 3.7 rubles per car-kilometer (Hovavko, 2012).

A significant body of research is devoted to the study of motorization in developing countries—for them, the rapid growth of the fleet is most relevant. These are studies on both developing countries in general (Kutzbach, 2009), Asian countries (Kitamura & Mohamad, 2009; Senbil et al., 2007), in particular cities in India (Shirgaokar, 2014), and China (Zhao, 2014). The focus of research is most often on aspects of the transport behavior of citizens, growth factors of motorization, and related effects. These studies show a high correlation between the level of motorization and population density, the influence of personal vehicles on reducing the use of public transport as a result of traffic jams and congestion, etc.

The increase in the level of motorization is also characteristic of Russia, while significant differences in this process between regions are noted (Tarhov, 2004); the leaders are the "capitals"—Moscow and Saint Petersburg, as well as the most economically developed regions. In conditions of the high influence of motor transport on the ecological state in cities, it is relevant to study the local distribution of motor transport within their borders. At the same time, from the point of view of data availability and environmental impact, the most suitable case is the city of Moscow.

2. Materials and methods

Data from several information databases were used. The Unified Interdepartmental Information and Statistical System (UIISS, 2024a, 2004b) and statistical collections of Federal State Statistics Service (Rosstat, 2024a) served as a source of data in the context of Russia as whole and individual subjects of the Federation. This information was processed using basic statistical analysis methods.

To analyze the distribution of the fleet and the level of motorization (number of vehicles per 1,000 inhabitants) at the level of individual districts of the city of Moscow and data from the forms of tax reporting on transport tax (5-TN) of the Federal Tax Service of Russia (2023) were used. The primary processing and aggregation of data was carried out in the R environment. The analysis was carried out using cartographic and statistical methods. To calculate the level of motorization, the data from the demographic statistics of Rosstat (2022; 2024b) were used.

3. Results

3.1. Moscow on the background of other regions of Russia

The increase in the number of cars is a long-term trend for Russia: over the period 2008–2023, the country's fleet increased 1.5 times: from 38.3 million cars to 59.4 million cars (UIISS, 2024a). At the same time, the number of passenger cars increased 1.6 times, trucks 1.3 times, and the number of buses, on the contrary, decreased by 10%. Similar trends were also evident at the level of individual regions.

The leaders among the regions of Russia in terms of fleet size are Moscow and the Moscow Region, which together form the Moscow Metropolitan Region, the largest urban agglomeration of the country (Figure 1). Together, the capital region accounts for 13.6% of the all-Russian fleet. At the same time, the growth in the number of cars in the capital region was slower than in other regions, due to which the share of Moscow and the Moscow Region in the all-Russian fleet decreased from 15.2% in 2008 to 13.6% in 2023.

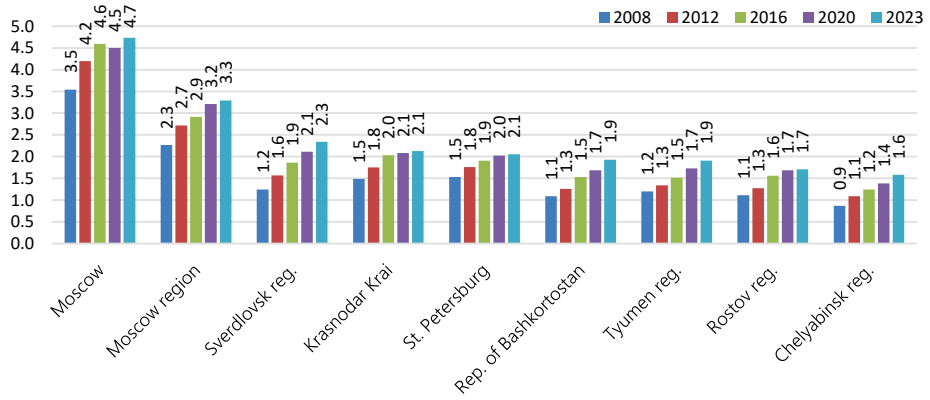

Figure 1. The dynamics of the fleet in nine leading regions, million autos.
Note. Data in the figure are calculated based on *Availability of road transport* by UIISS, 2024. (https//fedstat.ru/ndicator/31556.html).

On average, the level of motorization in Russia's regions is also growing: in 2008–2023, it increased 1.5 times. The level of motorization of the regions, unlike the size of the fleet, does not directly depend on the level of economic development of the region: the regions of the Far East, characterized by weak development of public transport and a high level of involvement of vehicles in the economy, especially in resource extraction, have the highest levels. The levels of motorization in Moscow and the Moscow region are lower than the national average (Figure 2), which is due to, firstly, the high level of development of public transport, characteristic of the agglomeration, and secondly, the small role of industry in the structure of the economy. Similar trends are noted when considering the level of availability of own cars (Rosstat, 2024a).

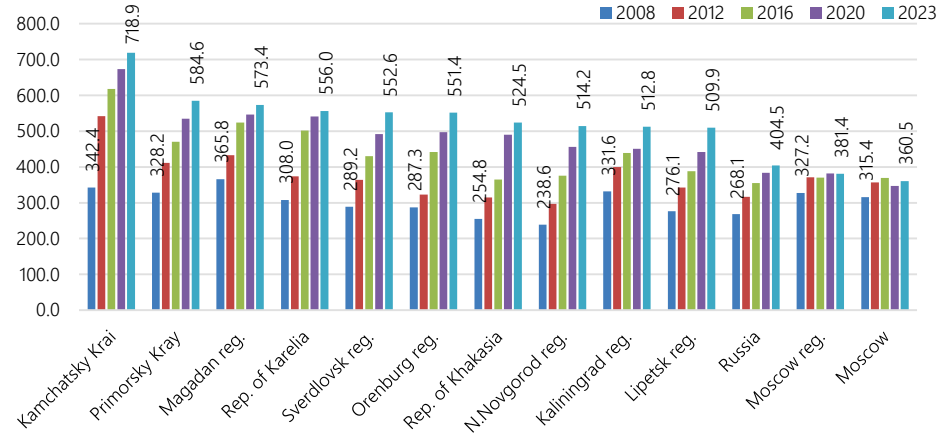

Figure 2. Dynamics of the level of motorization in the leading regions, vehicles/1000 people.
Note. Data in the figure were calculated based on Availability of road transport by UIISS, 2024a. (https//fedstat.ru/ndicator/31556.html); Average annual resident population by UIISS, 2024b (https//fedstat.ru/indicator/36228.html).

3.2. Dynamics of the fleet and motorization of Moscow

As of the beginning of 2023, the Moscow automobile fleet totals 4,607.5 thousand units, of which 89.8% are passenger cars, 9.2% trucks, and 1.0% buses. Compared to 2021, the number of registered vehicles in 2022 decreased by 2.4 thousand: the passenger car fleet declined by 16.7 thousand vehicles, while the number of cargo vehicles increased by 14.3 thousand. The reduction was mainly due to passenger transport. The reduction in the number of passenger cars may be the result of the withdrawal of a number of foreign manufacturers from the Russian market and a significant increase in the price of vehicles (up to 20% in 2022 and up to 23% in 2023) (Timerkhanov, 2024).

The maximum annual increase in the number of cars (19.1% per year) was observed in the early 1990s, then the situation stabilized somewhat, until in 1996 the increase began to slow down (Figure 3). Over the period 2011–2013, the rate of increase in the city's fleet decreased to 2–5% on average per year, which indicates market saturation. After 2014, a drop in population income, the personal fleet decreased by 8%, and the fleet of organizations by 6%. Thus, the average increase in the fleet in 2014–2022 slowed down compared to the earlier period and amounted to about 33,000 vehicles/year, or 0.8% of the fleet (before 2013, the increase was higher and amounted to about 153 thousand vehicles/year, or 4% of the fleet). In general, over the period from 2013 to 2023, the city's fleet increased by 306,000 units (6.9%), while the number of buses decreased by 9,800 thousand units.

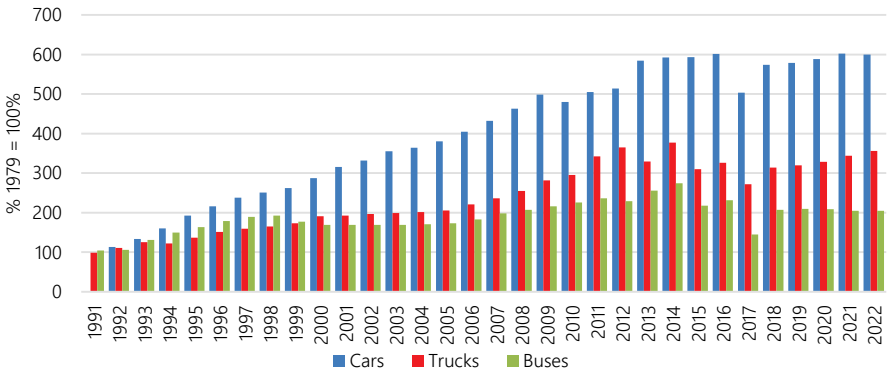

Figure 3. Changes in the motorization of the population of Moscow 1990–2022.
Note. Data in figure are calculated based on *Transport v Rossii 2023: statisticheskij sbornik* [Transport in Russia 2023: statistical handbook], by Rosstat, 2024a; *Demograficheskij ezhegodnik Rossii* 2023: statisticheskij sbornik [The Demographical Yearbook of Russia 2023: statistical handbook], by Rosstat, 2024b.

3.3. Motorization in the districts of Moscow

The level of motorization in the Moscow districts (Federal Tax Service of Russia, 2023; UIISS, 2024b) differs by 5.8 times: over 700 cars per 1,000 people are registered in the settlements of Vnukovskoye, Pervomayskoye, Sosenskoye, Zamoskvoretsky, and Danilovsky districts, while less than 250 cars per 1,000 people in the settlements of Kokoshkino and Kievsky, the districts of East Izmailovo, Kapotnya, Severnoye Tushino, Vostochny, Severnoye Medvedkovo, Kuzminki, Izmailovo, Orekhovo-Borisovo Severnoye, Brateevo, and Nagatinsky Zaton (Figure 4).

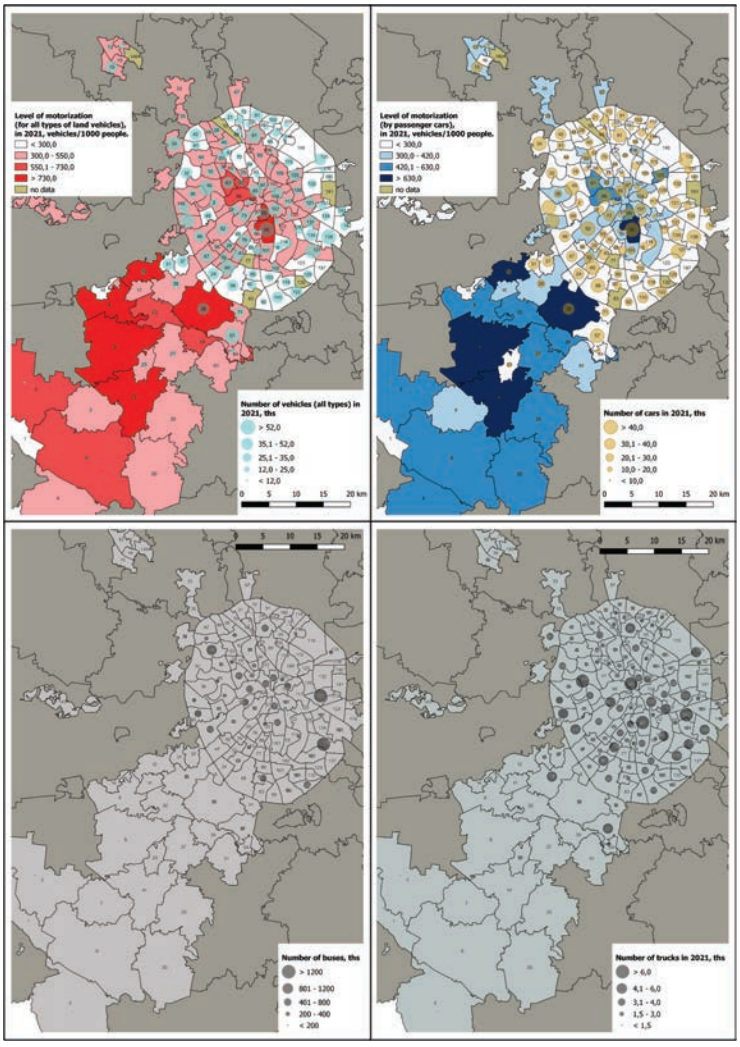

Figure 4. Number of registered vehicles and the level of motorization in Moscow municipalities. *Note.* Data in the figure are calculated based on *Data on statistical tax reporting forms – FTS of Russia Directorate in Moscow – Report on the tax base and structure of charges for transport tax* by FTS of Russia, 2023 (https://www.nalog.gov.ru/rn77/related_activities/statistics_and_analytics/forms/); *Population of the Russian Federation by municipalities as of January 1, 2022 (statistical bulletin),* by Rosstat, 2022. (https://rosstat.gov.ru/storage/mediabank/Chisl_nasel_RF_MO_01-01-2022.xlsx). The numbers indicate the districts (municipal entities) of Moscow[1].

[1]Municipal entities of City of Moscow (as for April 30, 2024): 1–Kievsky settlement, 2–Filevsky Park municipal district, 3–Novofedorovskoye settlement, 4–Rogovskoye settlement, 5–Mosrentgen settlement, 6–Voronovskoye settlement, 7–Mikhailovo-Yartsevskoye settlement, 8–Marushkinskoye settlement, 9–Pervomayskoye settlement, 10–Matushkino municipal district, 11–Vnukovo municipal District, 12–Vnukovo settlement, 13–Silino municipal district, 14–Kokoshkino settlement, 15–Kryukovo Municipal District, 16–Shchukino municipal District, 17–Krasnopakhorskoye settlement, 18–Nagatinsky Zaton municipal district, 19–Staroe Kryukovo Municipal District, 20–Klenovskoye settlement, 21–Dmitrovsky Municipal District, 22–Filimonkovskoye settlement, 23–Troitsk urban District, 24–Teply Stan Municipal District, 25–Shchapovskoye settlement, 26–Moskovsky settlement, 27–Desenovskoye settlement, 28–Khovrino Municipal District, 29–Lomonosovsky Municipal District, 30–Mozhaisky Municipal District, 31–Novo-Peredelkino municipal District, 32–Strogino municipal District, 33–

The settlements of New Moscow are distinguished by the highest levels of motorization for all land vehicles: Vnukovskoye, Sosenskoye, and Pervomaisky, which is due to statistical distortion caused by the underestimation of the population living in the suburban area, as well as the relatively weak development of public transport (compared with Old Moscow). Among the districts of Old Moscow, the center and adjacent districts of the capital are distinguished by the level of motorization: Danilovsky (750 vehicles/1,000 inhabitants), Khoroshevsky (652 vehicles/1,000 inhabitants), Presnensky (587 vehicles/1000 inhabitants), Begovoy (553 vehicles/1000 inhabitants), Tverskaya (536 vehicles/1,000 inhabitants) as presented at Figure 4.

The belt of average motorization consists of the adjacent areas (up to the Third Transport Ring) as well as areas of the west, south–west and north–west of Moscow. The lowest level is typical for the regions of the north, north–east, and south–east. A slightly different distribution is also noted when considering the absolute number of motor vehicles. The average level of polarization of the indicator is noticeable: 10% of the leading districts account for about 16% of the total fleet. The leader is the central Presnensky district (75,700 vehicles), also the regions of the semi-periphery and periphery of Moscow fall into the leaders in terms of the indicator: Marino (75,700 vehicles), Danilovsky (71,600 vehicles), Yuzhnoye Butovo (67,700 vehicles), Mitino (63,500 vehicles), and Vykhino-Zhulebino (63,500 vehicles). The large size of the fleet in the central and peripheral areas is dictated by various factors: in the center this is due to the registration of a large number of legal entities and higher incomes of the population, in the periphery—difficulties with public transport.

When considering passenger vehicles separately, a higher degree of polarization of the districts is noted. The settlements of New Moscow are distinguished by the highest levels of motorization due to the previously mentioned distortion. Among the districts of Old Moscow,

Molzhaninovsky Municipal District, 34–Mitino municipal District, 35–Kurkino municipal District, 36–Krylatskoye Municipal District, 37–Solntsevo Municipal District, 38–Sosenskoye settlement, 39–Voskresenskoye settlement, 40–Golovinsky Municipal District, 41–Yuzhnoye Tushino Municipal District, 42–Severnoye Tushino Municipal District, 43–Cheryomushki Municipal District, 44–Pokrovskoye-Streshnevo Municipal District, 45–Khoroshevo Municipal District–Mnevniki, 46–Ochakovo-Matveevskoye Municipal District, 47–Troparevo-Nikulino municipal District, 48–Levoberezhny Municipal District, 49–Fili–Davydkovo municipal District, 50–Obruchevsky Municipal District, 51–Ryazanovskoye settlement, 52–Ramenki Municipal District, 53–Voykovsky Municipal District, 54–Sokol Municipal District, 55–Zapadnoye Degunino Municipal District, 56–Vernadsky Prospekt Municipal District, 57–Yuzhnoye Butovo Municipal District, 58–Yasenevo Municipal District, 59–Dorogomilovo Municipal District, 60–Konkovo Municipal District, 61–Khoroshevsky Municipal District, 62–Begovoy Municipal District, 63–Koptevo municipal District, 64–Shcherbinka urban district, 65–Aeroport municipal District, 66–Presnensky Municipal District, 67–Severny Municipal District, 68–Beskudnikovsky Municipal District, 69–Gagarinsky Municipal District, 70–Timiryazevsky Municipal District, 71–Severnoe Butovo Municipal District, 72–Lianozovo Municipal District, 73–Khamovniki Municipal District, 74–Vostochnoye Degunino Municipal District, 75–Savelovsky Municipal District, 76–Academicheskiy Municipal District, 77–Zyuzino Municipal District, 78–Altufyevsky Municipal District, 79–Marfino municipal District, 80–Chertanovo Tsentralnoye Municipal District, 81–Otradnoye Municipal District, 82–Arbatskiy Municipal District, 83–Chertanovo Yuzhnoye Municipal District, 84–Butyrsky Municipal District, 85–Tverskoy Municipal District, 86–Chertanovo Severnoye Municipal District, 87–Yakimanka Municipal District, 88–Kotlovka Municipal District, 89–Ostankinsky Municipal District, 90–Donskoy Municipal District, 91–Bibirevo Municipal District, 92–Biryulyovo Zapadnoye Municipal District, 93–Marina Roscha Municipal District, 94–Nagorny Municipal District, 95–Sviblovo Municipal District, 96–Danilovsky Municipal District, 97–Meshchansky Municipal District, 98–Yuzhnoye Medvedkovo Municipal District, 99–Zamoskvorechye Municipal District, 100–Severnoye Medvedkovo Municipal District, 101–Nagatino-Sadovniki Municipal District, 102–Moskvorechye-Saburovo Municipal District, 103–Tsaritsyno Municipal District, 104–Basmanny Municipal District, 105–Krasnoselsky Municipal District, 106–Rostokino Municipal District, 107–Tagansky Municipal District, 108–Alekseevsky Municipal District, 109–Sokol'niki Municipal District, 110–Biryulyovo Vostochnoye municipal District, 111–Babushkinsky municipal District, 112–Yuzhnoportovy Municipal District, 113–Yaroslavsky Municipal District, 114–Pechatniki Municipal District, 115–Bogorodskoye Municipal District, 116–Metrogorodok Municipal District, 117–Lefortovo Municipal District, 118–Orekhovo-Borisovo Severnoye Municipal District, 119–Losinoostrovsky Municipal District, 120–Nizhegorodskiy Municipal District, 121–Perovo Municipal District, 122–Orekhovo-Borisovo Yuzhnoye Municipal District, 123–Marino Municipal District, 124–Veshnyaki municipal District, 125–Preobrazhenskoye Municipal District, 126–Sokolinaya Gora Municipal District, 127–Lyublino Municipal District, 128–Tekstilschiki Municipal District, 129–Brateevo Municipal District, 130–Zyablikovo Municipal District, 131–Ryazansky Municipal District, 132–Izmailovo Municipal District, 133–Novogireevo Municipal District, 134–Kuzminki Municipal District, 135–Golyanovo Municipal District, 136–Severnoye Izmailovo Municipal District, 137–Kapotnya Municipal District, 138–Vykhino-Zhulebino Municipal District, 139–Vostochny Municipal District, 140–Vostochnoye Izmailovo Municipal District, 141–Ivanovskoye Municipal District, 142–Kosino-Ukhtomsky municipal District, 143–Novokosino municipal District, 144–Nekrasovka municipal District, 145–Kuntsevo municipal district, 146–Savelki municipal formation.

the central, and adjacent districts stand out: Danilovsky (654 vehicles/1,000 inhabitants), Zamoskvoretsky (579 vehicles/1,000 inhabitants), Khoroshevsky (467 vehicles/1,000 inhabitants), Presnensky (467 vehicles/1,000 inhabitants), Preobrazhensky (424 vehicles/1,000 inhabitants), which is due to higher incomes of the population, as well as the registration of departmental vehicles. In absolute terms, the leaders are the districts of Marino (67,500 vehicles), Danilovsky (61,700 vehicles), Yuzhnoye Butovo (60,200 vehicles), Presnensky (60,100 vehicles), and Mitino (57,300 vehicles). Passenger cars make up most of the fleet in the leading districts (80–90%).

According to the number of trucks, the central districts of Moscow are distinguished, which is due to the accumulation of places of registration of legal entities. According to the number of trucks, Presnensky (11,300 vehicles), Khoroshevsky (8,500 vehicles), Zamoskvoretsky (8,400 vehicles), Basmanny (8,400 vehicles), and Danilovsky (6,6000 vehicles) (Figure 4).

The five leading districts concentrate 12% of the total truck fleet, the first ten leading districts—20%. At the same time, these figures should be assessed with some degree of conditionality, since such a concentration is due to the registration of legal entities and cars, which does not mean their real presence in these areas.

The districts of Lublino (1,925 vehicles), Perovo (1,338 vehicles), Pokrovskoye-Streshnevo (1,117 vehicles), Presnensky (787 vehicles), and Khoroshevsky (736 vehicles) are in the lead in terms of the number of buses. These districts concentrate 19% of Moscow's bus fleet, and the top ten leading districts—30%. The distribution of buses, as in the case of trucks, depends on the registration of owners (operators) and the location of bus fleets of SUE Mosgortrans and other carrier organizations.

4. Conclusion

The Moscow metropolitan region has the highest number of registered cars among the regions of Russia. Despite the tendency to increase the size of the fleet, the growth rate in Moscow is lower, which leads to a decrease in Moscow's share in the all-Russian fleet. In terms of motorization, Moscow lags behind other regions—it is lower than the national average, which is facilitated by the high level of public transport development.

The territorial distribution of registered transport in Moscow is inversely related to the level of motorization. The distribution of the fleet across the territory of Moscow depends on the following factors: the population and its income, the degree of development of public transport (for passenger vehicles), registration of legal entities—owners of cars and the distribution of transportation infrastructure.

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References

Bityukova, V. R. (2019). *Socialno-èkologičeskie problemy razvitija gorodov Rossii*. URSS.

Bityukova, V. R., & Mozgunov, N. A. (2019). Spatial features transformation of emission from motor vehicles in Moscow. *Geography, Environment, Sustainability, 12*(4), 57–73. https://doi.org/10.24057/2071-9388-2019-75

Federal Tax Service of Russia. (2023). Data on statistical tax reporting forms – FTS of Russia Directorate in Moscow – Report on the tax base and structure of charges for transport tax [Data set]. https://www.nalog.gov.ru/rn77/related_activities/statistics_and_analytics/forms/.

Federal State Statistics Service [Rosstat]. (2022). Chislennost' naselenija Rossijskoj Federacii po municipal'nym obrazovanijam na 1 janvarja 2024 goda (statisticheskij bjulleten') [Data set]. https://rosstat.gov.ru/storage/mediabank/Chisl_nasel_RF_MO_01-01-2022.xlsx

Federal State Statistics Service [Rosstat]. (2024a). *Transport v Rossii 2023: statisticheskij sbornik*. Rosstat.

Federal State Statistics Service [Rosstat]. (2024b). *Demograficheskij ezhegodnik Rossii 2023: statisticheskij sbornik*. Rosstat.

Hovavko, I. Yu. (2012). *Internalizacija vneshnih jeffektov ot zagrjaznenija okruzhajushhej sredy v RF*. [Unpublished doctoral dissertation]. Dissercat. https://www.dissercat.com/content/internalizatsiya-vneshnikh-effektov-ot-zagryazneniya-okruzhayushchei-sredy-v-rf

Islam, M. M., & Al Hadhrami, A. Y. S. (2012). Increased motorization and road traffic accidents in Oman. *Journal of Emerging Trends in Economics and Management Sciences, 3*(6), 907–914. https://www.scholarlinkinstitute.org/jetems/articles/Increased%20Motorization%20and%20Road%20Traffic%20Accidents%20in%20Oman.pdf

Kitamura, R., & Mohamad, J. (2009). Guest Editorial Rapid motorization in Asian cities: urban transport infrastructure, spatial development and travel behavior. *Transportation, 36*, 269–274. https://doi.org/10.1007/s11116-009-9203-2

Kutzbach, M. J. (2009). Motorization in developing countries: Causes, consequences, and effectiveness of policy options. *Journal of Urban Economics, 65*(2), 154–166. https://doi.org/10.1016/j.jue.2008.10.002

Naghavi, M., Shahraz, S., Bhalla, K., Jafari, N., Pourmalek, F., Bartels, D., & Puthenpurakal, J. A. (2009). Adverse health outcomes of road traffic injuries in Iran after rapid motorization. *Archives of Iranian Medicine, 12*(3), 284–294. https://pubmed.ncbi.nlm.nih.gov/19400607/

Pechatnova, E. V., & Kuznecov, V. N. (2019). Vzaimosvjaz' pokazatelej avtomobilizacii i avarijnosti na primere regionov Sibirskogo Federal'nogo okruga. *Innovacionnyj transport, 1*, 54–57. https://biblioserver.usurt.ru/cgi-bin/irbis64r_13/cgiirbis_64.exe?LNG=&C21COM=S&I21DBN=JURN&P21DBN=JURN&S21FMT=fullwebr&S21ALL=%3C.%3EK%3D%D0%A1%D0%9E%D0%A6%D0%98%D0%90%D0%9B%D0%AC%D0%9D%D0%AB%D0%99%20%D0%A0%D0%98%D0%A1%D0%9A%3C.%3E&Z21ID=&S21SRW=TIPVID&S21SRD=UP&S21STN=1&S21REF=&S21CNR=20

Peleckiene, V., Peleckis, K., Klymchuk, A., Tomashuk, I., & Semenyshina, I. (2022). Economic growth, motorization level, traffic safety: Are they related (experience of EU countries). *Independent Journal of Management & Production, 13*(3), 93–106. https://doi.org/10.14807/ijmp.v13i3.1897

Senbil, M., Zhang, J., & Fujiwara, A. (2007). Motorization in Asia: 14 countries and three metropolitan areas. *IATSS research, 31*(1), 46–58. https://doi.org/10.1016/S0386-1112(14)60183-7

Shirgaokar, M. (2014) Employment centers and travel behavior: Exploring the work commute of Mumbai's rapidly motorizing middle class. *Journal of Transport Geography, 41*, 249–258. https://doi.org/10.1016/j.jtrangeo.2014.10.003

Soehodho, S. (2007). Motorization in Indonesia and its impact to traffic accidents. *IATSS research, 31*(2), 27–33. https://doi.org/10.1016/S0386-1112(14)60219-3

Tarhov, S. A. (2004). Regional'nye razlichija v avtomobilizacii v Rossii, *1*(3), 55–64. https://geo.1sept.ru/article.php?ID=200400104

Timerkhanov, A. (2024, February 7). *Srednevzveshennaja cena novogo avtomobilja v 2023 godu vyrosla na 24%*. AUTOSTAT. https://www.autostat.ru/news/56801/

Unified Interdepartmental Information and Statistics System [UIISS]. (2024a). Availability of road transport [Data set]. https//fedstat.ru/indicator/31556.html

Unified Interdepartmental Information and Statistics System [UIISS]. (2024b). Average annual resident population [Data set]. https//fedstat.ru/indicator/36228.html

Zhao, P. (2014). Private motorised urban mobility in China's large cities: The social causes of change and an agenda for future research. *Journal of Transport Geography, 40*, 53–63. https://doi.org/10.1016/j.jtrangeo.2014.07.011

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PROTECTED STATUS AS A DEVELOPMENT OPPORTUNITY FOR THE COMMUNITY: ATTITUDES OF THE LOCAL POPULATION

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Abstract: The paper presents the results of a survey conducted among the population of two protected areas (PAs) in Serbia – the Carska Bara Special Nature Reserve (SNR) and the Vlasina Outstanding Natural Landscape (ONL). The aim was to determine whether the proclamation of a protected area affects the daily life and economy of the local population and how much the local community is involved in the management process? Emphasizing tourism as the only sustainable activity suitable for protected areas, a survey was conducted. The two areas analyzed here were chosen due to the proximity of settlements, i.e. their presence in the area of protected property, the still present traditional way of using natural resources (grazing, beekeeping, collecting mushrooms, snails and fruits, exploitation of mineral raw materials, fish farming) and the use of wild flora and fauna (mowing meadows, use of reeds and rushes), and length of tenure under protection. An additional point of interest is the fact that one of them is a plain and the other is a mountainous area. The perception of the local residents about life in the protected area, their future plans and the manager, were obtained. Respondents answered questions concerning their perception of everyday life in a protected area. Do they have personal benefit or harm? Are they engaged in tourism? Can they make a decent living from tourism? Is the number of visitors is higher after obtaining the protected status? Who is the manager and is he caring more about nature or the needs of the local population? The survey included 474 residents older than 18, in five settlements of the Carska Bara Special Nature Reserve and in seven settlements of the Vlasina Outstanding Natural Landscape. 39.0% women and 61.0% males made up the sample. The respondents' average age was 40.8 years old. The majority of those surveyed belonged to the employee category. Responses were analyzed using descriptive demographic statistics, with the help of the Statistical Package for the Social Sciences. The obtained results are quite pessimistic, because they confirm the initial assumption that the population of protected areas in Serbia has very little or no benefit at all from living near a protected area.

Keywords: protected areas; local population; tourism; survey research; Serbia

1. Introduction

This paper is a result of a survey conducted in 2017 in two protected areas in Serbia – the Carska Bara Special Nature Reserve (SNR) and the Vlasina Outstanding Natural Landscape (ONL). In the national nature protection system, both areas belong to the protection category I – protected area of international, national, or exceptional importance. Both areas are also internationally protected, as the Internationally Important Bird Areas (IBA), Internationally Important Plant Areas (IPA), and Ramsar sites. According to the International

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Union for Conservation of Nature (IUCN) categorization, SNR belongs to category IV – Habitat/Species Management Area, whereas ONL belongs to category V – Protected Landscape/Seascape.

The Carska Bara Special Nature Reserve is located in the northern, lowland part of Serbia, in the Autonomous Province of Vojvodina. It belongs to the municipality of Zrenjanin and covers the territory of five settlements. Two of them are in the SNR protection zone (Belo Blato and Lukino Selo), and the other three are in the immediate environment of the SNR (Knićanin, Perlez and Stajićevo). The Begej armlet, springing in Romania and still water Carska Bara, have been protected since 1994. They are a meeting place for valuable river, pond, lake, meadow, steppe, forest and plowland ecosystems, which are intersected by canals, embankments and field roads (JP Zavod za urbanizam Vojvodine, 2009) and inhabited by about 500 plant species (Puzović et al., 2009), 150 species of insects, 27 species of fish, 11 species of amphibians, 5 species of reptiles and 30 species of mammals. The greatest values are wetland birds – about 250 species (Pokrajinski zavod za zaštitu prirode, 2010).

Figure 1. Pier on Stari Begej (photo by T. Jojić Glavonjić, 2023).

The Vlasina Outstanding Natural Landscape is located in southeastern Serbia, in the mountainous part of the country (Rhodope Mountains). Under protection since 2010, this area of 13326 ha 83 a 59 m^2 covers most of the Vlasina Plateau with the Vlasina Lake reservoir, which is the largest and the highest lake in Serbia. The ONL area covers seven settlements (Božica, Vlasina Okruglica, Vlasina Rid, Vlasina Stojkovićeva, Groznatovci, Drajinci and Klisura). All settlements are in the zone under the third level of protection, and except for Božica, parts of all other settlements are under the second level of protection. The area of the ONL is marked by a rich flora and fauna. So far, 840 species of plants, about 140

species of birds and 28 species of mammals have been recorded (Belij, 2014; Zavod za zaštitu prirode Srbije, 2017), and floating peat islands are especially rare and attractive.

Figure 2. Vlasina Lake (photo by T. Jojić Glavonjić, 2017).

In addition to the rare and diverse natural heritage, both PAs have a rich tangible and intangible cultural heritage, along with another common feature – the old and increasingly small population. In the SNR settlements, the latest census in 2011 recorded a decrease in population by about 15%, compared to the 1991 census, when the area had not yet been protected. In the ONL settlements, this decline was much higher – 57.2% less inhabitants in 2011 than in 1991. The average age of the population in the SNR settlements in 2011 was 42.5 years, whereas in the ONL settlements it was 55.1 years. In the settlements of both studied areas, the share of young people up to 20 years of age is low (SNR 20.0%; ONL 12.1%), as opposed to the share of those older than 60 (SNR 25.4%; ONL 46.8%) (Jojić Glavonjić, 2020).

Increasing the percentage of the protected areas today is a global goal. The proclamation of such areas is not the problem. The problem is their sustainability. These areas require good organization and management in order to be able to sustain themselves, which is a rare case in practice. All of them are mostly operating at a loss, i.e. they are not able to cover the maintenance costs from the income they earn from admission fees, souvenirs and other services offered to visitors.

The successful implementation of protection in an area is highly dependent on the support of the local community. Whether or not support will be provided, this depends on their perception of the impact (either positive or negative) they are exposed to, as well as on the relationship with the manager (Benett & Dearden, 2014). The local population must find their interest, i.e. a material gain and an improvement of the quality of everyday life. A way to achieve this is primarily the development of tourism (Đokić, & Puzović, 1996), more precisely its sustainable form – ecotourism, as one of the ways to simultaneously protect and develop these valuable parts of nature (Stojanović, 2005).

In order to capture the attitudes of the local population regarding the development of tourism, but also the experience of everyday life in the protected area, the survey method was used. In a random sample, with a lower age limit of 18 years as an eliminatory criterion in the selection of respondents, 474 valid, completed questionnaires were analyzed using demographic statistics (the Statistical Package for the Social Sciences).

2. Results

The sample included 61.0% men and 39.0% women. The average age of the respondents was 40.8 years. The youngest respondent was 18 years old, and the oldest was 76. Regarding the employment status of respondents, most respondents were from the category of employees (53.7%), and the least from the category of students (0.6%).

The largest percentage of respondents (53.6%) believed that living in a protected area did not affect their daily lives either positively or negatively sense; 29.3% of them noticed a positive effect, 4.9% observed a negative one, while 12.2% reported both. However, 44.9% of the respondents stated that there was no personal benefit. Others recognized the benefits of healthy air (34.8%), the availability of natural resources, better conditions for raising children, an increased number of tourists after protection had been declared, as well as a greater opportunity to sell domestic products. Some percentage of the local population reported harmful consequences of protection: intrusion of wild animals (12.0%), flooding of land (7.4%), greater restrictions applying to hunting and fishing (6.1%), etc. However, the majority of the respondents believed that they did not suffer any harm (71.7%).

In the settlements of both studied PAs, hardly anyone was engaged in tourism. A small percentage of inhabitants rented out accommodation (1.7%), owned a boarding house (1.7%), a restaurant or a cafe (1.3%), sold their products (1.1%), made souvenirs (0.6%) or worked in service facilities (0.6%). The remaining 93% of the respondents did not engage in tourism. Few had opportunities for this (7.3%), while others were either waiting for subsidies (21.8%) or were simply not interested (70.9%). The largest percentage of the surveyed inhabitants believed that by engaging in tourism in a protected area (52.5%) one could earn a decent livelihood, but only under the condition that this was not the only activity. According to 46% of the respondents, tourism could contribute to the rest of the population in these rural settlements, while the remaining 54% did not share this view. The number of visitors was considered small (79.1%), and the largest percentage (31.4%) stated that it had the same before declaring these areas protected. However, 24.0% of them believed that there were more visitors than in the previous years and that this was a direct consequence of the protected status.

All of the respondents had a problem to state exactly who the manager was. A huge percentage of the surveyed residents of the SNR settlements (73.2%) stated that they did not know who the manager was, while only 19.1% of them answered correctly. The respondents from the ONL settlements knew who the manager was in 19.8% of cases, while 28.4% of them answered that they did not know. It should be emphasized that a certain percentage of respondents in both areas mentioned the names of guards and rangers as managers. This is because they had a direct contact with them and, accordingly, they identified those individuals as managers. When asked whether the manager cared more about natural values than the local population, most of them answered that the manager did not care at all (42.4%), 22.4% said that the manager cared equally, 20.5% claimed that he cared more about nature, while 14.8% of the respondents did not have an opinion on this issue.

3. Conclusion

The attitudes of the local population in the two protected areas in Serbia confirm the initial assumption, which has been present for a long time among the general and professional

public: the local population of protected areas in Serbia has either none or very little benefit and harm from living in such areas. The basic preconditions for sustainable development of these areas have not been met – the awareness of the local population about the value of the areas in which they are living and the cooperation with the manager. It is especially devastating that the largest percentage of the respondents did not know exactly who the manager was, as well as that most of them had a negative attitude towards the manager.

The natural potential for the development of sustainable activities (tourism in particular, with organic agriculture as an additional and compatible activity) in the analyzed protected areas does exist. A necessary precondition for turning it into a resource, for developing an area, in any direction, is the population of a favorable size and structure willing to engage in these activities. However, it should always be borne in mind that, as Stanković (1998) pointed out, tourism cannot be the main economic activity in protected areas, especially if they are small. Such areas have a predominant function of education and upbringing, as well as other non-economic functions, and as such they cannot fulfill the main function of tourism, which is financial gain. Terzić et al. (2019) also mention that tourism is not always the solution and is it not suitable for every rural settlement, especially if we keep in mind the key features of rural tourism – a distinctly seasonal character, small volume, short stays of tourists, and, consequently, minimal economic effects on rural households. Hence their conclusion that only villages located near already known tourist centers can count on a financial gain and development from tourism.

A sufficient number of capable and willing residents, who love their homeland and have a common goal, with the necessary support of managers and other stakeholders, as well as the government, especially in terms of infrastructure and social amenities, are necessary and minimum conditions without which there is no tourism development, and without which natural potentials, no matter how valuable, will not become natural resources – at least not in the service of the local population, which must be the carrier of tourism development and not just the decoration that sells domestic products at the local market.

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References

Belij, S. (Ed.) (2014). Predeo izuzetnih odlika Vlasina [The Vlasina Outstanding Natural Landscape]. Belgrade, Serbia: Zavod za zaštitu prirode Srbije, JP Direkcija za građevinsko zemljište i puteve opštine Surdulica.

Bennett, N.J., & Dearden, P. (2014). Why local people do not support conservation: Community perceptions of marine protected area livelihood impacts, governance and management in Thailand. *Marine Policy, 44*, 107–116. https://doi.org/10.1016/j.marpol.2013.08.017

Đokić, B., & Puzović, S. (1996). *Značaj turizma za unapređivanje zaštite prirodnih vrednosti Obedske bare*. Scientific conference "Turistički potencijali Jugoslavije", Novi Sad, Serbia.

Jojić Glavonjić, T. (2020). Geoekološko vrednovanje Ramsarskih područja u funkciji održivog razvoja lokalnih zajednica u Srbiji [Unpublished doctoral disertation]. University of Belgrade, Faculty of Geography.

JP Zavod za urbanizam Vojvodine (2009). *Prostorni plan područja posebne namene specijalnog rezervata prirode Stari Begej – Carska bara* [Spatial plan of the special purpose area SNR Stari Begej - Carska bara]. https://www.zavurbvo.rs/cir/delatnost/planovi/prostorni-planovi

Pokrajinski zavod za zaštitu prirode [Institute for Nature Conservation of Vojvodina Province] (2010). *Specijalni rezervat prirode Carska bara – Predlog za stavljanje pod zaštitu kao zaštićeno područje I kategorije – Studija zaštite* [Special nature reserve "Carska bara" – suggestion for proclaiming the area protected – Study of protection]. http://www.pzzp.rs/rs/sr/zastita-prirode/studije-zastite/zasticena-podrucja.html

Puzović, S., Sekulić, G., Stojnić, N., Grubač, B., & Tucakov, M. (2009). *Značajna područja za ptice u Srbiji* [Important bird areas in Serbia]. Ministry of Environment and Spatial Planning, Institute for Nature Conservation of Serbia, Provincial Secretariat for Environmental Protection and Sustainable Development.

Stanković, S. M. (1998). Veštačka jezera kao turistička vrednost Srbije [Artificial lakes as a tourist value of Serbia]. *Glasnik Srpskog geografskog društva, 78*(2), 21–33.

Stojanović, V. (2005). Održivi razvoj u specijalnim rezervatima prirode Vojvodine [Unpublished doctoral disertation]. University of Novi Sad, Faculty of Sciences, Department of Geography, Tourism and Hotel Management.

Terzić, A., Dimitrov, N., & Petrevska, B. (2019, 27 May). *Turistička valorizacija tradicionalnih ruralnih celina: rizici i mogućnosti u Srbiji i Makedoniji*. X Conference "Kulturno nasleđe – rizici i perspektive", Belgrade, Serbia, https://www.researchgate.net/publication/333856550_Turisticka_valorizacija_tradicionalnih_ruralnih_celina_rizici_i_mogucnosti_u_Srbiji_i_Makedoniji

Zavod za zaštitu prirode Srbije (2017). *Predeo izuzetnih odlika „Vlasina" – Studija zaštite* [The Vlasina Outstanding Natural Landscape – Protection study].

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URBAN EXPANSION OF LARGER CITIES IN NORTH MACEDONIA

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Abstract: The paper presents the territorial expansion of major urban settlements in North Macedonia (Bitola, Veles, Kumanovo, Skopje, Tetovo, Štip) in the period from 1900 to the present. The analysis is largely based on data from urban planning documentation. The main subject of the study is the urban expansion of the selected cities and their demographic changes. We can detect serious deterioration of the legal urbanisation with enormous illegal development of buildings, specifically residential and commercial. Significant changes have been observed in the growth of urban areas and the population in the analyzed cities. The urban and population growth of the city of Skopje is particularly characteristic. The main contributions of this paper are: 1) observation of historical development of the expansion of the cities, 2) presentation of influence of the cities in the immediate regional surroundings, 3) examination of the urban development and functionality of the cities, and 4) reflection on the impact on the local environment.

Keywords: urban expansion; cities; North Macedonia

1. Introduction

Urban expansion is a process that occurs due to changes in the socio-political, economic, and social systems within a specific geographical space (Vresk, 1990). This process became particularly prominent during the 20th century, especially after the Second World War. It is also evident in urban settlements in North Macedonia. This study focuses on major urban settlements such as Bitola, Veles, Kumanovo, Skopje, Tetovo, and Štip.

Changes in urban expansion for these cities are observed from the period after 1900. The analysis is generally aimed at determining changes in urban areas and demographic-geographic shifts. In the research, efforts were made to collect urban planning documentation from various time periods for the chosen cities. The areas and population numbers were determined cartographically and statistically. The analysis highlights a series of cause-and-effect aspects related to the identified conditions.

2. Methods

The issue of urban expansion is complex, so several methods were used in the study. The content analysis of primary and secondary sources was applied to gather data and information about urban and population development of the selected cities. Primary sources

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include original spatial and urban plans and planning documents from state institutions, local self-government units, the State Archives of the Republic of North Macedonia, the archives of the cities included in the study, the Real Estate Cadastre Agency of the Republic of North Macedonia, the State Statistical Office, planning agencies, and similar institutions. Secondary sources include texts and commentaries from professional journals, publications, monographs, previously conducted scientific studies, and so on.

Cartographic methods were used for processing and analyzing the planning documentation developed for the cities (under study) across different periods, scales, implementations, changes (legal and illegal), and cartographic representations. The comparison of plans was made using cartographic and GIS methodology. The plans were first georeferenced in the state coordinate system of the Republic of North Macedonia in the Gauss-Kruger projection EPSG 6316. After digitization of the plans, overlapping and analysis of the vectorized borders was performed.

Generalization and systematization methods were used to simplify the content of the collected data from different sources (with varying forms and structures) to make the materials mutually comparable. In our case, we used a basic index that best reflects the development of urban expansion in relation to the selected initial period (Equation 1). The basic index (B. Index) or index with a fixed base are relative numbers that represent the relative sizes of the studied phenomenon in the current period compared to the base period (Risteski, 2003):

$$I_{i,b} = \frac{y_i}{y_b} \cdot 100 \quad (1)$$

where $I_{i,b}$ is a B. Index value, y_b is a basic value of the data series, and y_i represents ordinal number of the time period to which the data refers. The comparative method was used to compare the state of urbanization processes during different time periods under varying social, political, and economic systems. The methods of analysis and synthesis were used to determine the causes and effects in the planned and actual urbanization of the studied cities.

3. Results

The starting point for determining urban expansion in cities, including those in the Republic of North Macedonia, is defining the city boundary. The term is complex and has been addressed in various disciplines. In a geographical context, the city boundary refers to the line between the physical extent of the built structure of the city, including all urban classes (within the city's space), and the transition from urbanized (densely built) areas to rural land. Boundaries can be either natural or artificially determined (relief barriers, rivers, roads, railways, linear and other infrastructural objects), which act as physical barriers to further urban expansion (Minghi, 1963). According to this definition, the main criteria are:

- population density (urban areas have a higher density, while rural areas have a lower density),
- land use (urban land is used for housing, business purposes, public functions, industry, energy, etc., while rural land is primarily used for agriculture and rangelands), and
- infrastructure and functional equipment (the presence of comprehensive linear, surface, underground, and above-ground infrastructure).

In the administrative-political context, city boundaries are legally defined frameworks that geographically delineate the city's spatial expansion, within which the city administration holds authority with legal jurisdiction for governance. These boundaries are determined in regulations and urban plans, from which jurisdiction for governance, provision of services, and collection of taxes and revenues for the maintenance, improvement, and development of the city is derived (Urban Planning Law of 2020 with amendments from 2023, 2020, 2023). Administrative city boundaries do not always align with geographical boundaries or with the physical structure of the city.

There are also other concepts for defining urban boundaries, such as anthropological, sociological, and cultural concepts. However, these are generally not defined as physical lines in geographic space but as diffusely intertwined areas of delineation, and for this reason, they are not considered further in this study.

In this analysis, the focus is on the concept of geographical and administrative-political delineation of the city's urban boundary. From the collected urban planning documentation developed after 1900, specific planning documents from certain periods were identified and analyzed for all the studied urban settlements. The immediate results are presented in the following table, where the planning documents for each city are listed individually, along with the time of their creation and data on the areas of urban coverage shown in absolute and relative values (Table 1).

Table 1. Overview of the areas covered by the urban plans of the cities of Bitola, Veles, Kumanovo, Skopje, Tetovo, and Štip, by year, in hectares (ha)

City of Bitola						
Urban Plan	Regulatory Plan 1929	Urban Plan 1949	Urban Plan 1968	Urban Plan 1978	Regulatory Plan 1990	Urban Plan 1999
Area	394.4	720	1,250	2,440	2,600	2,245
B. Index	100.0	182.6	316.9	618.7	659.2	569.2

City of Veles					
Urban Plan	Water Supply Plan 1930	Street Plan 1977	BUP* 1986	GUP* 2006	Program for GUP 2023
Area	206.5	554	910.6	1,099.8	1,506.1
B. Index	100.0	268.3	441.0	532.6	729.3

City of Kumanovo						
Urban Plan	Regulatory Plan 1923	Decision No.1894/1 in 28.02.1959	Expanded Construction Zone, SO Kumanovo 1968	BUP 1971	BUP modified 1986	GUP 2002
Area	283.2	516	752	1,053	1,823.2	1,886.3
B. Index	100.0	182.2	265.4	371.8	643.7	666.1

City of Skopje							
Urban Plan	GRP 1914	GRP 1929	GRP 1949	BUP 1965	BUP 1985	GUP 2002	GUP 2012
Area	1,112.3	1,192.9	4,637.0	11,556.7	6,844.9	7,656.4	8,790.0
B. Index	100.0	107.2	416.9	1,039.0	615.4	688.3	790.3

Table 1. Overview of the areas covered by the urban plans of the cities of Bitola, Veles, Kumanovo, Skopje, Tetovo, and Štip, by year, in hectares (*continued*)

City of Tetovo					
Urban Plan	Cadastral Survey 1937	BUP 1990	GUP 2002		
Area	294.2	861	1,121.0		
B. Index	100.0	292.7	381.0		
City of Štip					
Urban Plan	Detailed Plan 1927	Cadastral Base 1958	BUP modified 1984	GUP modified 1999	GUP 2022
Area	97	630	2,180	2,039	2,292.3
B. Index	100.0	649.5	2,247.4	2,102.6	2,363.2

Note. *BUP refers to Basic Urban Plan and GUP refers to General Urban Plan. Data are based on: City of Bitola, 1929; Korobar, 1999; Institute for Urban Planning and Design Bitola, 1978, 1999; Veles, 1930; Municipality of Veles, 1977; Institute for Urbanism and Residential Communal Technology of SRM Skopje, 1986; Spatial Planning Agency-Urban LLC Štip, 2006; Ivanov Engineering Bitola, 2022; Mirosavljević, 1923; Antevski, 2001; Institute for Urban Planning and Architecture of the City of Skopje, 1973; Institute for Spatial Planning Ohrid, 1986; Prostor DOO Kumanovo, 2002; Leko, 1914; Mihajlović, 1929; Kubeš, 1949; Institute for Urbanism and Architecture Skopje, 1965a, 1965b, 1965c, 1985; Public Enterprise for Spatial and Urban Plans, 2002a, 2002b; IN-PUMA, 2022; Institute for Spatial Planning Ohrid – Megaproject, 1984; Public enterprise for urban planning, development of construction land "ŠTIP PROJECT", 1999; Municipality of Štip, 1927.

Urban expansion of cities is a parallel process to the population development. The number of residents in the analyzed cities, based on censuses after 1900, is presented in Table 2. Although the time periods of urban planning documentation and population censuses do not completely overlap, the parallel spatial and demographic development of the cities Bitola, Veles, Kumanovo, Skopje, Tetovo, and Štip is evident.

Table 2. Population dynamics based on Censuses from 1900 to 2022 in the cities of Bitola, Veles, Kumanovo, Skopje, Tetovo, and Štip

Population	1900	1921	1931	1948	1953	1961	1971	1981	1994	2002	2021
Bitola	60,000	27,000	33,024	30,761	37,564	49,001	65,035	78,507	77,464	74,550	69,287
B. Index	100.0	45.0	55.0	51.3	62.6	81.7	108.4	130.8	129.1	124.2	115.5
Veles	19,700	14,155	13,445	15,350	19,373	27,050	35,980	42,557	44,149	43,716	40,664
B. Index	100.0	71.9	68.2	77.9	98.3	137.3	182.6	216.0	224.1	221.9	206.4
Kumanovo	14,530	13,400	16,984	20,242	23,339	30,762	46,363	60,842	65,233	70,842	75,051
B. Index	100.0	92.2	116.9	139.3	160.6	211.7	319.1	418.7	449.0	487.6	516.5
Skopje	31,900	40,660	68,334	89,953	124,476	197,341	312,980	408,143	444,760	506,926	526,502
B. Index	100.0	127.5	214.2	282.0	390.2	618.6	981.2	1,279.4	1,394.2	1,589.1	1,650.5
Tetovo	19,200	15,119	16,359	17,132	20,209	25,357	35,745	46,523	50,344	52,915	63,176
B. Index	100.0	78.7	85.2	89.2	105.3	132.1	186.2	242.3	262.2	275.6	329.0
Štip	20,900	11,173	11,895	11,361	13,845	20,269	27,224	36,230	41,730	43,652	42,000
B. Index	100.0	53.4	56.9	54.4	66.2	97.0	130.3	173.4	199.7	208.7	201.0

Note. Data are based on: RSZ, 1984, 1991; DZS, 2005, 2022; Kzhnchov, 1900; Stojmilov & Apostolovska, 2016; Dimitrov et al., 2017.

4. Analysis of urban and demographic development of the cities Bitola, Veles, Kumanovo, Skopje, Tetovo, and Štip

The analysis of the urban and demographic development of the cities Bitola, Veles, Kumanovo, Skopje, Tetovo, and Štip is based on the data from Tables 1 and 2. The processes of urban expansion and demographic growth of each city are presented below.

4.1. Analysis of the urban and demographic development of the city of Bitola

Bitola, as an urban settlement, has a long period of development. However, this development generally occurred spontaneously and without planning. The first urban plan dates back to 1929, known as Regulatory Plan of Bitola, with an urban coverage of 394,4 ha. In 1949, it increased to 720 ha, which is an increase of 182.6%, and by 1999, the GUP of Bitola encompassed 2,245 ha, with a basic growth index of 569.2% (Figure 1). The demographic development in Bitola, due to its loss of the status as a regional center during the Ottoman period, along with the influence of the Balkan Wars and the First World War, shows a unique trend. In 1900, Bitola had 60,000 inhabitants, which dropped to only 27,000 by 1921. There was minimal growth until 1961, after which the population stabilized between 65,000 and 75,000 representing a basic growth index of around 130%. It is noted that the spatial expansion of the city progressed much more intensively than the population growth. This was due to the expansion of the urban area for purposes related to industry, infrastructure, and urban greenery.

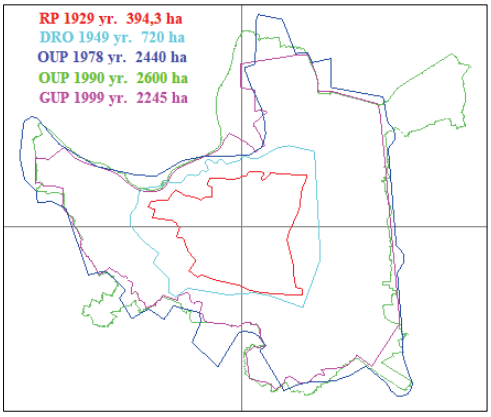

Figure 1. Superimposed planning scopes of adopted urban plans of Bitola.
Source. Lazarevska, 2024.

4.2. Analysis of the urban and demographic development of the City of Veles

In 1930, the first plan for water supply in the city of Veles covered 206.5 ha, while the planning program for the 2023 GUP shows an urban coverage of 1,506.1 ha, indicating a basic growth index of 729.3% (Figure 2). The demographic development of Veles from 1900 to the 1953 Census shows stagnation, with the population reaching around 20,000 residents. After 1961, the population grew to about 44,000 by 1994, reflecting an index growth of 224%. However, the population then decreased, reaching 40,664 residents by the 2021 Census.

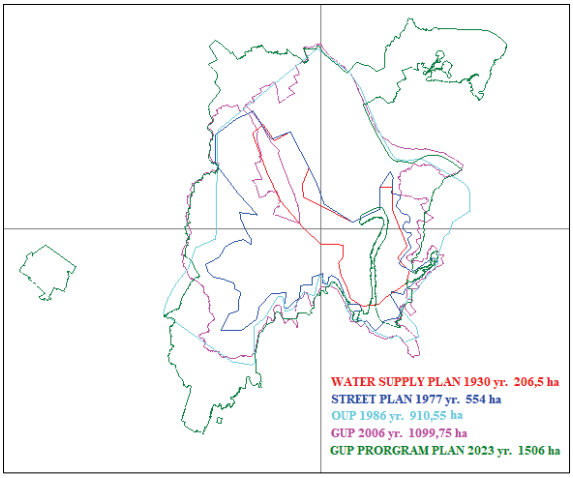

Figure 2. Superimposed planning scopes of adopted urban plans of Veles.
Source. Lazarevska, 2024.

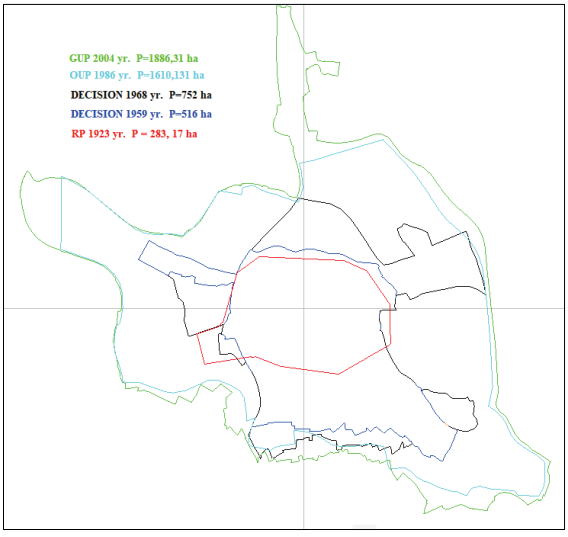

Figure 3. Overlapping superimposed planning scopes of adopted urban plans and decisions of Kumanovo.
Source. Lazarevska, 2024.

4.3. Analysis of the urban and demographic development of the city of Kumanovo

Kumanovo's urban development, based on official planning documentation, began in 1923 with a Regulatory Plan covering an urban area of 283,2 ha. The urban area continuously increased, reaching 1,886.3 ha in the 2002 Urban Plan of Kumanovo, showing a basic growth index of 666.1 % (Figure 3).

The demographic development of Kumanovo shows a permanent increase, from 14,530 inhabitants in 1900 to 75,051 in 2021, with a basic growth index of 516.5%. However, it is evident that the population increase was significantly higher after 1961, as the population nearly doubled by 2021.

4.4. Analysis of the urban and demographic development of the city of Skopje

As the capital of Republic of North Macedonia, Skopje experienced significant changes in its urban development process. The first urban planning documentation was created in 1914, when the city covered 1,112.3 ha. This area remained until 1949, when a General Regulatory Plan was drafted, expanding the urban area to 4,637 ha. After the 1963 earthquake, a new BUP was developed, covering 11,556.7 ha, reflecting a basic growth index of 1,039.0%. However, this urban growth was not fully realized, and a new BUP was created in 1985, covering 6,844.9 ha. This area was later enlarged to 8,790 ha in the 2012 GUP (Figure 4).

In terms of demographic development, Skopje has shown continuous population growth. In 1900 Skopje had 31,900 residents, and by 2021 it had grown to 526,502 inhabitants (including surrounding areas), with a basic growth index of 1,650.5%.

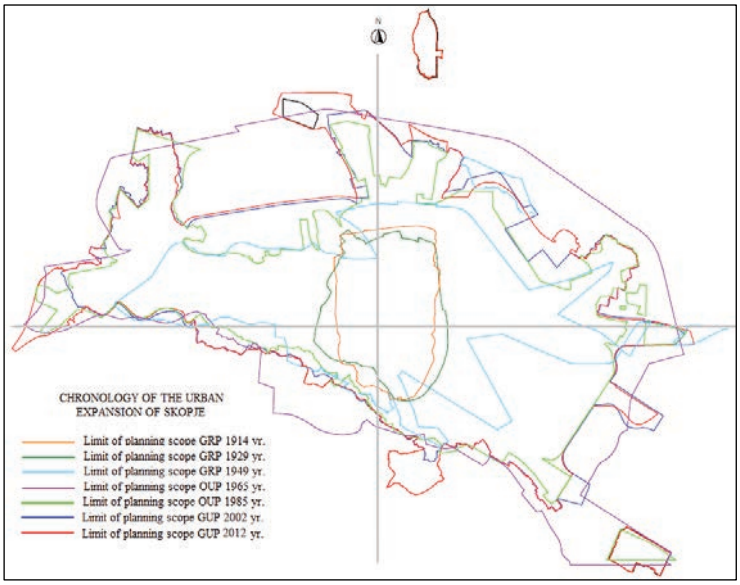

Figure 4. Superimposed planning scopes of adopted urban plans of Skopje.
Source. Lazarevska, 2024

4.5. Analysis of the urban and demographic development of the city of Tetovo

Tetovo's urban development is governed by only three planning documents. The first was a cadastral survey in 1937, when the city covered 294.2 ha. The second was a BUP from 1990, with an urban area of 861 ha, and the third was the GUP from 2002, with an urban area of

1,121 ha. The lack of appropriate urban planning and adherence to these plans has led to a relatively spontaneous and predominantly illegal urban structure in Tetovo (Figure 5).

Tetovo's demographic development showed that in 1900, the city had 19,200 inhabitants. This number remained stagnant until 1961, when the population began to increase more rapidly, reaching 63,176 in 2021, with a basic growth index of 329%. The rapid population growth in the last two to three decades is due to delayed rural-to-urban migration towards Tetovo.

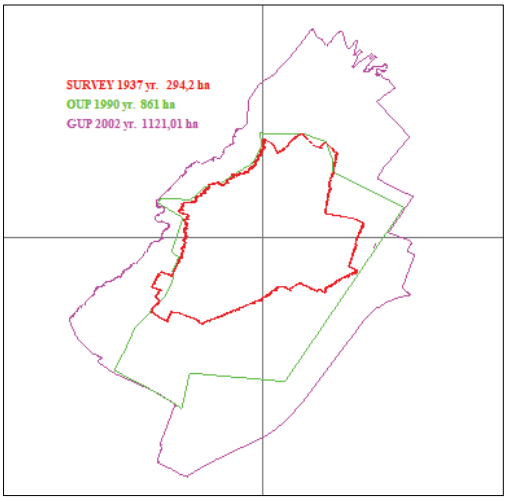

Figure 5. Superimposed planning scopes of adopted urban plans of Tetovo.
Source. Lazarevska, 2024

4.6. Analysis of the urban and demographic development of the city of Štip

The first detailed plan for the city of Štip dates back to 1927, covering 97 ha. The city's urban development became more organized after 1958, when the urban area expanded to 630 ha. Significant growth occurred after 1984, when Štip's urban structure was dimensioned to over 2,000 ha, and with the 2022 GUP, the city is projected to have an urban coverage of 2,292.3 ha, representing a basic growth index of 2,363% (Figure 6). This growth is attributed to the large number of well-developed industrial facilities in the city during the last two to three decades of the 20th century, which attracted population from rural areas.

Significant demographic growth in Štip occurred after 1981. As a result of the relatively well-developed industry, the population grew from 27,224 residents in 1981 to 42,000 in 2021. However, the population growth is not as pronounced because other smaller urban settlements near Štip (Vinica, Kochani, Probištip, Radovish, and St. Nikole) also experienced significant development during the same period.

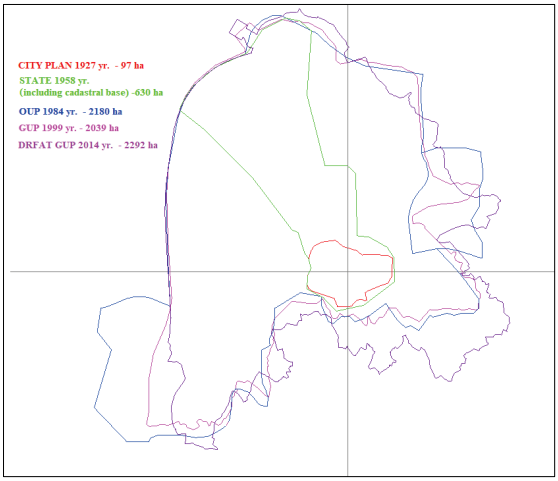

Figure 6. Superimposed planning scopes of adopted urban plans of Štip.
Source. Lazarevska, 2024.

5. Discussion

The urban and demographic development of cities in North Macedonia has been shaped by numerous military, political, socio-political, and economic events. Between 1912 and 1913, the Balkan Wars occurred, followed by the First World War (1914–1918), and the Second World War (1941–1945). After the Second World War, from 1948 to 1953, land expropriation took place, and industrialization surged in the 1960s, 1970s, and 1980s. The period from 1991 to 1998 marked a non-transparent privatization process of public assets. All these events, including ethnic and pluralistic dynamics, significantly influenced the development of the cities of Republic of North Macedonia.

In general, the urbanization process in Republic of North Macedonia can be divided into several phases: between the two World Wars, immediately after the Second World War, during industrialization, and post-1990 following the dissolution of Yugoslavia. Cities like Bitola, Veles, Kumanovo, Skopje, Tetovo, and Štip experienced slow urbanization between the two World Wars. During the Second World War, this process was halted, accompanied by destructive events. After the war, urban planning was approached with enthusiasm, and the first post-war urban plans laid the foundation for future development.

The industrialization, which took place during the 1960s, 1970s, and 1980s, was a period in which all urban settlements, particularly the larger cities, experienced significant urban expansion. At that time, the general societal focus was on advancing the country's economic development through the growth of secondary activities. As a result, various infrastructure and industrial facilities were constructed, engaging the workforce in the cities, as well as drawing a large portion of the rural labor force. This led to a migration process from rural areas to the cities. The balanced spatial distribution of the population was severely disrupted, leading to rural depopulation on one hand, and accelerated population concentration in the cities on the other. The settlement process in cities was accompanied by unplanned and irregular construction, leading to the formation of urban districts and

suburban settlements with inadequate urban infrastructure. The consequences of such aggressive, unchecked expansion (often at the expense of public interest) have degraded the urban landscape to the point of disfigurement.

The urbanization of the cities Bitola, Veles, Kumanovo, Skopje, Tetovo, and Štip after 1990 is characterized by the destruction of existing industrial capacities and the repurposing of those spaces for other activities, particularly residential use. In the absence of ideas and opportunities for financing productive capacities, the population of the analyzed cities and beyond has directed their savings towards investing in real estate, primarily in housing (mainly apartments). As a result, the housing stock has grown faster than the number of households, despite the rapid fragmentation of households. A typical example is Skopje, where according to the 2002 Census, there were 506,926 inhabitants, 146,566 households, and 163,745 dwellings (all types of residences), while the 2021 Census recorded 526,502 inhabitants, 171,171 households, and 213,850 dwellings. This means that the average number of members per household in 2002 was 3.45 people, while in 2021, it decreased to 3.07 persons. The average number of dwellings per household in 2002 was 1.12, and in 2021, it increased to 1.25 dwellings per household (Markoski & Dimitrov, 2022). The construction of housing continues, while the population stagnates (considering the age structure and the indifferent attitude of the younger population toward forming marital unions), the number of members per household decreases, and the number of dwellings per household increases. This marks a new process of the urban expansion of cities in general and particularly in the analyzed cities of Macedonia.

6. Conclusion

The article focuses on the urban expansion of the larger cities in the Republic of North Macedonia, specifically Bitola, Veles, Kumanovo, Skopje, Tetovo, and Štip. The covered time period begins after the year 1900. As shown, the first urban planning documents in the studied cities generally date back to the period between the two World Wars. Due to the events during the Second World War, urban and demographic development stagnated. However, immediately after the war, the development of urban planning documentation and accelerated population growth began. The following documents were created:

- Bitola has had five urban plans, the most recent from 1999, covering an urban area of 2,245 ha, and a base growth index of 569.2%. According to the 2021 Census, it has a population of 69,287.
- Veles has had four plans, the latest in 2023, covering 1,506 ha with a base growth index of 729.3%, and a population of 40,664 in 2021.
- Kumanovo has had five plans, the most recent from 2002, covering 1,886 ha with a growth index of 666.1%, and a population of 75,051 in 2021.
- Skopje's last plan from 2012 covers 8,790 ha with a growth index of 790.3%, and a population of 526,502 in 2021.
- Tetovo has had two plans, the latest from 2002, covering 1,121 ha with a growth index of 381.0%, and a population of 63,176 in 2021.
- Štip has had four plans, the latest from 2022, covering 2,232 ha with a growth index of 2,363.2%, and a population of 42,000 in 2021.

The analysis shows that urban planning documentation is not fully aligned with demographic development. The pace of drafting and implementing urban planning documentation lags behind the economic and demographic growth. Growing population in these cities was independently engaged in illegal construction of entire neighborhoods and city districts, leading to inadequate communal infrastructure, the consequences of which are still felt today.

A process of devastation in the processes of urban expansion of cities has been identified. On the one hand, excellent residences with beautiful houses and agricultural estates are being abandoned in rural areas and smaller urban settlements. On the other hand, the cities suffocate the biological capacity of the natural environment. In the article, a specific set of measures is highlighted to address the issues arising from the inadequate approach to planning and implementing urban planning documentation. Solutions must be sought in:

- reorganization of society,
- productive engagement of the working population,
- sustainable use of natural resources,
- development of the primary sector for self-sustainability of the population and society,
- modernization of agricultural management,
- guaranteed purchase of agricultural production,
- decentralization of functions towards the interior of the country,
- simplification of societal functioning,
- construction of modern communal infrastructure in rural areas,
- closure of unproductive and destructive institutions and organizations in social activities,
- orientation towards productive activities, and other measures.

References

Antevski, N. (2001). *Analyzes for the legalization of illegally built buildings in the construction area and outside the construction area* [Master thesis]. "Ss. Cyril and Methodius" University, Faculty of Civil Engineering.

City of Bitola. (1929). *Regulatory plan of the city of Bitola*.

Dimitrov, N. V., Markoski, B., Radevski, I., & Zlatanoski, V. (2017). Bitola – from Eyalet capital to regional centre in the Republic of Macedonia. *Urban Development Issues, 55*, 67–82. http://dx.doi.org/10.2478/udi-2018-0006

IN-PUMA. (2022). *General urban plan of Štip, Municipality of Štip*.

Institute for Spatial Planning Ohrid – Megaproject. (1984). *Basic urban plan for Štip - amendments and additions*.

Institute for Spatial Planning Ohrid. (1986). *Basic urban plan for the city of Kumanovo - changes and additions*. Assembly of the municipality of Kumanovo.

Institute for Urban Planning and Architecture of the City of Skopje. (1973). *Basic urban plan for the city of Kumanovo.* Assembly of the municipality of Kumanovo.

Institute for Urban Planning and Design Bitola. (1978). *Amendments and additions to the basic urban plan of the city of Bitola*.

Institute for Urban Planning and Design Bitola. (1999). *General urban plan of the city of Bitola (third major changes and additions).* Assembly of the municipality of Bitola.

Institute for Urbanism and Architecture Skopje. (1965a). *Basic urban plan of Skopje, book 12.*

Institute for Urbanism and Architecture Skopje. (1965b). *Basic urban plan of Skopje, book 15.*

Institute for Urbanism and Architecture Skopje. (1965c). *Basic urban plan of Skopje, book 1–21*.

Institute for Urbanism and Architecture Skopje. (1985). *Basic Urban Plan.* Assembly of the City of Skopje.

Institute for Urbanism and Residential Communal Technology of SRM Skopje. (1986). *Basic urban plan of Titov Veles*. Municipality of Titov Veles.

Ivanov Engineering Bitola. (2022). *Proposed planning program for the general urban plan of the city of Veles*. Municipality of Veles.

Korobar, V. P. (1999). Urban planning in Macedonia in the last 50 years. In *Jubilee Proceedings 50 years of the Faculty of Architecture* (pp. 90–94). Faculty of Architecture, Skopje.

Kubeš, L. (1949). *General Regulation Plan for Skopje 1948*. Government of the RM.

Kzhnchov, V. (1900). *Macedonia. Ethnography and Statistics*. Bŭlgarskoto knizhovno druzhestvo v Sofiia.

Lazarevska, M. (2024). *Analysis of the urban expansion of the cities of Bitola, Veles, Kumanovo, Skopje, Tetovo and Štip* [Unpublished doctoral dissertation]. UKIM, PMF–Institute of Geography, Skopje.

Leko, D. (1914). *General regulation plan of the city of Skopje*.

Markoski B., & Dimitrov V. N. (2022). *Sector Study, Demographic Development of the City of Skopje for the General Urban Plan (2022–2032)*. Spatial Planning Agency.

Mihajlović, J. (1929). *Regulatory plan of Skopje*. Skopski Glasnik.

Minghi, J. (1963). Boundary Studies in Political Geography. *Annals of the Association of American Geographers*, *53*(3), 407–428. https://doi.org/10.1111/j.1467-8306.1963.tb00457.x

Mirosavljević, D. (1923). *Regulation plan for Kumanovo*.

Municipality of Bitola. (2021). *Analysis of the degree and manner of implementation and realization of urban plans in the area of the municipality of Bitola*.

Municipality of Štip. (1927). *Detailed urban plan, Štip Municipality*.

Municipality of Veles. (1977). *Street plan of the city of Titov Veles*.

Prostor DOO Kumanovo. (2002). *General urban plan for Kumanovo*. Municipality of Kumanovo.

Public enterprise for spatial and urban plans. (2002a). *General urban plan for the headquarters of the municipality of Tetovo*. Municipality of Tetovo.

Public enterprise for spatial and urban plans. (2002b). *General Urban Plan of the City of Skopje*. Assembly of the City of Skopje.

Public enterprise for urban planning, development of construction land "ŠTIP PROJECT". (1999). *General urban plan of the city of Štip - changes and additions*. Municipality of Štip.

Republic Institute of Statistics (RSZ). (1984). *Census of population, households and dwellings, 1981, Population according to censuses 1848, 1953, 1961, 1971, 1981*.

Republic Institute of Statistics (RSZ). (1991). *Census of the population, households, dwellings and agricultural holdings in 1991*.

Risteski, S. (2003). *Statistika za biznis i ekonomija* [Statistics for business and economics]. Ekonomski fakultet.

Spatial Planning Agency-Urban LLC Štip. (2006). *General urban plan for the city of Veles*. Municipality of Veles.

State Statistics Office (DZS). (2005). *Census of the population, households and dwellings 2002, Book XIII: Total number of population, households and dwellings according to the territorial organization of the Republic of Macedonia from 2004, 2002*.

State Statistics Office (DZS). (2022). *Total resident population, households and dwellings in the Republic of North Macedonia, Census 2021*.

Stojmilov, A. & Apostolovska Toshevska, B. (2016). *Socioeconomic geography of the Republic of Macedonia* (2nd Ed.). (Социоекономска географија на Република Македонија). Faculty of Natural Sciences and Mathematics.

Urban Planning Law of 2020 with amendments from 2023, Official Gazette of RSM, No. 32 (2020); No. 111 (2023).

Veles. (1930). *Water supply plan for the city of Veles*. Veles

Vresk, M. (1990). *Grad u regionalnom i urbanom planiranju* [The city in regional and urban planning]. Školska knjiga.

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HUMAN GEOGRAPHY AND ETHNOGRAPHY IN EMMANUEL DE MARTONNE'S FIELD NOTEBOOKS: METHODS AND DISCIPLINARY BOUNDARIES

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Abstract: As a historian of geography, I work on what constitutes geographical science, its object of study, its founding concepts and methodology; I analyze how geography is born and developed at the national and international levels through the circulation of knowledge. Therefore, I wondered about the apparent paradox contained in the very title of the congress (5th Congress of Slavic Geographers and Ethnographers) which closely associates geography and ethnography, in the continuity of previous congresses dating from the interwar period (Prague 1924, Poland 1927, Kingdom of Yugoslavia 1930 and Kingdom of Bulgaria 1936). In many countries, the academic world of the social sciences appears today increasingly compartmentalized; in geography in particular, there is on one side human geography and on the other physical geography, this was not the case during the interwar period, at the time of the first four congresses.

What does this association with ethnography say about the evolution of geography (I speak here from the point of view of the geographer that I am) as a discipline at a time when geomorphology is predominant in geography? What are the links between ethnography, human geography and physical geography at the time of the first four congresses of Slavic geographers and ethnographers?

In an attempt to shed light on this issue, I propose to study the part of human geography and ethnography in the 27 field notebooks of the French geographer Emmanuel de Martonne based on the results of a research program that I have coordinated at the Centre Nationale de la Recherche Scientifique (CNRS) and entitled *Corpus Emmanuel de Martonne*. Given the close links between Emmanuel de Martonne and Jovan Cvijić, two great geomorphologists (but not only) internationally recognized, I will introduce some comparisons between them. After discussing the emergence of concepts related to human geography in the first half of the 20th century, the presentation will show what methodology and field tools are used by E. de Martonne and J. Cvijić to describe and explain human facts.

Keywords: Human geography; epistemology; field notebook; E. de Martonne; J. Cvijić

1. Introduction

In the history of geography, the aim is to study what constitutes the science of geography in relation to other human sciences in the field, its main object of study, its founding concepts and its methodology. The discipline of geography was born and developed in ways that sometimes differed from country to country, while at the same time having points in common thanks to links between geographers at an international level. We are particularly interested here in the circulation of knowledge between European geographers in the first half of the twentieth century, and in particular between the Serbian geographer Jovan Cvijić

(1865–1927) and his colleague and friend the French geographer Emmanuel de Martonne (1873–1955), both of whom gained international recognition during their lifetime.

A figure like Cvijić, who went down in history as a specialist in both karst geomorphology and ethnology, does not really exist in France. The small world of French academic geography in the first half of the twentieth century was organised under the leadership of Paul Vidal de la Blache (1845–1918) from the Ecole Normale Supérieure and then Sorbonne University in Paris. Through a division of tasks at the Sorbonne, E. de Martonne (1873–1955) took charge of physical geography, the predominant branch of geography at the time, while his colleague Albert Demangeon (1872–1940) dealt with human geography. So professionally, de Martonne did not see himself as a specialist in human geography. However, although they were not in the majority, the human aspects were not neglected when he went out into the field, as an analysis of his notebooks and photographs clearly shows. In academic terms, however, the articles resulting from his fieldwork are for the most part strictly geomorpho-climatic. On the other hand, in the two large books in Volume 4 of his *Géographie universelle*, "Central Europe", human geography plays a significant role.

The aim of this article is to examine the links between physical geography, human geography and ethnology, in other words to look at the disciplinary boundaries of the "new" geography as defined by de Martonne. We propose to do this on the basis of a corpus of field notebooks, photographs and other archives of the French geographer; we will take advantage of this to present as much as possible of the professional and friendly links between de Martonne and Cvijić.

After presenting the scientific context of the emergence of the concepts of human geography at the turn of the twentieth century, we will explain the field methodology used by de Martonne to tackle aspects of human geography and ethnology before looking at how de Martonne reintroduced them in his *Géographie universelle* dedicated to Central Europe.

2. The emergence of concepts of human geography at the turn of the 20th century

2.1. An international scientific context favourable to the emergence of human sciences

In the history of science, the period 1880–1910 corresponds to a "growth of the social sciences and university disciplinarization" (Robic, 2023, p. 164) "in the context of international interest in the promotion of a human geography distinct from the old political geography" (Robic, 2014, p. 13). It is therefore essential to take an interest in the words used to define the objects of study that come under neighbouring, and therefore competing, disciplines, namely human geography, ethnology, anthropology and sociology.

For European geography, the forerunner was the German geographer Friedrich Ratzel (1844–1904), who published *Anthropogeographie* in two volumes in 1882 and 1891. This new concept of "Anthropogeography", coined by F. Ratzel from the Greek root "anthropos" meaning "man", aimed to restore the living and the human to their rightful place in geography. Following in F. Ratzel's footsteps, the turn of the century saw the emergence of various disciplines within the human sciences. One of F. Ratzel's students, Franz Boas (1858–

1942), a German who had emigrated to the United States, became the father of American anthropology. Marcel Mauss (1872–1950), a French sociologist, is considered to be the father of French ethnology.

Figure 1. The French geographer Paul Vidal de la Blache (1845–1918).
Note. From CNRS, UMR Géographie-Cités, France

At the turn of the 20th century, French geography began to be institutionalised thanks to Paul Vidal de la Blache (1845–1918) (Figure 1), who was authorised to teach only geography at the chair of history and geography at the University of Nancy (Berdoulay, 2008). A critical reader of F. Ratzel, whose determinism he did not adopt, P. Vidal de la Blache sought and succeeded in establishing geography as a discipline independent of history, by promoting what the French historian Lucien Febvre (1878–1956) called "possibilism". P. Vidal de la Blache wrote several articles on human geography, focusing on human-environment relations, which was new at the time; in particular, he reinvested the well-known concept of "genre de vie" ("way of life") and, by combining it with the concepts of "environment" and "adaptation", made it the key concept of French human geography: His posthumous book, *Principes de géographie humaine* (*Principles of Human Geography*), published in 1922, takes up his new ideas.

At the turn of the 20th century, ethnography, human geography and anthropogeography were three field-based social and human sciences; they had neither the same history nor the same definition in different empires or countries. Nevertheless, the circulation of knowledge enables cross-fertilisation and reciprocal enrichment. Since we cannot exhaust this immense subject of the epistemology of science here, we will confine ourselves to the French case, seen from the perspective of geographical science: we will attempt a few definitions and show the blurring of disciplinary boundaries. We have shown that P. Vidal de la Blache developed the key concepts of his "human geography" initially on the basis of F. Ratzel's anthropogeography: the two terms may have been synonymous at the very beginning of the twentieth century, but thereafter they were hardly ever used by French geographers. The new name of "human geography" enabled the French school of geography to become independent of the German school of geography (Korinmann, 1983)

and to focus on the concepts of interactions between human-being and his environment. Established earlier than geography and anthropogeography, ethnography is the descriptive study of the culture and activities of a human group: its material techniques, its social organisation, its religious beliefs, its working tools, its way of working the land, the way it dresses and builds its housing. In some respects, the boundaries between ethnographic data and human geography data are blurred: costumes, tools, forms of land use and types of housing are subjects of interest to both ethnographers and human geographers.

2.2. Semantic analysis of the concepts of "human geography" used by the French geographer Emmanuel de Martonne

Having sketched out the scientific context at the turn of the twentieth century, let us now turn our attention within French geography to one of Vidal de la Blache's disciples, his son-in-law E. de Martonne (Figure 2), whose professional activity spanned the first half of the twentieth century. There are three reasons for this choice: E. de Martonne, a brilliant academic, was trained in geography by P. Vidal de la Blache, and when his master died in 1918, he became the leader of the fledgling French geography movement, which he brought to the forefront of the international scene; E. de Martonne thus embodies the evolution of the French geographical discipline and the establishment—or otherwise—of geographical terminology. What terms did he use in his academic writings to deal with human facts in geography?

Figure 2. The French geographer Emmanuel de Martonne (1873–1955).
Note. From CNRS, UMR Géographie-Cités, don de Madame Sommer

First of all, E. de Martonne's bibliography (Hallair, 2007) shows that the French geographer devoted only 5% of his academic publications to subjects relating to human geography, i.e. 13 publications out of more than 220, which is very few. But that's to be expected from a geomorphology specialist (Broc et al., 2010). What is interesting, however, is to see that these 13 publications are divided into different, fairly chronological blocks, using

fairly heterogeneous terminology to deal with aspects of human geography, proof that concepts in human geography are still under construction. The disciplinary boundaries between human geography, lifestyle, ethnography, social geography and human geography were still quite blurred at the time of E. de Martonne, since he used one term or another.

Figure 3. The Serbian geographer Jovan Cvijić (1865–1927).
Note. Belgrade City Museum, Legacy of Jovan Cvijić

Let us explain some of the terms referring to "human geography" used by E. de Martonne. First of all, E. de Martonne uses the term "anthropogeography", which spread, particularly in France, following the reception of F. Ratzel's *Anthropogeographie* (Robic, 2014). The dominance of German-language geography on the international scene was prevalent at the turn of the century (Débarre, 2014). After passing his agrégation in 1895, E. de Martonne, a graduate of the Ecole Normale Supérieure, spent a year in Vienna, Berlin and Leipzig on his "tour of Germany", like every other brilliant French geography student. It should also be remembered that in 1893, J. Cvijić (Figure 3) published in German the thesis he had written under the guidance of the German professor Albrecht Penck (1858–1945) in Vienna.

In his early years, E. de Martonne used the term "anthropogeographical maps" ("cartes anthropogéographiques") for the second academic article of his career, published in 1896–1897, on the life of the peoples of the Upper Nile. Although E. de Martonne never used the term anthropogeography again in the title of a publication, perhaps to distance himself from German geography, he did use it twice in an exchange of correspondence in French with J. Cvijić a few years later in 1904: "I have been asked to write an anthropogeographical article for Ratzel's Festschrift" and "I believe that these questions of transhumance are among the most interesting and least explored in anthropogeography". At the turn of the 20th century, the term "anthropogeography", of German origin, enabled the French and Serbian geographers to understand each other.

Proposed English translation by G. Hallair of the letter in French from E. de Martonne to J. Cvijić dated January 30, 1904:

> *My dear colleague,*
> *Are you still in Belgrade? Or have you decidedly become Bohemian? Not knowing, I am sending this letter to your old address, as I did for some of my last publications sent some time ago. I really regretted not being able to go ahead with our planned excursion to the Iron Gates, but my time was so full! I still don't know how I managed to do everything I did. Now I would like to ask you for some information. I've been asked to write an anthropogeographical article for Ratzel's Festschrift and I've been thinking of taking up again the pastoral life in the southern Karpathians, a sketch of which I gave in my "Wallachia". I believe that these questions of transhumance are among the most interesting and least explored in anthropogeography. I'd like to try and do a brief review of what we know about this. Could you give me some information on Serbia and Macedonia (especially Serbia). I'm enclosing a questionnaire which, if you don't have time, you could ask one of your students to answer. Of course—although the question is not formulated—please indicate the works where information can be found on the questions asked.*
> *I have another project for which I would also like your support. By extending my field of observation further than the southern Karpathians, and by comparing observations from lowland and mountain stations, I would like to try to draw a rough line between the region where eastern and northern exposure is the wettest (with the limit of lower trees and snow) and the region where southern and western exposure is the wettest. I'd like to get in touch with your Serbian meteorologists. What has been published? Would it be possible to have handwritten information (like that obtained in Romania) to contact?*
> *Please be so kind as to answer the 1st question in particular as soon as possible.*
> *Thank you in advance, and best regards.*
> *E. de Martonne*
> *Since my return, I have completely reorganised my laboratory, which has taken up a lot of my time. I haven't yet completed the catalogue and classification of my photographs, but I'll send it to you as soon as it's done. Perhaps, as I suggested, we could make some useful exchanges.*

The second term that E. de Martonne uses to describe aspects of human geography is "life", which appears in the title of his 1904 article for the collection of homages to F. Ratzel: "La vie pastorale et la transhumance dans les Karpates méridionales et leur importance géographique et historique" ("Pastoral life and transhumance in the southern Karpathians and their geographical and historical significance"). This is a direct reference to his master P. Vidal de la Blache's concept of the "way of life". E. de Martonne also analysed population distribution, one of the axes of the "way of life" concept established by P. Vidal de la Blache, for his supplementary thesis in literature, published in 1903.

True to the framework of the regional geography thesis instigated by P. Vidal de la Blache, which became a trademark of the new "French school of geography", E. de Martonne published his own in 1902 on *La Valachie, essai de monographie g*éographique (*La Valachie, an attempt in geographical monography*): alongside physical and climatic geography, he analysed the human and economic geography of this region of Romania.

From his work as an expert geographer in the various study committees that prepared the peace treaties of the 1919–1920 Peace Conference, and which consequently redrew the borders of the countries of Central Europe, E. de Martonne repeatedly used the term

"ethnography" to qualify the aspects of human geography that he described and analysed: "ethnographic map", "ethnographic sketch".

Finally, in 1927, in his article in tribute to J. Cvijić, when E. de Martonne summarised "the geographical work of Jovan Cvijic" (Martonne et al., 1927, pp. 5–14), he did not use the term ethnography or anthropogeography but "social and human geography", emphasising the richness, breadth and novelty of J. Cvijić's work, in particular his major investigation into Serbian migrations, which the Serbian scholar called "metanastasian movements". Commenting on J. Cvijić's work *La péninsule balkanique, étude de géographie humaine*, published in French in Paris in 1918, E. de Martonne noted that "it is not only a description of the types of population and their way of life from a material and economic point of view, but also of their psychological life. This is something that had never been attempted before...". (Martonne, 1927, p. 12).

2.3. Human geography and ethnography in France

The emergence of the human sciences from the turn of the twentieth century and their more or less concurrent development now make it possible to analyse the links between human geography and ethnography from the point of view of French geography. Two types of links are examined: firstly, E. de Martonne's position, which was to ensure that the discipline of geography maintained its own identity in relation to ethnography, as can be seen in the article reporting on the "2nd Congress of Slavic Geographers and Ethnographers" held in Poland in 1927, which he published in the journal *Les annales de Géographie*. Secondly, we will present an attempt, as original as it was short-lived, to create a French institutional association between geography and ethnography in the aftermath of the Second World War.

Echoing the title of the 5th Congress of Slavic Geographers and Ethnographers in 2024 (Denda et al., 2023), we begin by analysing de Martonne's two-and-a-half page account of the 2nd Congress of Slavic Geographers and Ethnologists held in Poland in 1927 (Martonne, 1927). In 1927, E. de Martonne was at the congress and presented a paper entitled "Principes d'une division géographique des Karpates". He took part in the congress in the company of three other well-known French geographers: Pierre Desfontaines (1894–1978), one of E. de Martonne's students, who was open to inter-disciplinary exchanges between geography, prehistory, ethnology and anthropology presented a paper in French entitled "La géographie préhistorique de la Bohême" (Deffontaines, 1929, p. 244). Alfred Fichelle (1889–1968), an agrégé in history and geography and a specialist in the Slavic world, was appointed administrator of the Institut Ernest Denis (Institut français) in Prague in 1927 and presented a paper entitled "Les conditions historiques et géographiques de l'économie nationale tchécoslovaque" (Fichelle, 1930, p. 41). Théodore Lefebvre (1889–1943), who was more interested in human geography than physical geography, had not yet defended his thesis on lifestyles in the eastern Atlantic Pyrenees (Ginsburger, 2016); he wrote on "Population density in Turkey in 1914 and 1927".

In his report on the 2nd Congress of Slavic Geographers and Ethnographers in 1927, E. de Martonne praised the perfect organisation of the event, which he compared very highly to an international congress of geography: "The perfection of the material organisation does credit to the Congress Secretariat headed by Professor Sawicki and to the local committees

set up in the main centres" (Martonne, 1927, p. 548). However, the French geographer seemed to regret somewhat the combination of geography and ethnography, while at the same time acknowledging a certain scattering of subjects: "The share of geography itself in the discussions was diminished by association with ethnography and by the breadth with which any communication on any subject of physical or natural science was admitted". Nevertheless, he acknowledged the richness of the exchanges for the discipline of geography: "The sum of geographical ideas stirred up was no less considerable".

While E. de Martonne remained cautious in 1927 about the reciprocal place of geography and ethnography, let us now look at an example of an attempt at institutional association between geography and ethnography at the end of our study period, i.e. in the aftermath of the 2nd World War. In January–March 1948, the first issue of the *Revue de Géographie humaine et d'Ethnologie* appeared, founded by the geographer P. Deffontaines (see above) and A. Leroi-Gourhan, a French ethnologist and prehistorian. The stated aim of the journal's two editors was that these two disciplines, geography and ethnography, both disciplines concerned with mankind, should be able to cross-fertilise each other, while sharing a common interest in the spatial distribution of the facts observed and studied. But the journal soon ceased publication, a sign that this association was not viable in the French academic field of the time.

To conclude this part devoted to the epistemology of geography and the emergence and development, in Europe and especially in France, of the concepts of human geography from the turn of the twentieth century until the Second World War, we must emphasise the youth of geography as an academic discipline in France, its emergence as an independent discipline in relation to history, and the sometimes fierce competition between the different disciplines of human geography, ethnography, ethnology, sociology and anthropology. The semantic and historical analysis of the various terms used by the French geographer E. de Martonne to deal with aspects relating to human geography has enabled us to identify three main points: firstly, a strong reference to German geography at the beginning of his career with "anthropogeography", a reference that disappeared when French geography overtook German geography internationally in the first half of the twentieth century, then a Vidalian heritage with the concept of "genre de vie" and "geography of life", and finally, an equal treatment, at least for a time and not without a certain amount of mistrust, between "ethnography" and "human geography". In the next part, the study of field methodology by the French geographer E. de Martonne allows us to explore in greater depth the links between human geography and ethnography.

3. Between human geography and ethnography, what is E. de Martonne's field methodology?

If, as we analysed in the first part, the academic writings of the French geographer have very little to do with the various aspects of human geography, the same cannot be said of his fieldwork material, which consists of his notebooks and photographs. The latter are surprisingly rich in elements of human geography and ethnography. The French geographer's corpus of 27 field notebooks mainly concerns mountainous areas and/or areas where there is contact between mountains and plains, in France (16 notebooks) and outside France: 2 on Belgium and Luxembourg and 9 on Central Europe, the French geographer's

favourite terrain. As part of an archive development project entitled "Corpus Emmanuel de Martonne", coordinated by Gaëlle Hallair, the corpus of 27 notebooks has been made freely accessible online in the NUBIS digital library of the Bibliothèque Inter-universitaire de la Sorbonne in Paris (n.d.). In addition, a collaborative online transcription of the notebooks is currently underway and can be accessed via the TRANSCRIRE platform (n.d.).

The corpus of photographs on glass plates, either taken in the field by the Sorbonne Professor or received by his colleagues around the world, totals around 11,000 images (MediHAL). In addition to the first two, there is a third collection of 48 letters in French sent by E. de Martonne to J. Cvijic from the turn of the twentieth century (in his first letter, E. de Martonne invites J. Cvijic to his wedding with the daughter of his master Vidal de la Blache) to J. Cvijic's death in January 1927 (the last letter from E. de Martonne is dated 12 December 1926). These letters are available for consultation at the archives of the Serbian Academy of Sciences and Arts in Belgrade. After presenting the main field methods used by E. de Martonne to understand human geography and ethnography, we will analyse the human geography and ethnography themes recorded in his notebooks and in his photographs.

3.1. Strategies for gathering scientific data

E. de Martonne's academic writings do not provide any information on the strategies and methods he uses in the field to collect raw data for research into human geography and ethnography. We have access to his private writings, namely his correspondence and field notebooks. At the time of E. de Martonne, in the first half of the 20th century, field research trips legitimised the geographer's work, but were also very costly in terms of time, finance and energy (Hallair, 2017).

We learn from the notebooks that the French geographer visited both farms and factories to gather information. In his 1908 notebook No. 4 on Northern France, two double-page spreads are devoted to information gathered during the visit to the Platiot farm in Longuenesse: the history of the farm, the size of the land, agricultural choices, crops, labour, tools, facilities, farmer training, sale of farm produce. In his notebook No. 20 of 1923 "Czecho-Poland", alongside the pages devoted to physical geography, the French geographer records the information gathered during his visit to the Skdoda factory in Pilsen on August 4, 1923: the issue of the blast furnaces, the coalfield, the coal, the production of cannons and munitions during the war, the number of workers, the wages, the workers' housing estates, the equipment and production of the steel foundry, the forges, the gas, the power station, the products manufactured, the international customers.

When the French geographer is unable to go and find information in the field himself, particularly abroad, he asks his network to do it for him. Ever since his education at the prestigious "Ecole Normale Supérieure" on the rue d'Ulm in Paris, the French geographer has been building up a network of colleagues all over the world, a network that he knows very well how to call on for his needs. In a letter dated January 30, 1904 (see Figure 4), he did not hesitate to ask his Serbian colleague to gather information for him on the question of transhumance, using his own network and possibly his own students. E. de Martonne attached a detailed questionnaire to his letter.

In his field notebooks, the Sorbonne professor certainly aimed to describe and understand the relief in front of his eyes, but indications of human geography and

ethnography were always present, albeit to a lesser extent. There are two types of information: textual and iconographic.

The textual analysis beginning with *Human geography* appears regularly in his various field notebooks. In his notebook No. 9 of 1911 concerning an excursion through the Carpathians along a South-North transect, E. de Martonne, after describing the physical geography of the Lipto basin, goes on to analyse the human geography of the basin on double page 28: "Human geography. The Lipto basin. Marvellously cultivated, fields stretched out along the slope on large, bare, soft ridges, Picardy-like. Wheat, maize, potatoes, oats, forage, cabbage. Settlement appears to be truly Magyar but some [illegible] German. Lipto Sz Miklos is the real centre of the whole region. Large, wide, cobbled streets, clean, with the appearance of small, well-kept Romanian towns. numerous shops, grocery shops, ironmongery stores, fashions! This is obviously where the whole rural world gets its supplies. There are travelling salesmen in the hotel. 2 or 3 large factories. 1 tobacco factory" (translation by the author).

Figure 4. *Notebook No. 21. double page 22.*
Note. From *Notebook No. 21,* by E. de Martonne, 1923, Library of the Paris Institute of Geography, Paris Pantheon Sorbonne University, France

From time to time, in the midst of a text on human geography, E. de Martonne enters the domain of ethnography, noting types of costume, details of dress or even psychological traits linked to geographical origin. In notebook No. 21 *Slovakia, 1923*, on double page 22 (see Figure 4), before the letters GH for "géographie humaine" ("human geography"), we find the following description of clothing: "Large square in the middle, market, Slovak farmers. Various costumes: men in waistcoats as in Romania, women in striped aprons, various colours... boots. All along the road to the 3rd station, Slovak peasants walking to the fair" (translation by the author).

Information on human geography is also to be found in the numerous sketches that dot the double-page spread of the notebooks, although they are very much in the minority compared with the information on physical geography. In a panoramic drawing, he would always quickly sketch at least one village with the cross of its church in the centre, or a few roofs of isolated houses, or even the railway station when he was travelling by train., as is the case, for example, in his sketchbook No. 21 *Slovakia* on double page 28. More ethnographic and also rarer, on double page 22 (Figure 4) of the same notebook No. 21, he quickly and somewhat clumsily drew a clothing detail, namely a type of female bonnet,

which he described and judged as follows: “curious women's costumes bonnet with ribbons embroidered in bright colours very pretty” (translated by the author). The French geographer was also interested in types of housing, particularly roofs. On double page 22 of sketchbook No. 20 (Czechoslovakia–Poland, 1923), he produced a small, simple sketch of the roof of a house on the Olomuc plain. Although he drew aspects of human geography, they were almost never large, complicated sketches, as he was so good at doing for aspects of geomorphology and physical geography; he was much less at ease in this domain. Occasionally, he would draw a plan of a farm, taking up a page of his notebook, as shown, for example, by the plan he drew of Northern France in his notebook No. 4 of 1908.

E. de Martonne's strategies for collecting field data in human geography and ethnography were therefore varied. He called on his professional network and travelled intensively through his research fields, recording geographical and ethnographical information in one field notebook at a time, each notebook constituting what we once called “a methodological platform” (Hallair, 2013,) synthesising observation, description, analysis, explanation and visualisation. A focused analysis of a selection of 10 of the French geographer's field notebooks now allows us to delve deeper into the themes of human geography and ethnography addressed.

3.2. Main themes of human geography/ethnography in the notebooks

We carried out a detailed, quantified analysis of a small corpus of 10 notebooks (a third of all the notebooks currently known of E. de Martonne) chosen for their representativeness: at the beginning (1907) and at the end of his career (1935), in France (Nord, Morvan, Vosges, Alps) and in Central Europe (Austro-Hungarian Empire, Carpathians, Romania, Slovakia, Czechoslovakia, Poland). The aim was to identify the main themes of human geography and ethnography, the frequency of their occurrence and the abundance of information contained in the 826 pages of this corpus. For each notebook selected, we listed in a table the pages concerned with descriptions of human geography and the various themes addressed from time to time.

The results of this analysis show first of all that human geography and ethnography account for a minority in relation to the analysis of landforms, i.e. around 1/8th, which is not surprising for a geomorphologist. What's more, the occurrences of human geography range from one word to a page, which means that the French geographer can take the time to note down fairly rich and comprehensive information relating to human geography. Finally, human geography is expressed mainly in text and very little in sketches or drawings. These occurrences are also related to soil types, land tenure, type of ownership, population and relations with the outside world, in keeping with the Vidalian legacy of “possibilism” (see below).

The main themes of human geography that emerge from this analysis of the field notebooks explore three areas, which we will detail briefly: economic geography, types of housing and population. E. de Martonne does not hesitate to link them to the historical or even prehistoric context and to make comparisons (with other places or other periods).

The economic geography that interests the French geographer concerns the types of agricultural production (cereal growing, arboriculture, viticulture, horticulture, brewing, in the plains, in the mountains, in the countryside and on the outskirts of towns, the breeding

of horses, cows and sheep), mining (mines, coal) and industry (sugar refineries, iron and steel works, machine tools, watchmaking) and finally ports, all in relation to the movement of these products.

The types of housing, whether rural or urban, attract the attention of the French geographer: the distribution of housing (grouped or not), its exposure on the slopes (adret or ubac, in relation to the slope), its location (near water points and traffic routes), their its permanent or seasonal occupation, the shape of the houses, the shape of the roofs (gable or 4-sided), the materials used (rammed earth, thatch, tiles, wood, stone), the organisation of the different living elements (living rooms, lean-to, hutches, orchards, garden, path) and the links between the inhabitants, the animals and the seeds or crops, the monuments (church, railway station, market), the links between the centre and the outskirts, and urban development. The relationship with space remains predominant, but can sometimes fade into ethnography when E. de Martonne focuses on the decoration of a gateway, for example.

The elements relating to the population that E. de Martonne records in his notebooks refer to their distribution in relation to the surrounding environment, ethnic origin, (subjective) impressions of poverty/wealth, dirtiness/cleanliness, psychological characteristics and details of male and female costumes. The French geographer's keen interest in the variety and detail of costumes is his furthest step towards ethnography.

Finally, all the themes of human geography as practised in France in the first half of the twentieth century are covered in the French geomorphologist's field notebooks. He describes and analyses "ways of life" according to the Vidalian model. These three main themes of human geography and ethnography can be found in the collection of 11,000 photographs that E. de Martonne has built up since he started out; these 11,000 photographs on glass plates are the third and final part of his field methodology.

3.3. Field photographs between human geography and ethnography

As he wrote to his colleague and friend J. Cvijić on January 30, 1904 (see translation), E. de Martonne set about building up a collection of geographical photographs from his first university post in Rennes. As a student in Vienna at the end of the 19th century, he had made no secret of his admiration for the Professor A. Penck's collection and began building his own on his return to France. It has to be said that at that time, photography was rare and precious, and its modernism aroused a great deal of enthusiasm, even beyond the circle of geographers (Hallair, 2019). In his letter of 1904, E. de Martonne suggested to his Serbian colleague exchanging photographs, something he would never stop asking J. Cvijić and all his colleagues in France and abroad to do, in order to constantly enrich his collection.

In the field, E. de Martonne never travelled without his notebook, camera and maps. Unlike J. Cvijić, who went out into the field assisted by his photographer, E. de Martonne took his own photographs, which he also carefully captioned on his return. Photography was one of the tools he used to describe and visualise the field, working closely with the notebook (Hallair, 2013, 2016).

Among the photographs in the E. de Martonne collection, the proportion of human geography and ethnography is higher than in the field notebooks. For example, of the 47 photographs taken of the Morvan in Burgundy (France), around a third are wholly or partly

human geography. In the case of Slovakia, this proportion rises to more than half, with around 30 of the 53 photographs relating to human geography.

However, the three main themes of human geography and ethnography that permeate the field notebooks can be found in the photographs on glass plates in the E. de Martonne collection: economic geography, housing and populations. As photography is polysemous, it can fall into any of these three broad categories. A selection of glass plates taken by E. de Martonne and his colleagues in the Morvan (Figures 5, 6), Slovakia (Figures 7, 8) and Romania illustrate this point.

Figure 5. *Le Creusot (Saône et Loire), general view of the factories*
Note. From collection E. de Martonne. Glass plate, F523(046), Copyright by CNRS, UMR PRODIG, France

Figure 6. *Thoisy, farm*.
Note. From E. de Martonne collection, Glass plate photograph by E. de Martonne F523(006), Copyright by CNRS, UMR PRODIG, France

Figure 7. *Slovak Carpathians and the Waag Valley*.
Note. From E. de Martonne collection, Glass plate photograph by E. de Martonne, EU3231(016), Copyright by CNRS, UMR PRODIG, France

Figure 8. *Slovakia. Near Trencin, wood industry*.
Note. From E. de Martonne collection, glass plate photograph by A. Fichelle, before 1931, EU3231(017), Copyright by CNRS, UMR PRODIG, France

Firstly, the photograph of Le Creusot (Figure 5) shows an urban and industrial town in full expansion, while that of the small town in the Vah valley (Figure 7) shows a particular spatial organisation between the houses lined up along the road and the cultivated land in the lower parts, both of which relate to economic geography and urban housing. The shot of rural housing (Figure 6) occupy a special place, as this theme was well studied at the time by geographers interested in building materials, roof types and the boundaries between different functional spaces: they could be cross-referenced with the notions of wealth, poverty and even cleanliness used by E. de Martonne in his notebooks. Finally, the last one showing a Slovakian peasant in traditional costume working with wood (Figure 8) refers to the theme of population with a particular focus on costumes.

An analysis of the field methodology used by E. de Martonne shows that the French geographer implemented strategies to gather data from human geography and

ethnography. Moreover, in his notebooks as in his field photographs, he sought to illustrate and deal with the same themes relating to regional geography "à la française". It is with the jewel in the crown of this regional geography that we will approach our fourth and final part, which is dedicated to volume 4 of the *Universal Geography* on Central Europe.

4 From field notebooks and photographs to Géographie universelle (Universal Geography): what human geography?

4.1. "Géographie universelle" ("Universal Geography"): a reference for geography

The result of a collective effort by French geographers, the *Géographie universelle* was conceived in 1907/1908 by P. Vidal de la Blache, who divided up the different regions of the world between his disciples. Those in his esteem were given regions accessible from France so that they could spend time there and practise field geography. At the time, fieldwork was the criterion for validating the "new geography" or "géographie de plein vent" (open-air geography'), to use an expression popularised by the French historian Lucien Febvre and explained by M.-C. Robic, a specialist in Vidalian geography (*Un géographe de plein vent : Albert Demangeon (1872-1940),* 2018). This open-air geography contrasts with cabinet geography (Robic, 2016). The First World War marked a turning point, redrawing the borders of many countries, so the first volume was published in 1927 and the last in 1948 (Wolff, 2005).

An expression of French geographical thought and a veritable monument to the French school of geography, *Géographie Universelle* was a reference for all geographers in the first half of the twentieth century and was particularly well received in France and abroad (Hallair, 2007). Its aim was to provide every educated person with in-depth knowledge of both physical geography and human geography, the latter of which, according to P. Vidal de la Blache, encompasses the distribution of populations, how they are grouped, their lifestyles, their housing, economic issues and international relations.

In *Géographie universelle*, E. de Martonne dealt with Central Europe, his favourite field of research, and wrote Volume 4 in two parts published in 1930 and 1931 respectively. To prepare his manuscript, the French geographer made several field trips, and the notebooks devoted to Central Europe can be analysed as the preparatory phase for gathering the necessary geographical information. The chronology of the notebooks currently available is very clear: notebooks No. 8, No. 9 and partially No. 12 (1911, Austrian Empire, Hungary), notebooks No. 16 and 17 (Romania, 1921), notebook No. 19 (Czechoslovakia, 1923), notebook No. 20 (Czecho-Poland, 1923), notebook No. 23 (Moldavia, 1929) (Hallair, 2020).

4.2. From field notebooks and photographs to E. de Martonne's "Central Europe"

It is interesting to compare the field notebooks from 1911 to 1929 and the photographs in the de Martonne collection with the finished academic work in the "Central Europe" volume, in the 1930s, by analysing the genetics of both text and image. We will illustrate this with examples taken from the angle of human geography and ethnography. Echoing the 1927 Congress of Slavic Geographers and Ethnographers, these examples relate the "Poland"

section of E. de Martonne's *Géographie Universelle* to his 1923 field notebook No. 20 and images from his photographic collection, which corresponds to the Polish terrain.

Concerning the geography of the Polish population, we note that in chapter XXXIX about "Territory and peoples", the 2 penultimate paragraphs from "From the division between Prussia, Austria and Russia" to the end of the pararaph ".... division politique" (Martonne, 1930, p. 630) largely reproduce elements noted on double pages 32 and 33 of notebook No. 20 about the "three social types of Polish people", reflecting the "three temperaments" that developed under the three very different political powers: Russian, Prussian and Austro-Hungarian.

Figure 9. *Pamientkovo estate near Poznan. 1926.*
Note. From E. de Martonne collection, glass plate photograph by E. de Martonne (1926), EU334(012), France, CNRS, UMR PRODIG

The urban geography of Warsaw attracted the attention of E. de Martonne in 1923, as he devoted a double page 27 to it. This can be linked to the section devoted to "Warsaw: site and development", in particular pages 674–676 of chapter XLII "The Great Plain of the North". Both describe the urban development of Warsaw and its urban morphology.

Finally, the last example concerns rural settlements and the geography of agricultural production in Posnania. The two photographs at the top of plate CXIX accompanying the text of the *Géographie Universelle*, p. 677, were taken by the French geographer and come from his photographic collection (Figure 9). In each case, we can see that the academic discourse is much smoother, neutral and restrained, whereas in his field notebook, which was never intended to leave the private sphere, E. de Martonne expressed himself more spontaneously, even if it meant taking offence at the dirtiness or squalor of certain districts of Warsaw.

We will conclude this contribution, paradoxically dedicated to the analysis of human geography and ethnography in the work of the geomorphology specialist E. de Martonne, by insisting on the paradigm of regional geography of the French school of geography. We

have been able to demonstrate that aspects of human geography and ethnography are surprisingly important, whether in field methodology or in the tools of description, analysis and visualisation that are notebooks and photographs. Similarly, the two large volumes on "Central Europe" in the great work of *Géographie Universelle* are a majestic contribution to regional geography. Apart from the book on *Principes de la Géographie humaine* by his father-in-law Vidal de la Blache, which he completed and published after his death, *Central Europe* is the academic work in which E. de Martonne delved most deeply into questions of human geography and ethnography.

This contribution sheds light on a little-known aspect of the French geographer's interest in human geography and ethnography. Didn't he end his letter of January 28, 1923 to J. Cvijić with "I'm sending you my *Abrégé de Géographie physique* (*Abbreviated book of physical geography*), which has finally been published! What do you think of the last chapter added on human geography?" (translated by the author).

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References

Berdoulay, V. (2008). *La formation de l'école française de géographie: 1870–1914* [The formation of the French school of geography: 1870–1914]. CTHS.

Broc, N., Calvet, M., & Giusti, C. (2010). *Une histoire de la géographie physique en France (XIXe–XXe siècles): Les hommes, les oeuvres, les idées* [A history of physical geography in France (19th–20th centuries): People, works, ideas], Presses Universitaires de Perpignan.

Un géographe de plein vent. Albert Demangeon (1872–1940) [A geographer in the open air. Albert Demangeon (1872–1940)]. (2018). Bibliothèque Mazarine. Éditions des Cendres.

Débarre, S. (Ed.). (2014). Géographies entre France et Allemagne, Acteurs, notions et pratiques (fin XIXe – milieu XXesiècle). *Revue Germanique internationale*, *20*. https://doi.org/10.4000/rgi.1481

Deffontaines, P. (1929). *La géographie préhistorique de la Bohême*. In Sawicki, L. (Ed.), *Pamiętnik II Zjazdu Słowiańskich Geografów i Etnografów odbytego w Polsce w roku 1927*, Tom I [Proceedings of the 2nd Congress of Slavic Geographers and Ethnographers in Poland 1927, Volume I], (pp. 244–246). Komitet Organizacyjny II. Z.S.G.E.

Denda, S., Radovanović, M., Yamashkin, A. A. (2023). Congresses of the Slavic geographers and ethnographers—chronological retrospection. *Journal of the Geographical Institute "Jovan Cvijić" SASA*. https://doi.org/10.2298/IJGI230831001D

Fichelle, A. (1930). Les conditions historiques et géographiques de l'économie nationale tchécoslovaque. In Sawicki, L. (Ed.), *Pamiętnik II Zjazdu Słowiańskich Geografów i Etnografów odbytego w Polsce w roku 1927*, Tom II [Proceedings of the 2nd Congress of Slavic Geographers and Ethnographers in Poland 1927, Volume II], p. 41. Komitet Organizacyjny II. Z.S.G.E.

Ginsburger, N. (2016). Théodore Lefebvre, un bon géographe pour Poitiers? *Norois* [online], 7–19. https://doi.org/10.4000/norois.4983

Hallair, G. (2007). *Emmanuel de Martonne et l'Europe centrale* [Emmanuel de Martonne and Central Europe]. UMR PRODIG, UMR Géographie-cités. https://hal.science/hal-00282068v1/file/Grafigeo_Gaelle_decembre2007.pdf

Hallair G. (2013). Les carnets de terrain du géographe français Emmanuel de Martonne (1873–1955): méthode géographique, circulation des savoirs et processus de visualisation. *Belgeo* [online], 2. https://doi.org/10.4000/belgeo.10807

Hallair G. (2016). Circulation of photographic plates between Jovan Cvijić and Emmanuel de Martonne. In V. Jović, & A. M. Petrović (Eds.), *150th Anniversary of Jovan Cvijić's birth* (pp. 69–90). Serbian Academy of Sciences and Arts.

Hallair G. (2017). Le terrain dans les carnets et les photographies des géographes français et allemands (fin XIXe–mi XXe s.). In J.-L. Georget, G. Hallair, B. Tschofen (Eds.), *Saisir le terrain ou l'invention des sciences empiriques en France et en Allemagne* (pp. 89–112). Presses universitaires du Septentrion.

Hallair G. (2019). La photographie, un nouvel outil pour les géographes. In Perles V., Demurger M. (Eds.), *Archives de la planète*, (pp. 140–151). Musée départemental Albert Kahn.

Hallair, G. (2020). La Roumanie d'Emmanuel de Martonne: carnets de terrain. Retrieved from https://nubis.bis-sorbonne.fr/s/de-martonne-et-la-roumanie/page/83_la-roumanie-de-martonne

Korinman, M. (1983). Friedrich Ratzel et la Politische Geographie. *Hérodote*, *28*, 128–140.

Martonne E. de, (1923). Tchécoslovaquie-Pologne. Carnet n 20. https://nubis.bis-sorbonne.fr/ark:/15733/kfm9?mirador-1=1

Martonne, E. de, (1927). Le Congrès des géographes slaves en Pologne. *Annales de Géographie*, *36*, (204), 548–550; https://doi.org/10.3406/geo.1927.9116

Martonne, E. de, Gauvain, A., & Haumant, E. (1927a). *En mémoire de Jovan Cvijic* [In memory of Jovan Cvijic]. Felix Alcan.

Martonne, E. de (1930). *Géographie Universelle: Europe centrale. 1. part*. *Généralités-allemagne, Volume 4.* Librairie Armand Colin.

MediHAL. *CNRS Huma-num*. [Data set]. Retrieved from https://media.hal.science/search/index/?q=Martonne&rows=30&authFullName_s=Emmanuel+de+Martonne

Robic, M.-C. (2014). La réception de Friedrich Ratzel en France et ses usages au temps de l'installation de la géographie à l'Université (années 1880–1914). *Revue germanique internationale*, 20, 13–39. https://doi.org/10.4000/rgi.1485

Robic M.-C. (2016). Géographe de plein vent, géographe de cabinet. *Hypergeo*. https://hypergeo.eu/geographe-de-plein-vent-geographe-de-cabinet/

Robic, M.-C. (2023). Friedrich Ratzel, géographie et sciences sociales en France (1890–1918)—Centralité et distanciations. *Geographica Helvetica 78*(1), 157–167. https://doi.org/10.5194/gh-78-157-2023

TRANSCRIRE. (n.d.). *CNRS Huma-num*. Retrieved from https://transcrire.huma-num.fr/scripto/5/item

Wolff, D. (2005). *Albert Demangeon (1872–1940). De l'école communale à la chaire en Sorbonne, l'itinéraire d'un géographe moderne* [Unpublished doctoral dissertation]. Université Panthéon-Sorbonne—Paris I. https://theses.hal.science/tel-00009648

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GEOPHILOSOPHY OF MODERN: PROLOGOMENA

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Abstract: This paper provides a methodological framework for the synthesis of geographical thinking during the century-long period of modern, which began with the introduction of regular university geography classes in the 1870s and ended with the announcement of the spatial turn in the social sciences in the 1970s. To offer an original solution in the field of research on contemporary geographical thinking, the author started from the analysis of reference works in this field. Based on the characteristics of the philosophy of basic geographical approaches (empiricist, positivist, humanist, and structuralist), the author singled out three dominant concepts: historical-geographical, philosophical-geographical, and political-geographical. Based on these examples and theoretically based on classification of scientific thinking, the author offered a post-structuralist account of the history of geographical thinking. It is based on two assumptions, that there was a strong reception of key ideas from other scientific disciplines (philosophy, social theory, and regional economy) and that geophilosophy can serve as a kind of amalgam that will offer a post-structuralist framework for presenting contemporary geographical thinking. Since a mere presentation of the historical development of modern geography would to a significant extent represent only a bibliographic-encyclopaedic presentation of the development of certain approaches (positivist, humanist, and structuralist), the author combined an evolutionary-historical presentation (analytical method) with an idiographic and nomothetic approach. Thus, a theoretical framework was created which will give this research a synthetic character and which will be applied to socio-geographical studies of the contemporary history of Sarajevo from the point of view of behavioural geography.

Keywords: geophilosophy; modern; philosophy of geography; geographic axes; spatial thinking

1. Introduction

The content of study *Geophilosophy of Modern* (Mutabdžija, 2022a, 2023) is divided into two books, the first of which has the subtitle "Theory" and is characterized by two goals. The first is general education, while the second refers to the knowledge of interdisciplinarity in the domain of contemporary social and humanistic research (propaedeutic framework). On the basis of such broad goals of the work, clear tasks arise, which relate to the research of the theoretical development of key scientific disciplines, which significantly shaped the theoretical framework of contemporary geographical thinking. The structure of book one consists of five chapters, which represent the theoretical discourse of modern. "The place of geography" provides basic clues about the origin, time frames, and methodological foundations of this phase in the development of geographical thinking. The second chapter is "Philosophical Discourse: *Erdindividuum* and *Espace*", which includes an overview of the historical development of the most important philosophical ideas and their ontological framework (Hegel and Lefebvre). "Sociological atlas: cities and heterotopias" is devoted to a historical review of the origin and development of various grand theories and theories of

everyday life, which decisively contributed to the profiling of geographical thinking. Examples of antagonism and cooperation between individual sociologists and geographers (Durkheim, dela Blache, the Weber brothers, representatives of the Chicago School of Sociology), which will create the idea of urban geography, will be highlighted in particular. However, the focus will be on Michel Foucault's (2005; 2012) contribution to the new theoretical foundation of geography and other social sciences (spatial turn, archeology, and genealogy of geography). "Economic Roadmaps of Modern", provide basic indications about neoclassical theory, as the economic basis of modern geography. From this emerges the description of the main stages in the development of capitalism and the geographical consequences of such development, which is most effectively sublimated by David Harvey (985; 1990; 2013) with the description of flexible accumulation and its spatial fix. The final chapter refers to geophilosophy and its Deleuze and Guattari (2013) framework and a description of six concepts (space, land, territory, assemblage, becoming, and geotrauma), which best reflect the complexity and ambiguity in the development of geographical thinking during the modern period.

The second volume of the study has the subtitle "Practice" and its methodological framework, in addition to the general educational one, is characterized by a practical/political-geographical meaning (understanding of turning social events in the modern history of Europe, world wars, economic crises, and social stratification), and in the background of which there were also major socio-geographic disagreements, caused by political-geographical ambitions of key political actors (colonialism, imperialism, class, and racial relations). The reason for the goals set in this way lies in the current political-geographical situation in Europe, where the author opens the possibility for readers to think about the sustainability of existing solutions (democratic and spatial-functional) and their analogy with historically similar situations in Europe. The book consists of three parts, the first of which is "Science/Assemblage", which contains two terms, whereby the first term is viewed in the light of epistemological knowledge, while the second has a geophilosophical meaning (assemblage) and denotes the complexity, multiplicity, and connection of several scientific areas (philosophical, socio-theoretical, and economic) within the geographical discourse. The introductory chapter provides basic indications about the characteristics of the contemporary philosophy of geography, which includes ontologies in the Geographic Information System (GIS) environment, geographic epistemology, and spaces of representation. The second chapter is called "Geophilosophical axes of geography", in which the elements of Deleuze's (2009) ontology are presented, so that through these geophilosophical terms, the encyclopedic-lexicographical structure of the book is "broken" and gives the reader the opportunity to think abstractly. The author believes that such an approach represents a departure from the dominant positivist approach in geography, but also means approaching critical thinking and postmodern geographies. The second part of the book is called "Empirical-Analytical Geography" and it contains the chapters "Positivism/Landscape" and "Logical Empiricism/Space". The third part is "Historical-hermeneutic geography", which includes the chapters "Behavioral geography/becoming" and "Humanistic Geographies/Place". These are also the most complex chapters, because they imply certain psychological and philosophical progress. They point out the specifics of the origins of certain approaches, starting from behaviorism to geographical phenomenology. This was achieved through a

description of the opposition between explanatory and descriptive science, key philosophical terms (Dasein, Verstehen & Intentionalite*),* and a description of the most important geographers who created within the framework of this approach. Basic philosophical terms (Being, perception, and existence) and other terms (experience, consciousness, and meaning) in geography are clarified, and the elements of pragmatism and idealism in geography are unified through the opposition of nominalism and realism, the centrality of mind or spirit, and their specific geographical meaning.

2. Reception: interdisciplinarity and layering

Reception ideas taken from various philosophical, social-theoretical, regional-economic, and psychological studies had a key influence on the development of contemporary geographical thinking. This speaks of the strong interdisciplinary connections and influences of these scientific fields on the shaping of modern geography, which served to create a kind of matrix or algorithm, on the basis of which the methodological concept of the study of modern geophilosophy will be developed. In the light of complexity these scientific fields, especially the concept of assembly and its essential determinants (horizontal axis), we can single out the links that provide interaction through geophilosophy: geography (G), philosophy (Ph), sociological theory (ST), and regional economy (RE). We can observe each of these representations, conditionally, on two levels, the first of which refers to the geographical, visible, or surface aspect (in Foucault's vocabulary, the archeology of geography). Next figure explain horizontal axes (G1-geographical level or archeology of geography) between geography, philosophy, sociological theory, and regional economy.

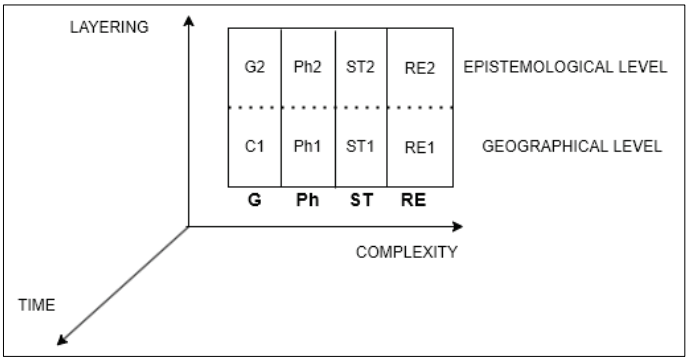

Figure 1. Horizontal connections in geography.
Note: Adopted from "Geophilosophy of Modern I: Theory", by Mutabdzija, 2022a, p. 275.

The second level implies an epistemological or deeper meaning (a kind of genealogy of geography), which forms vertical connections and can be presented as selected sub disciplines and relevant terms. For simplification, four sub disciplines from geography (historical, political, economic, and social) and philosophy (ontology, epistemology, methodology, and ideology) will be chosen. In contrast, relevant concepts from sociological theory and regional economy will be contained in social and economic geography. For the level of geographical representations, aspects of expression are essential. We have already

mentioned the importance of historical-philosophical development during the observed period. Hence, it is crucial to understand the reasons for changes in the critical interpretation of the subjects of philosophy/geography from the domain of the mentioned aspects. This means that vertical connections create a methodological framework that enables the creation of a specific model, i.e., an abstraction of the natural world used in geography to simplify the enormous complexity of the earth's surface and its interaction with social processes. To not burden this presentation with definitions and the subject of study of specific sub disciplines of geography and philosophy, as well as selected terms of geophilosophy, we will now content ourselves only with the presentation of the methodological framework model of the study of modern geophilosophy.

The existing wide range of geophilosophical concepts builds a new methodological framework for the adequate study of the essential (ontological and epistemological) characteristics of modern geography, which was achieved through a set of D & G concepts (space, land, territory, becoming, assemblage, and geotrauma). This made it possible to achieve the main results of research on the development of geographical thinking during modern times, which are summarized in the assessment that it is necessary to see complex social processes as a whole and present them through a system of cause-and-effect relationships. Next figure shows model of vertical connections in modern geography (G2 or genealogy of geography), and the abbreviations have clear definitions: historical (HG), political (PG), economic (EG), and social geography (SG); ontology (O), epistemology (E), methodology (M) and ideology (I); space (Sp), earth (Ea), territory (T), becoming (Be), assemblage (As), and geo trauma (GT).

These results stem from the research objectives, which were seen through the redefinition of vital geographical terms (space, place, and environment). However, it was not possible to adequately perceive them and even more difficult to interpret them without a firm reliance on philosophy (methodology, epistemology, ontology, and ideology), sociological theory (grand theories and theories of everyday life), and economics (political and regional economy, and economic geography). This posed a difficult task for the reader, mainly a geographer. On the one hand, it implied the adoption of fundamental philosophical and geophilosophical terms and their combination with geographical ones, and on the other hand, the understanding of complex socio-geographical processes. That arose in the interaction of geography with economics (three industrial revolutions and the issue of distribution of social wealth), sociology (structures

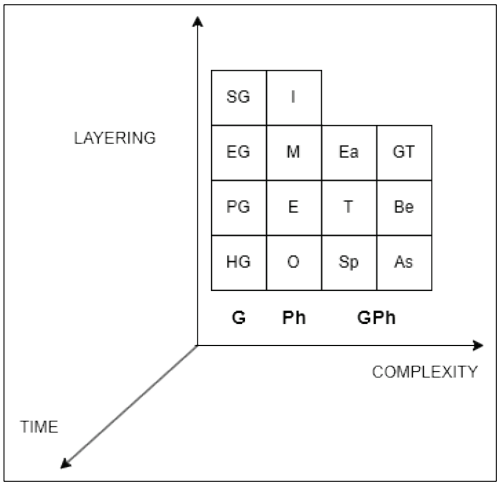

Figure 2. A model of vertical connections in geography.

Note: Adopted from "Geophilosophy of Modern I: Theory" by Mutabdzija, 2022a, p. 276.

and agencies), and anthropology (the importance of culture and the creation of cultural-geographical landscapes).

Applying the scientific method became imperative when processing such complex social phenomena because it relativized subjective assessment. This sheds light on the starting hypothesis of the work, which brought the origin and development of scientific geography into a direct relationship with the development of economic and social theories and philosophical thinking. Furthermore, this methodological framework indicated the general educational importance and the importance of the specific theoretical study of the discipline, the complexity of whose development implies the definition of significant economic and philosophical-sociological concepts and the theoretical foundations of modernity.

3. Representation

In the understanding of space and its description, a key place is occupied by the notion of representation, which has served several geographers to construct ideas about real and imaginary spaces. This implies a simplified definition of geography, which for Warf (2006) is a science or art that deals with writing about the Earth or describing it (visible spaces), which can be considered its most important task. This is achieved in different ways (signs, abstraction, and experience), and the basis for this opinion is related to hermeneutics (discovering meaning), while modern views on representation differ significantly from each other. Traditional geographical thinking has long remained tied to positivism, which was based on the clear assumption that there are precise distinctions in the world around us (observer-observed, facts-values). This can be simply interpreted in the way that there is only one truth, because it is a mirror of the objective world and its representation is only a technical issue that does not cast doubt on that truth and its interpretation. As a conclusion, there is only one objective reality (truth), so there is only one true meaning of signs.

In the next phase of the development of geographical thinking, language and issues of meaning became central issues that continuously questioned the positivist notion of signs and representations. In this, the works of three structuralist thinkers, who advanced the importance of structural linguistics, were of great importance. The first was the linguist Ferdinand de Saussure, according to whom signs do not have universal meanings, but acquire them based on their position in relation to other signs (signifier-signified). Another was the philosopher Ludwig Wittgenstein, who continued this line of thinking, arguing that all linguistic structures are essentially arbitrary, and that language is not a neutral way to construct and share meaning. For him, it is an opaque medium that limits its users' views of reality, and therefore language is not only a "mirror of the world" (an allusion that may have inspired Rorty's "Philosophy and the Mirror of Nature"), but also a means (existentialist) by which "we live in the world". The third was Jacques Derrida, who applied a completely new methodological procedure of deconstruction, with the aim of analyzing language (nature, writing and meaning). This procedure refers to the critical examination of essential and conceptual differences or oppositions (binary and hierarchical), which include a pair of concepts (fundamental and derivative), such as: nature-culture, speech-writing, mind-body, presence-absence, inside-outside, and form-meaning. The method of deconstruction became dominant in the domain of textual and literary analysis, so that texts and all social objects lost their essential meanings, which was the original goal of hermeneutics.

Instead, they took on multiple, variable, or even contradictory meanings, with each representation of the world simplified.

Conditionally, the next phase (post-structuralist) in the development of the concept of representation was created by Henri Lefebvre (1991), who was a pioneer in presenting the social character of spatial representations and who critically illuminated the representation of geographical areas. This is achieved by a broad description of various aspects of capitalism, from the capitalist society that reproduces itself through the self-production of space on different scales, from the individual (individual body) to the global economy. For him, space and time are products of a given society, and therefore cannot be considered universal categories. Since their understanding is related to the given context of a concrete society, it means that these (space and time) are not only relational (social), but also historical categories. The structure of spatial production defined in this way, as a relational construct, consists of spatial practices, representation of space and spaces of representation. This cannot be understood without knowing its theoretical basis, which consists of triadic dialectics (Hegel, Marx, and Nietzsche), language theory (symbolic, paradigmatic, and syntactic dimensions) and phenomenology based on the representation observed-imagined-experienced (Heidegger, Merleau-Ponty, and Bachlar). Within these multiple triads, all elements intertwine, which leads to the merging of consciousness and space, but also to the creation of unclear boundaries between the real and the imagined.

Michel Foucault (2012) is significant for geography on several grounds, one of which is the definition of the limits of modernity, which he establishes through the theory of power, that is, social practices that led to the discipline of the population (prison, hospital). For him, representation is always connected with the question of power, which inevitably serves one's interests. In the domain of hegemonic discourses, it refers to the dominant power in society, which tends to legitimize social practices and turn them into the status quo, in the process of constituting the subject in everyday life. The concept of representation also has a dimension of political understanding, according to which it always has social consequences, although they are not always predictable. That is why this knowledge is less a mirror of the world, and more a disputed field of struggle that is linked to the attitudes of different social interests. This leads to the conclusion that representation is part of reality, which it helps establish. Since the creation of words is also the creation of the world, since discourses not only reflect the world, but also constitute it, then it follows that epistemology and ontology are always intertwined. The specificity of Foucault's creativity is also reflected in the fact that he created on the border of different eras (structuralism/poststructuralism or modern/postmodern), whereby he is largely responsible for this discontinuity.

When it comes to geographers who dealt with the issue of representation, it should be said that their number is small (positivist and empiricist tradition) and only with the emergence of post-structuralist geography does the denaturalization of space begin. This implied research into ways of encoding space and bringing it into the domain of consciousness. The most favorable field of geography for the application of representation is critical cartography and GIS, and papers on this were written by Harley and Woodward, who connected the geographic map with the social construction of power interests through its (cartographic) historical role in colonial conquests. Pickles edited a collection of papers on GIS that offer a strong critical appraisal of its social implications dominated by discussion

framed in typically technocratic terms (engineering, efficiency, control, and manipulation). It is a discourse in which method replaces theory, representation is presented only as a technical problem, and not as a social one that serves to process information (creation and manipulation of spatial images) and has become a rapidly expanding technology (state apparatus and business). This means that technology requires a critical theory that reflects a continuous examination of the ways in which the use of technology and its products reconfigure broader patterns of cultural, economic, or political relations, and how they thereby contribute to the emergence of new geographies (an allusion to Soja's "Postmodern Geographies-The Reassertion of Space in Critical Social Theory"). From this follows Pickels' key conclusion that GIS confirms the Cartesian view of space (positivist and empiricist aspect) and as such provides geographers with an applied dimension in the market of knowledge (a limited range of critical positions).

Among other geographers who have focused on the nature of representation and the broader relations between the historical configuration of power and space, Derek Gregory (1978; 1994) should be mentioned. Through "Geographical Imaginations", he showed how seemingly different modernist paradigms (positivism and Marxism) reflect a common mode that assumes the existence of an observer (detached, omniscient, and objective), an assumption that becomes increasingly questionable in an age of growing relativism. His contribution to the process of geographical representation contains some objective truth, independent of his authorial experience and which he calls the modernist "world-as-exhibition", which is based on the connection between commodity production and consumption. This is already the area that in the world of geography David Harvey described so extensively and prognostically in numerous works (17 books), and then Neil Smith hrough the process of the end of globalization. All those authors understood that the periodic restructuring of capitalism inevitably triggers simultaneous changes in symbolic systems, on the basis of which the crisis of representation in mass circles of time and space compression, which was initiated by contemporary globalization at the end of the 20th century, arose. The beginnings of this space/time compression were recognized by Torsten Hagerstrand, and Doreen Masi formulated it clearly.

4. Geographic axes

After the exact forms of spatial representation, in which we created spatial representations through certain models, we are now moving into the world of imagination, in which our landmarks will be spatial axes (horizontal and vertical). Geographical theory recognizes several axes around which certain phenomena or processes are grouped, thus indicating a certain regularity in the spatial distribution of given phenomena. In the first volume of this book, economic and geophilosophical axes were mentioned, and now attention will be paid to geography. Within it, two approaches are recognized, the first of which is purely geographical (Harvey, 2013), while the second is more philosophical-geographical (Kostinskiy, 1997).

This demanding description will begin with the question of power and social relations in capitalism, which Harvey has clearly presented in several of his books (1985; 1987; 2013). He achieved the sublimation of these descriptions through his work on contemporary American power, in which he identifies two key axes, political and economic. He stated these axes

represent two logics of power, one of which (political) is territorially based, includes the state as the main political actor, which through its power controls often densely populated areas where capital accumulation takes place. The second axis represents the capitalist logic, based on the flows of economic power that spreads across state borders in the endless search for capital accumulation. This is why Harvey calls it a political/territorial anti-capitalist logic of power and he explains this conflict of different logics with molecular processes of capital accumulation throw space and time (passive revolutions in the geographical shaping of capital accumulation). According to him, these tensions and contradictions can also produce geographical configurations that achieve stability, at least for a while. It follows that these two logics are combined, but each has its own life, one clumsily fixed on the state space, and the other very mobile. These facts are embedded in the systemic probability of antagonism between them, including a high degree of unpredictability. Such a concentration of instruments of power, in itself, points to the worrying effect that geography can have more spent conceptions of power and those that focus on "it as a means of making something possible", rather than on the ability to dominate and control.

4.1 Towards spatial awareness

Another example of the existence of axes in geography can be found in the work of Kostinskiy (1997), who connects four key geographical concepts through a horizontal (objective) axis, which connects the whole and part, and a vertical (subjective) axis, which connects the general and the particular. In the further elaboration of this theory, Kostinskiy identifies key geographical terms (space, territory, and place, region) with the aforementioned methodological terms (general, particular, and whole, part) and thus builds assumptions for the establishment of spatial awareness, who's vertical (subjective) axis is epistemological, and the horizontal (objective) ontological essence.

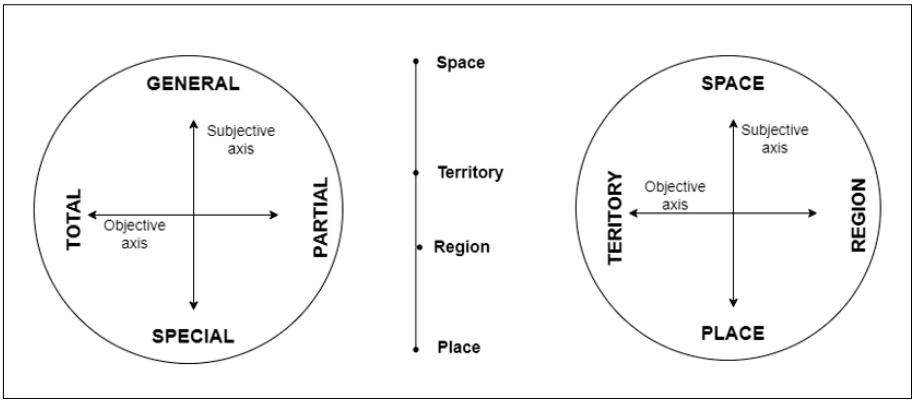

Figure 3. Spatial awareness and hierarchical relationships.
Note: Adopted from "Geographical matrix of spatiality" [Geografičeskaja matrica prostranstvennosti] by G. D. Kostinskiy, 1997, Izvestija geografii RAN, Serija geografičeskaja (5), p. 21, 22, 26, 29.

The previous diagram (Figure 3) clearly shows the relationships between the four basic geographical concepts, between which Kostinskiy (1997, p. 18) builds internal connections

and hierarchical relationships. In this regard, there are two "axes" of relations, whole and part, and general and special, so that "in the subject (ontological) aspect, the opposition is territory-region, and in the methodological (epistemological) space-place". The concepts of space and territory have a specific weight, as the central concepts of the aforementioned axes. This question, probably, represents one of the essential geographical questions, through which its basic ontological and epistemological characteristics are intertwined. It is important to note the difference between the mentioned terms in the domain of historical duration. The concept of space has ancient philosophical roots, while the concept of territory gained its full significance only after the Peace of Westphalia (1648) and is linked to the modern processes of cultural self-definition (Protestants and Catholics), which strongly expressed the political importance and power of social space. This is related to the basic characteristic of geography (spatiality), so Agnew (2009, p. 746) states that the concept of territory had the meaning of a limited spatial extent, primarily in the domain of "expressing a certain identity, i.e., it represented the boundary of sovereignty, jurisdiction, administration and citizenship". From this it is evident that this is not only a geographical (cultural) term, but also a legal (administrative) one, which has other meanings as well.

In defining the terms territory and territoriality, Delaney (2009, 196–208) emphasizes the practical relationships between the terms: space, power, and meaning. Each of these terms refers to complex social phenomena, and in combination, they influence the increase in the complexity of the terms territory and territoriality. A certain bipolarity of geographical representations is reflected in the existence of the aforementioned horizontal and vertical connections. They are already recognized in the domain of other sciences and have previously been analyzed in various fields, starting with geography (Harvey, Johnston, and Kostinskiy), economics (Hoover), social theory (Foucault), and philosophy (D & G). Through them, the duality of geography (natural and social science) and the specificity of its development during the modern period can be expressed in a "non-positivist way". A critical review of the work of Kostinskiy (1997) was given by Elackov (2013, p. 5) and Temirbekov (2011, p. 281). The first one agrees about the existence of these axes (in this form), but he believes that their interpretation should be presented as "a kind of scale, from the lack of regional signs (indifference to content) to the full determinability of these signs". Since the region itself, in the broadest sense, includes three varieties (area, private, and complex areas), it is possible to combine the aforementioned "axes" into one, arranged "in accordance with the complexity and content of the concepts: territory–area–private region–complex region". Another author focuses on the elements of the essential (ontological) difference between the given terms and states that "the only thing that needs to be proven here is that the concept of space is extensive, at least three-dimensional, and territory is no more than a two-dimensional concept." Elackov (2013, p. 6) refutes this point of view by stating that even as a two-dimensional space it is still space, even if it has a special name, on the basis of which he introduces the term geospace and its derivatives (subspace), which consists of its components (litho, hydro, atmo, bio, etc.). For him, the main difference between geospace (and a number of its subspaces) and territory relates to content rather than dimensions or physical extent.

Kostinskiy (1997) refers to Heidegger and Russian philosophers (Mamardashvili and Podoroga), on the basis of whose phenomenological assumptions he defines the concept of

spatiality, which unites the mentioned geographical concepts through an "objective and universal form of arrangement". For him, there is one, phenomenologically understood spatiality that unites two "spaces". The first refers to the body space ("physical" space), from which traditional positivist science starts, and the second is the "process space" (thinking and practice). This was just an idea on the basis of which he defined the mentioned concepts more precisely, but also indicated the existence of the mentioned geographical axes. Kostinskiy (1997, p. 29) depicted the mentioned axes in the form of a cross, which is located inside the tetrahedron. The key conclusion of the analysis of Kostinskiy (1997) refers to the understanding of the basic geographical terms (space, place, territory, and region), which make up the four poles, i.e., two pairs of concepts form two different but complementary principles of spatial practice. At the same time, the first pair (space-place) has an analytical-synthetic meaning, and the second (territory-region) has a generic meaning.

The previous diagrams were synthesized by Grčić (2011, p. 98) in such a way that he also placed the mentioned geographical axes in a tetrahedron, and the spatial hierarchy between the given terms was more precisely described and incorporated into the synthesis diagram. He starts from the fact that the smallest unit or geographical "molecule" is a place (settlement) that integrates three elements: man (society), nature, and the economy. To solve the problem of unity and complexity in geography, the question of the role played by the categories of whole and part is essential for him. Referring to Kostinskiy (1997), he presented it graphically through the mentioned geographical axes, of which the horizontal (objective) represents the subject or ontological essence that connects the territory and the region, while the vertical (subjective) represents the methodological or epistemological essence of those relations, which represents the relationship between space and place.

4.2 Spatiality

At the end of the description of spatial thinking, we come to this term, which in English has two meanings (metric and derivative). The first is spaciousness and represents "the quality of large size and a lot of space", which refers to the physical characteristics of that space (width, length, and height) and this term is characteristic of technical sciences. Another meaning is spatiality, and it is more geographical and refers to "the influence of space on actions, interactions, entities, and theories". This dictionary also offers several examples, e.g., according to Shepherd spatiality is a social construct, not an exogenously given, absolute coordinate system... but a product of the political economic system; Clegg states that spatiality is constitutive in certain ways, in which different modalities of power come into force. The two main dimensions of spatiality are range and intensity.

The term is also used as a synonym for distribution, or spatial expression. However, the more precise geographical meaning of the term spatiality is elaborated by Gregory (2009, 715–717), who defines it as "the way in which space is involved in the constitution and behavior of life on Earth". He recognizes four main forms or traditions of spatiality, based on different philosophical explanations (existentialism and phenomenology, structural Marxism, structuration theory, and poststructuralism), which some geographers (Pickles, Castells, Soja, and Thrift) have processed and applied in social geography and related fields. Gregory notes that the sharp boundaries between these forms of spatiality are disappearing, and their meanings are increasingly intertwined. For our purposes, the notion of spatiality takes on

central importance in defining the methodological framework of the work (Figure 4). This means that the previously mentioned geometric framework and content of geographic axes has been completely transformed. At the center of the new model is the concept of spatiality, within which the mentioned geographical concepts (space, territory, region, and place) exist, connected by the mentioned geographic axes (horizontal and vertical), and the extension of which is represented by new (geophilosophical) concepts.

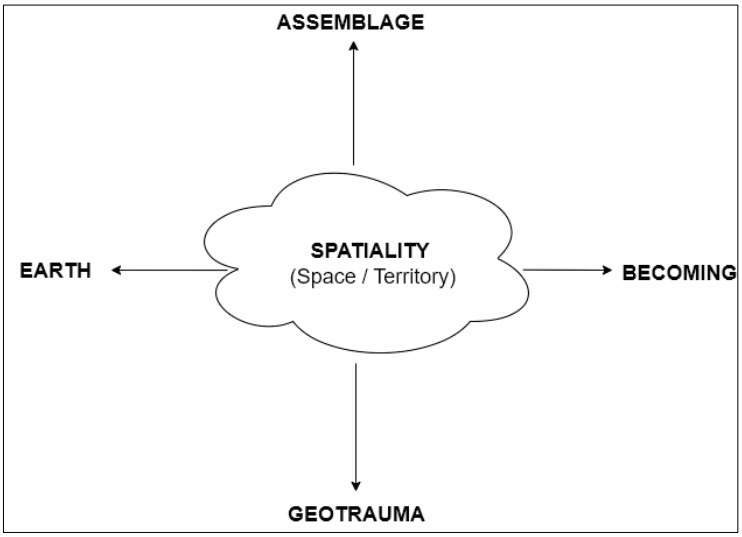

Figure 4. Transformation of geographic into geophilosophical axes.
Note: Adopted from "Geophilosophy of Modern II: Practice" by Mutabdzija, 2023, p. 57

At the same time, the aforementioned axes retain the previously described properties (Kostinskiy, 1997), which means that the vertical (subjective) axis consists of the epistemological essence (space, assemblage, geotrauma), and the horizontal (objective) axis represents the ontological essence (territory, becoming, Earth). In this way, the strict form built by the mentioned axes (cross, tetrahedron or mandala) is abandoned, but it becomes an imaginary space (cloud). Such logic enables the reconfiguration of the content of those axes according to geophilosophical meanings and their formation as a set, not of two, but of three terms. In this way, assumptions are created for the meaningful use of selected geophilosophical terms, in accordance with the previously set goals.

5. Conclusion

This paper represents an attempt to synthesize his own two-volume book on contemporary geographical thinking. In doing so, the author was not guided by the principle of retelling the key details but tried to offer a clear and reviewed methodological framework for a proper understanding of this extensive, complex, and very demanding matter. The key terms in that methodology are the interdisciplinarity of various influences from other scientific disciplines and the layering of geographical representations themselves. They are

conditioned by the existence of horizontal and vertical axes, which connect space, place, territory, and region. In order to avoid a narrative-analytical approach, geophilosophy was added to this methodological framework, a kind of amalgam that connected different contexts, concepts, and methods, and made it possible to make geographic thinking abstract and bring it closer to contemporary trends in other humanities and social sciences.

References

Agnew, J. (2009). Territory. In D. Gregory et al. (Eds.), *The Dictionary of Human Geography* (pp. 746–747). Blackwell Publishing Ltd.

Delaney, D. (2009). Territory and Territoriality. In R. Kitchin & N. Thrift (Eds.), *International Encyclopedia of Human Geography* (pp. 196–208). Elsevier

Deleuze, G. (2009). *Razlika i ponavljanje*. [Difference and repetition]. Fedon.

Deleuze, G., & Guattari, F. (2013). *Kapitalizam i šizofrenija 2. Tisuću platoa* [Capitalism and schizophrenia 2. A thousand plateaus]. Sandorf & Mizantrop.

Elackov, A. B. (2013). Territorija i rajon v geografičeskoj matrice prostranstvennosti [Territory and region in the geographic matrix of spatiality]. *Известия РАН. Серия географическая*, *3*, 5–13. https://doi.org/10.15356/0373-2444-2013-3-5-13

Foucault, M. (2005). Druga mesta. [Of Other Spaces: Utopias and Heterotopias]. In P. Milenković & D. Marinković (Eds.), *Michel Foucault 1926–1984–2004: hrestomatija* (pp. 28–36). Vojvođanska sociološka asocijacija.

Foucault, M. (2012). *Moć/znanje. Odabrani spisi i razgovori 1972–1977*. [Power/knowledge: selected interviews and other writings, 1972–1977]. Mediterran Publishing

Grčić, M. (2011). Problem celovitosti u geografiji [The problem of completeness in geography]. *Treći kongres srpskih geografa* [The 3rd Congress of Serbian Geographers] (pp. 97–107). SGD & GDRS.

Gregory, D. (1978). *Ideology, Science and Human Geography*. Hutchinson.

Gregory, D. (1994). *Geographical imaginations*. Blackwell.

Harvey, D. (1985). The Geopolitics of Capitalism. In D. Gregory & J. Urry (Eds.), *Social Relations and Spatial Structures* (pp. 128–163). Palgrave. https://doi.org/10.1007/978-1-349-27935-7_7

Harvey, D. (1990). Flexible accumulation through urbanization: Reflections on "post-modernism" in the American city. *Perspecta 26*, 251–272. https://www.jstor.org/stable/1567167

Harvey, D. (2013). *Kratka povijest neoliberalizma* [A Brief History of Neoliberalism]. Vbz.

Kostinskiy, G. D. (1997). Geografičeskaja matrica prostranstvennosti [Geographic matrix of spatiality], *Известия РАН, Серия географическая, 5,* 16–31. http://www.mediafire.com/?xuk2loxa7gjxwyn

Lefebvre, H. (1991). *The Production of Space*. Blackwell

Mutabdzija, G. (2023). *Geophilosophy of the Modern II: Practice.* Amazon KDP

Mutabdzija, G. (2022a). *Geophilosophy of the Modern I: Theory*. Amazon KDP

Temirbekov, A. T. (2011). O sušnosti i sootnošenii ponjatij "territorija" i "prostranstvo" v èkonomičeskoj i social'noj geografii [On the essence and relationship of the concepts of "territory" and "space" in economic and social geography]. In Katrovskiy (Ed.) *,Social'no-èkonomičeskaja geografija: istorija, teorija, metody, praktika* [Social-economical geography: hystory, methods, practice] (pp. 279–283). Универсум.

Warf, B. (2006). Humanistic geography. In B. Warf (Ed.), *Encyclopedia of Human Geography* (pp. 233–236). Sage.

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INTERTWINING GEOGRAPHY AND ART THROUGH SELECTED LANDSCAPE PAINTINGS

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Abstract: Geography is often classified as a natural science, but less frequently as an interdisciplinary one, and it is rarely connected to art. However, as one of the pillars of science, alongside mathematics and philosophy, geography has broken through the narrow confines imposed on it by the natural development of science, scientific disciplines, and especially technological and methodological tools. Through numerous works of art, in painting, music, and literature, the geographical space is reflected with all its physical elements, as well as its social and economic realities. Geographical space has always inspired painters, whether in Renaissance, Romanticism, Impressionism, Realism, Neorealism, or Modernism.

Keywords: landscape painting; art and science; geography of art; geohumanities; Sava Šumanović

1. Introduction

The geographical area has inspired numerous artists, painters, musicians, and photographers, not only because of its physical features but also its social, societal, and political movements. For example, the paintings of Mihovil Krušlin visually depict the geography of Velebit; Oton Gliha and Frano Šimunović, in their work "Gromače" illustrate the rural landscape of Primorje and the Dalmatian hinterland; Krsto Hegedušić, with his Podravina motifs, observes the social structure of Podravina villages; Petar Lubarda portrays the geomorphology of the Montenegrin karst, while the Dalmatian karst landscape, intertwined with dense maquis and cypress trees, and the urban structure of Adriatic towns, can be geographically studied in the paintings of Petar Dobrović and many others. The entire functional and social structure of Bosnian villages and towns is depicted in the works of Jovan Bijelić. While fine art drew its inspiration from the concrete, living, dynamic relief, the pedology of karst and the Pannonian Plain, agrarian forms of field cultivation, and the hydrological characteristics of rivers, seas, and their movements, geography has not fully embraced the art of painting as a subject of research.

The geographical space also inspired one of the greatest Serbian painters, Sava Šumanović. Srem and Šid are constant motifs in his paintings. Through his works, we can see the slopes of Fruška Gora, loess terraces and flatland, and the alluvial plain of the Sava River. The structure and method of land cultivation, as well as the crops Šumanović painted, along with the typical forest vegetation species, are also part of scientific research conducted by rural geographers, just as the structure of the Srem village with its narrow streets, traditional buildings, and the everyday life of Srem farmers.

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The area where geography and visual art intersect is a path to transdisciplinary ideas, perspectives, and joint action. It is in the interest of both, geography and fine art to commonly contemplate the environment, spatial transformation, and the social structure of society.

2. Art and science

Art and science, when viewed experientially, emotionally, and practically, are very similar. Both scientists and artists patiently, creatively, and persistently invest in the work and goals they set, while enduring criticism and attacks from colleagues and the public. These are professions chosen not for financial gain but out of passion (Schaaf et al., 2017). Both art and science are creative and analytical categories of study, research, and decision-making processes. Research is not exclusive to science, but also a feature of art, and inspiration is the starting point that leads from an idea to the final result in both fields. Learning is a process that transforms both scientists and artists into experts capable of defending their work while resisting often malicious criticism. Both categories must face and accept failure as an integral part of scientific and artistic growth (Schaaf et al., 2017).

Kepes (1956) published a book titled *The New Landscape in Art and Science*, attempting to explain the different functions of visual arts and science, and what might connect them, constantly returning to the idea that nature serves as a common base, a shared language for both. According to him, the landscape is simultaneously a subject of material research, an aesthetic resource, and a means of visual learning. Kepes was convinced that if artists and scientists worked together in synergy, they could develop new visual images that would inspire scientists in their search for new visual models. His ideas were particularly prominent in the 1970s when environmental awareness began to rise and ecological movements gained global momentum. Kepes argues that human involvement in the world and our technological advancement have dulled the beauty of the world, but at the same time led to progress:

- degradation of natural beauty due to human presence: "The light that once illuminated those pale peaks with its rose hues at dawn and purple tones at sunset is now dimmed and faint"(Kepes, 1971, p. 89); and
- "Neglect of nature's wealth leads to the destruction of living forms, and eventually to the degradation and destruction of humanity itself" – as evidence of this claim, Kepes uses the story of Icarus (Kepes, 1972, p. 1).

Here, Kepes found a social, as well as an educational, role for the artist. Only an artist familiar with scientific developments and an understanding of the implications of new technologies could influence the expected ecological challenges. For Kepes, this meant a new civic art (his term), based on interdisciplinary collaboration. One way to expand the vision of art was to create exchange and communication between art and other disciplines, such as science, spatial and transport planning, and architecture. Kepes sees this multi- and transdisciplinarity as the primary goal of art and science, which is the goal of the entire human environment (Kepes, 1971).

3. Art—geography—landscape

As St John (2021) pointed out "Art and geography as a science have long been intertwined in the interpretation of how we represent the world around us. Geographers interpret and analyze works of art, becoming kind of curators of exhibitions, collaborating with artists, and even becoming creative practitioners themselves" (p. 249).

As far back as fourteen thousand years ago, humans left marks on rocks that resembled both art and cartography. In France, in the Lascaux Cave, hunter-gatherers painted the walls 15,000 years BC. An even earlier example is the Chauvet-Pont-d'Arc Cave (30,000 BC) in southern France, as well as Altamira in Spain (18,000 BC). Petroglyphs were carved by nomads 12,000 years ago in North America, in the Algerian Sahara (Figure 1), and even earlier by Aboriginal tribes in Australia.

Figure 1. Tadrart, Algeria.
Note. Adapted from *The Dawn of Imagination: Rock Art in Africa* (p. 47), by David Coulson, 2010, Trust for African Rock Art (https://africanrockart.org/wp-content/uploads/2023/05/Dawn-of-Imagination-Catalogue.pdf). Copyright 2010 by David Coulson / TARA. Adapted with permission.

Human beings have left future generations with many valuable experiences in various cultural and scientific fields. One of the most significant legacies in every society is art. Through art, ideologies, and politics dominant in a particular society are reflected. Nature and geographical events are intertwined in various contexts to depict certain artistic concepts (Hassani, 2009). Each nation has a unique identity that is entirely different from other nations; in other words, each nation is created in a specific geographic location and has its history.

Geographical space was changed during not only the geological past, but its apperance was changed by the work of human communities. Those changes also affect social relationships within the community, ranging from loose ties in Neolithic societies to solid political communities focused on transforming the landscape through the construction of irrigation systems, dams, deforestation, and the conversion of forested areas into agricultural land, all the way to modern urban-industrial environments. The speed and nature of these changes depend on the social and political goals of human communities.

The development of creative geography has led scientists to embrace graphic methods, including visual art, image creation, creative writing, and performance techniques as tools for research (Hawkins, 2015). For a long period in human history, science and art studied human history in parallel, without touching upon or collaborating.

The process of establishing geography with artistic practices intensified after the 1960s with the diffusion of the humanistic epistemological movement. By conceptualizing art as processes that involve conceptual frameworks with multiple meanings, the creative return has been marked by studies that highlight (in)visible, (in)tangible, (in)expressible, and (im)possible geographical experiences (de Souza Junior, 2024).

Art, like science, arises from the organic relationship between humans and the environment, fundamental elements of geographical study, which is why art is essential to geography (Marandola Junior, 2010). ''Artists do not create art only in space but also with space, subjectively perceiving it" (Dozena, 2020, p. 380) and artistic images are essentially visual witnesses of the real world (Shapin, 1984), but also the subject of research within geographical disciplines (Gregory, 1994; Schwartz, 1996), as they serve as a treasure trove of information and data of geographic spaces.

The comprehensive artistic output of „Neue Slowenische Kunst" (NSK) emerged in the 1980s in Trbovlje, centered around the Laibach group As part of the "Laibach Kunst" project, the painting section includes the work of the IRWIN group (Hasanović, 2016), through which the connection between art and socio-economic geography is evident, in graphics and linocuts of heavy industry in Slovenia – Trbovlje Power Station, Hrastnik Glass Factory, and Trbovlje Cement Factory. These socio-realist linocuts are witnesses to society's industrial development, which has been erased from the Slovenian and Croatian landscapes over the past 30 years, as new architectural forms have emerged due to economic restructuring and the rise of new social layers. However, it is also a form of politicization of art, reflecting the dissolution of one political system and the development of neoliberal capitalism.

The external (physical) erasure of industrial heritage is an impressive landscape transformation beyond recognition. Geographers now have the opportunity to use the art of painting in landscape research and spatial planning (Balm, 2000). Painting is a sensory window to the geographical horizon it depicts (Dardel, 2016). Almeida (2021) emphasizes that "if art is creative writing of space, it is undeniable that it is closely related to geography, which aims to interpret and explain space" (p. 129).

4. Landscape as the subject of artistic and scientific analysis

The concept of the landscape has a long and intricate etymology, and its explanation is one of the key contributions of cultural geography to interdisciplinary research. The term "landscape" has early medieval origins and originally referred to an area of land used by an agrarian community (Ingold, 2021). The geographical reality of landscapes emerges through the continuous shaping of the Earth's surface by both human and natural activities. According to St John, Carl Sauer popularized the idea of the "cultural landscape" in his essay *The Morphology of Landscape*, published in 1925, where he described the study of visible forms shaped by the interactions of nature and culture, using the horological method and producing descriptive writing and cartography (St John, 2021).

Cosgrove (1985) wrote that the concept of landscape emerged as a "way of seeing" the external world in the 15th and early 16th centuries. It was a visual concept tied to the Enlightenment philosophical movement, with landscape representation techniques like architecture, exploration, landscape painting, cartography, and military science derived from the principles of linear perspective. Since its inception, modern geographical knowledge has been in contact with artistic practices. The reason is clear. There is no need to doubt or explain that art emerged before science.

These studies relate to performances, graffiti, literature, painting, installations, and other artistic forms that are sensibly, intersubjectively, and intercorporeally connected to spatial dynamics. Although geography has a long tradition of cartography, fieldwork sketching,

graphic methods (da Costa Gomes, 2017), and GIS, the word and written text remain dominant. Many geographers are less theoretically equipped to engage with images than with words (Hawkins, 2015), often strictly separating art from science in the form of paintings, photographs, or videos. However, this presents both a challenge and an opportunity, justifying the necessary link between geography and art in which essential questions need to be addressed (Hawkins, 2014):

- What is the meaning of visual art in the world?;
- Which geographic regions are art centers, and which are consumers of art?; and
- How do we come into contact with works of art?

Each installation, painting, or performance is a potential sensory experience of the landscape that evokes multiple, geo-aesthetic connections (Carlotti, 2014). Identifying geography's influence on art in human life can thus reveal a broad understanding of creativity and cultural movements across various fields (Hassani, 2009). There are numerous opportunities for interdisciplinary and multidisciplinary work within geography and collaboration in these areas. Collaborating with other sciences that share similar study subjects opens up the possibility for approaches that, through their methods, analyze subjective and emotional perceptions of spatial realities (de Souza Junior & de Almeida, 2020; Hassani, 2009).

For Cosgrove (1985), the landscape is an ideological concept in which a particular class of people has its place in nature, and whose social position differs from other classes to the external environment. In this context, geography becomes a tool for critically examining our role in nature. The environment has the role of a complex natural, cultural, and political entity. The shared origins of art, geography, and the humanities, along with the contemporary development of transdisciplinarity, open the possibility for the emergence of geo-humanistic sciences.

5. Geodiversity in art

Through the medium of painting, geographers can identify a wide range of spatial phenomena and processes, from geomorphological and climatological aspects to socio-demographic patterns, depending on the geographic discipline studying the artwork. Painting is not merely a reflection of artistic creativity but also serves as a documentary source and a field of scientific research, expanding the knowledge of geospatial realities (Truffert & Robida, 2007).

In physical geography, geomorphology is most directly linked to painting and geodiversity, which is represented through artistic works. Geodiversity encompasses the variety of landscapes, forms, and processes on and beneath the Earth's surface (geotopes, geospheres), including their features, relationships, and systems. It consists of geological diversity (rocks, minerals), geomorphological diversity (erosion and accumulation processes), and pedological diversity, including the structures and types of landscapes (Bétard, 2017; Gray, 2013).

A subdiscipline of geomorphology, cultural geomorphology, examines the influence of landscape culture and heritage on the geomorphology of geographical space (Bétard, 2017; Motte, 2017; Panizza & Piacente, 2003; Portal, 2018). Consequently, geodiversity also encompasses the social sciences, where the cultural sphere dominates, and painting, as an expression of artistic creation, becomes a tool for understanding the evolution of the abiotic environment.

Landscape motifs reveal that relief forms, rocks, soil, and hydrogeography allow the reconstruction of past landscapes. Various human activities influence erosion and

accumulation processes in geospace. Through actions, certain human societies leave their marks on the landscape, as seen in excavated structures (open-pit mines, quarries), constructed objects (dams, hydroelectric plants, roads), managed environments (parks and gardens), and archaeological remains (tumuli, hillforts, necropolises). These changes alter existing landscapes and create new ones (Portal & Bétard, 2019).

Geodiversity becomes recognizable when it is represented (through drawings, photographs, paintings, etc.), whether as a result of scientific study or artistic creation (such as theater or film scenography) (Roger, 1997). Geodiversity is thus a combination of scientifically objectified reality and fictional elements, whose representations hold value, whether they are produced from reality or are partially or entirely invented or created. Through this blend of art and science, geodiversity helps deepen our understanding of the environment, offering insight into both, natural processes and human interventions in shaping landscapes.

6. Geography in the paintings of Sava Šumanović

In his most significant period, centered around Šid, Sava Šumanović emerged as a painter of geodiversity and geohumanism. The motifs present in his paintings are drawn from the immediate surroundings of Šid, particularly the northern part, which is part of or continues into the Fruška gora region (Bašićević, 1960). His works provide a scientific avenue to study landscape geodiversity and its transformation over the past century. Geography in his paintings is reflected in the physical characteristics of the space, from the sunlit slopes of Fruška gora with its cultural landscape of vineyards to the Srem loess plateau that surrounds Fruška gora, where Šid is located in its western part.

Figure 2. Prede iz okoline Šida [Šid area], 1933.
Note. Ulje na platnu [Oil on canvas]; 81,5 x 60 cm, ISŠ 68, property of the Gallery "Sava Šumanović", Šid.

Figure 3. Putevi [Roads], Predeo iz Srema, 1934.
Note. Ulje na platnu [Oil on canvas]; 81 x 60 cm, ISŠ 80, property of the Gallery "Sava Šumanović", Šid.

Figure 4. Žetva [Harvest], 1940.
Note. Ulje na platnu [Oil on canvas]; 100 x 81 cm, ISŠ 177, property of the Gallery "Sava Šumanović", Šid.

Geomorphology, a key element in many of Šumanović's landscapes, offers opportunities for geographical research into the interplay between art and landforms. For instance, in paintings such as *Predeo iz okoline Šida* (1933), *Putevi* (1934), and *Žetva* (1940), Šumanović captures the region's physical terrain (Figure 2, 3, and 4). The fertile "black soil" (crnica) is portrayed either as bare, unused land or as covered by the cultivated agrarian landscape of wheat fields, orchards, and vineyards. His depictions of agricultural fields allow us to observe land parceling, polyculture production, and the relationships between meadows, pastures, and arable land. Paintings such as *Harvesting* showcase the rural landscape of Srem in the early 20th century, with parcelled fields separated by meadows and pastures, representing scattered estates (Figure 4).

Šumanović's work belongs to the currents of poetic realism; as he said, "the landscape dictated my style of painting" (as cited in Burojević & Jukić, 2009, p. 13). He did not only focus on landscapes but also reflected the social class positions of various groups, from farmers working the land, harvesting wheat, and tending vineyards, to urban residents on the streets of Šid or by the river. In *Šidski sokaci*, Šumanović portrays the rural periphery of the town, with traditional Srem houses lined along a dirt road, shaded by linden trees during the summer (Figure 5) or classic Srem houses with their gabled facades and porches, featuring two windows.

Figure 5. Seoska ulica [Village street], 1933.
Note. Ulje na platnu [Oil on canvas]; 81 x 60 cm, ISŠ 88, property of the Gallery "Sava Šumanović", Šid.

Figure 6. Seoska kuća [Country house], 1932.
Note. Ulje na platnu [Oil on canvas]; ; 81 x 60 cm, ISŠ 96, property of the Gallery "Sava Šumanović", Šid.

Figure 7. Periferija Šida pod snijegom [The outskirts of Šid covered in snow], 1940.
Note. Ulje na platnu [Oil on canvas]; 81 x 60 cm, ISŠ 128, property of the Gallery "Sava Šumanović", Šid.

By the 19th century, construction used baked brick, and roofs were covered with red clay tiles, which can be seen in Šumanović's works. The houses' facades were typically whitewashed with lime, and the lower part (the "cokl") was painted in a darker color, as depicted in his paintings of Šid's periphery (Figure 6).

This brief description reveals the geography of the area, the types of rural settlements, vegetation, and phytogeographical characteristics. Art critics and many admirers of Šumanović's work particularly appreciate his winter landscapes of Šid and its surroundings. In these paintings, where the snow's whiteness covers the relief's morphology, we see a clear distinction between the artistic and scientific approaches to space. The snowy whiteness in Šumanović's winter landscapes (Figure 7) adds a poetic quality, more so than in his spring or summer landscapes, where the terrain's morphology is portrayed more realistically and objectively, making it scientifically more relevant.

In conclusion, Sava Šumanović's work aligns with the sentiment expressed by Ibler (1929, cover page): "One must live the life of their time. One must create in the spirit of their time... Because art is an expression of a worldview. Because art and life are one."

7. Conclusion

Art and geography, as a science, within their intersecting circles, have the potential to interpret, analyze, and present geographical reality—both physical and social—transcending the barriers fluidly set by both science and art. Artistic paintings are a reflection of the life of the time in which they were created, as the artist cannot stand apart from the contemporary era and the collective that surrounds them. In doing so, the artist enters the realm of geography, and its subdiscipline, visually presenting information and data on geographical space. Space serves as the link between geography and art, and in symbiosis with art—particularly painting—geographers can identify numerous phenomena and processes in space, whether of natural or anthropogenic origin. Geography thus gets a new, higher dimension, positioning itself as a transdisciplinary science—geohumanistic. Integrating with philosophy, art, social, and environmental sciences, geography becomes a bridge that holistically explains the complexity of the relationship between humans and their environment.

A portion of Croatian painters, especially those belonging to the group "Zemlja," depict peasants, workers, rural "bogce" villages with muddy paths and cottages, and the customs of Podravina villages. In the artistic work of Sava Šumanović, particularly during the "Šid period," we observe a holistic approach to art. The geography of the Šid area, its inhabitants, and the structure of life are represented in paintings that reflect cultural geomorphology, agrarian relations in the village, and functional rural and urban settlements. Like the works of the group „Zemlja", Šumanović's art serves as a social and economic document of its time that geographers still need to study.

References

Almeida, M.G. (2021). Paisagens: Uma Contribuição Da Arte Para A Geografia Sociocultural. *Espaço e Cultura, 49*, 125–142. https://doi.org/10.12957/espacoecultura.2021.60698

Balm, R. (2000). Art as Geographic Tool For Landscape Explanation. *Middle States Geographer*, *33*, 1–9. https://msaag.aag.org/wp-content/uploads/2013/05/1_Balm.pdf

Bašićević, D. (1960). *Sava Šumanović: život i umjetnost.* Društvo Historičara Umjetnosti Hrvatske.

Bétard F. (2017). *Géodiversité, biodiversité et patrimoines environnementaux. De la connaissance à la conservation et à la valorisation*. Université Paris-Diderot.

Carlotti, L. (2014). L'art comme expérience du paysage. In A. Berque, M. Maupertuis, V. Bernard-Leoni (Eds.), *Le Lien au Lieu: Actes de la chaire de mésologie de l'Université de Corse* (pp. 103–110). Eoliennes

Cosgrove, D. (1985). Prospect, Perspective and the Evolution of the Landscape Idea. *Transactions of the Institute of British Geographers*, *10*(1), 45–62. https://doi.org/10.2307/622249

da Costa Gomes, P.C. (2017). *Quadros Geográficos. Uma forma De Ver, Uma Forma De Pensar*. Bertrand Brasil.

Dardel, E. (2016). O Homem e a Terra: Natureza da realidade geográfica. *Revista da Abordagem Gestaltica*, *22*(2), 245–246.

de Souza Junior, C.R.B. (2024.) Art and Geography: Horizons of Creative Practices. *Geotemas*, *14*, 01–24.

de Souza Junior, C.R.B., & de Alemida, M.G. (2020). Creative Geographies: experiential affinities in art-geography relations. *Sociedade & Natureza*, *32*, 462–471. https://doi.org/10.14393/SN-v32-2020-47209

Dozena, A. (2020). Horizontes geográfico-artísticos entre o passado e o future/Geographic-artistic horizons between past and future. *Geograficidade*, *10*, 73–82. https://doi.org/10.22409/geograficidade2020.100.a40528

Gray M. (2013). *Geodiversity: Valuing and Conserving Abiotic Nature*. Wiley-Blackwell.

Gregory, D. (1994). *Geographical Imaginations.* Wiley-Blackwell.

Hasanović, J. (2016). Neue Slowenische Kunst: Političko čitanje umjetnosti kao retrogradne nadidentifikacije s budućnosti. *Sarajevski žurnal za društvena pitanja (Sarajevo Social Science Review)*, *5*(1–2), 111–126.

Hassani, G.H. (2009). The Effect of Geography on Art and Culture. *The International Journal of the Arts in Society: Annual Review*, *4*(1), 267–272. https://doi.org/10.18848/1833-1866/CGP/v04i01/35560

Hawkins, H. (2014). *For Creative Geographies: Geography, Visual Arts and the Making of Worlds*. Routledge.

Hawkins, H. (2015). Creative geographic methods: knowing, representing, intervening. On composing place and page. *Cultural Geographies*, *22*(2), 247–268, https://doi.org/10.1177/1474474015569995

Ibler, D. (1929). *Izložba Udruženja umjetnika Zemlja* [Exhibition of the Association of Artists Zemlja]. Arhiv za likovne umjetnosti (Zagreb). https://dizbi.hazu.hr/a/?pr=iiif.v.a&id=10906

Ingold, T. (2021). *Being Alive: Essays on Movement, Knowledge and Description*. Routledge.

Kepes, G. (1956). *The New Landscape in Art and Science.* Paul Theobald and Company.

Kepes, G. (1971). Toward Civic Art. *Leonardo*, *4*(1), 69–73.

Kepes, G. (1972). Art and Ecological Consciousness. In G. Kepes (Ed.), *Arts of the Environment* (pp. 1–12). George Braziller.

Marandola Júnior, E. (2010). Humanismo e arte para uma geografia do conhecimento. *Geosul*, *25*(49), 7–26. https://doi.org/10.5007/2177-5230.2010v25n49p7

Motte, E. (2017). *Iconographie et géomorphologie: usages et représentations artistiques des rivages comme outil de connaissance de l'évolution du littoral* (Doctoral dissertation). Retrieved from https://theses.hal.science/tel-01894893/

Panizza, M., & Piacente S. (2003). *Geomorfologia culturale*. Pitagora.

Portal, C. (2018). Geodiversity and Anthropocene Landscapes: New Perceptions and Aesthetic Renewal of Some European "Coalscapes". *Environment, Space, Place, 10*(1), 89–110. https://doi.org/10.5749/envispacplac.10.1.0089

Portal, C., & Bétard, F. (2019). Representing geodiversity: Between art, sciences and geographical imagination. An introduction. *Géomorphologie:* Relief, Processus, Environnement, *25*(3), 141–149. https://doi.org/10.4000/geomorphologie.13487

Roger, A. (1997). *Court traité du paysage.* Gallimard, Bibliothèque des Sciences humaines.

Schaaf, R., Worrall-Hood, J., & Jones, O. (2017). Geography and art: encountering place across disciplines. *Cultural geographies*, *24*(2), 319–327. https://doi.org/10.1177/1474474016673068

Schwartz, J.M. (1996). The Geography Lesson: photographs and the construction of imaginative geographies. *Journal of Historical Geography, 22*(1), 16–45. https://doi.org/10.1006/jhge.1996.0003

Shapin, S. (1984). Pump and Circumstance: Robert Boyle's Literary Technology. *Social Studies of Science*, *14*(4), 481–520. https://doi.org/10.1177/030631284014004001

St John, R. (2021). *Exploded scales, island imaginaries: The new landscape in art and geography* (Doctoral dissertation). Retrieved from https://theses.gla.ac.uk/82484/13/2021stjohnphd.pdf

Burojević, V., & Jukić, Lj. (2009) *Posle 70 godina* [After 70 years]. Galerija slika „Sava Šumanović" Šid.

Truffert, C., & Robida F. (2007). Produire la connaissance géologique en 3D: stratégie, perspetives. *Géosciences*, *6*, 22–27.

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THE HISTORICAL HERITAGE OF RUSSIA AND THE MISSION OF GEOGRAPHY

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Abstract: The report examines the phenomenon of Russia's historical heritage as a factor in maintaining authenticity and ensuring the successful development of the country. The heritage concept refers to particularly valuable objects and environmental phenomena that reflect the history of nature and society and their natural and cultural diversity. Heritage is the most intimate area of human existence. They turn to their spiritual heritage in the most difficult and tragic moments of their history. This was the case in Russia during the "time of troubles" at the beginning of the 17th century, during the Napoleonic invasion of 1812, and during the Great Patriotic War of 1941–1945. The people of Russia associate the recovery from the crisis of the post-Soviet period with the legacy of their great past. However, recently, there have been increasingly frequent disruptions in the manifestation of the desire of countries and peoples to preserve their heritage—this, in a way, is the instinct for self-preservation of man as a species. Threats to heritage exist in open and hidden forms, and the number and severity of their manifestations are constantly and almost everywhere increasing. At the same time, the spiritual traditions of the people of Russia do not allow us to come to terms with the inevitability of threats. They force us to counter this dangerous process with persistent, creative work to save the heritage and ensure its reliable future. A significant part of this work and the ever-increasing responsibility for preserving heritage falls on geography—the science of the spatial organization of social life, unthinkable in our time without heritage. The mission of geography is, first of all, to disseminate, through this science, the ideology of heritage as an indispensable factor in sustainable development. Heritage as a geographical phenomenon is fully inherent in Russia, which is characterized by its own special forms of organizing natural and cultural heritage, as well as its study and management. This paper describes these forms, identifies current problems in heritage management, and discusses approaches to solving them.

Keywords: historical heritage; threats to heritage; Russian heritage; mission of geography in preserving heritage

1. Introduction

Heritage is the values of the natural environment and the values of the "second nature"—the culture of people, usually represented in natural, historical, and cultural monuments. Heritage is the memory of everything important for the future in our past and present. Heritage is everything that people distinguish from the world of values around them into a special category, subject to mandatory transfer from generation to generation. This is the meaning of the UNESCO Convention on World Cultural and Natural Heritage adopted in 1972, as well as a number of other UNESCO actions and many similar national legislative acts of countries around the world.

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Russia has also developed a fairly well-developed policy in the field of historical heritage[1], based on the centuries-old traditions of the peoples of the country and enshrined in the relevant legal acts. In many ways, this occurred under the influence of research in geography and related scientific and applied disciplines. At the end of the 20th century, there was a noticeable increase in the status of the heritage phenomenon in connection with the adoption of the concept of sustainable development as a global civilization imperative. Within the framework of this concept, heritage is interpreted as one of the most important conditions for the well-being of society. This is precisely what the head of the UN Commission on Environment and Development (UNCED) G. H. Brundtland asserts at the very beginning of her review "From One Earth to One World": "We have the power to reconcile human affairs with natural laws and to thrive in the process. In this our cultural and spiritual heritages can reinforce our economic interests and survival imperatives" (UN Secretary-General, World Commission on Environment and Development, 1987, p. 18).

The decades that followed the adoption of the concept of sustainable development convincingly confirmed the accuracy of defining the role and place of heritage in the formation of "the future we want". The noted circumstance manifested itself, first of all, in the growth of responsibility of states and non-governmental structures for the state of heritage in the world and in individual countries, for the effectiveness of policy in this area. At the same time, the increase in the social status of the heritage phenomenon became a serious challenge not only for the sphere of heritage management, but also for the science of heritage, in the development of which geography has played and plays an important role. In this paper, we will reveal the thesis formulated above using the example of Russia.

2. The phenomenon of heritage in modern Russia

Among the many factors and conditions of people's lives throughout the history of Russia, as well as other countries of the world, heritage has played and continues to play a very special role. Based on modern trends in the development of nature and society, it can be assumed that the significance of heritage for the fate of civilization will not only be important, but also decisive for its future. The perception of this position as an axiom of development increasingly permeates modern human society at all its levels—from personal to civilization one. In these conditions, coordination of all components of policy in the field of heritage becomes necessary. Including those whose appearance is caused by the latest processes of greening and humanization of modern society, requiring scientific understanding.

Heritage and, in particular, spiritual heritage, is the most secret area of human existence. It is, figuratively speaking, a system of civilization codes of ethnic groups, a kind of matrix from which a nation is reproduced. Nations turn to their spiritual heritage in the most difficult and tragic moments of their history. This was the case in Russia during the "Time of Troubles" at the beginning of the 17th century, during the Patriotic War of 1812, and during the Great Patriotic War of 1941–1945. The spiritual heritage of its great past is increasingly becoming a decisive factor for the peoples of Russia in emerging from the protracted crisis of the post-Soviet period of its history.

[1]Here and below, historical heritage is understood as the totality of all known categories of heritage: natural and cultural, including spiritual heritage; tangible and intangible one.

Heritage, in its essence, is a historical category, the content of which can change in different eras. The ordinary in one historical period can be transformed into the unique and vice versa. At the same time, those values that provide the natural and socio-cultural prerequisites for the preservation and development of civilization remain eternal. Among them are the climatic conditions of the planet, the biological and landscape diversity of the natural environment, the cultural diversity of the human community, the traditional values of peoples, etc. It is precisely this understanding of the phenomenon of heritage that follows from the decisions of two major international conferences of the last decades: on the environment and development in Rio de Janeiro in 1992 and on cultural policy for development in Stockholm in 1998.

In Russia, the formation of heritage ideology was based on the cultural traditions of the ethnic groups living in the country. In modern times, the development of heritage ideology and the practices corresponding to it occurred in Russia almost synchronously with that in other countries of the world. A network of protected areas of natural and cultural heritage was formed—strict nature reserves, national parks, museum-reserves (open air museums), etc. State management bodies were created for them, as well as public (non-governmental) organizations in this area. The most famous of them were the All-Russian Society for Nature Conservation (1924) and the All-Russian Society for the Protection of Historical and Cultural Monuments (1965). Structures for scientific support of heritage policy were established in the country—divisions in academic and industry institutes, special research institutes and institutions, commissions in the Academy of Sciences, etc.

The concept of heritage in the modern sense of the word is relatively new in the cultural and political lexicon of Russia. It was first used at the official level in the USSR Law "On the Protection and Use of Historical and Cultural Monuments" (adopted on October 29, 1976). The preamble to this law, in particular, states: "Historical and cultural monuments of the peoples of the USSR constitute an integral part of the world cultural heritage and testify to the enormous contribution of the peoples of our country to the development of world civilization" (USSR Law "On the Protection and Use of Historical and Cultural Monuments", 1976, par. 4). This phrase from the aforementioned document can be perceived as the Soviet Union's reaction to the adoption by UNESCO in 1972 of the "Convention concerning the Protection of the World Cultural and Natural Heritage", which the USSR joined in 1988.

During that period, there was a noticeable increase in activity in the heritage sphere in the country: informal public organizations were created, the first state structures for heritage management appeared with this term in their names, specialized journals were created, and numerous scientific and educational conferences were held. In 1992, the state Russian Research Institute of Cultural and Natural Heritage was created. The Commission on Cultural and Natural Heritage began its work at the Russian Academy of Sciences. Later, in 2002, the Federal Law "On Cultural Heritage Objects (Historical and Cultural Monuments) of the Peoples of the Russian Federation" (2002) was adopted, which secured the status of cultural heritage in the post-Soviet period, as well as a number of other federal regulatory legal acts on heritage. Regional laws on cultural heritage and other similar regulatory documents appeared in the constituent entities of the federation. Heritage topics were included in secondary school curricula. Since 1993, universities in the country have been teaching courses on heritage, publishing textbooks, and establishing academic departments at universities.

The development of the heritage management infrastructure has predictably led to an increase in the number of cultural and natural heritage sites presented in the relevant lists—from world[2] to local ones. The effectiveness of its protection and the interest of the country's population in its preservation have significantly increased. There are noticeable positive changes in the use of heritage in the tourism sector, as well as in the interests of education. The most striking example of this kind was the creation of a historical cluster based on the ancient city of Tauric Chersonesos in Crimea (Figure 1), which opened to visitors in the summer of 2024.

Figure 1. New historical cluster of the ancient city Tauric Chersonesos in Crimea.

3. Historical heritage as a geographical phenomenon

The historical heritage of society manifests itself as a geographical phenomenon with a regular spatial differentiation. The differences in the manifestation of this phenomenon in space occur under the influence of the following main factors:

- natural features (natural uniqueness, pronounced standard format of natural components of the environment and their combinations, increased values of indicators of natural diversity and biological productivity compared to background values, etc.);
- socio-historical features (cultural uniqueness, expressed standard of cultural manifestations, history of development of the territory, its material evidence, increased values of cultural diversity indicators in comparison with background values, etc.);
- subjective features of perception of the world of natural and cultural values as heritage (ethnogenesis, ethnopsychology, mentality, etc.); and
- objective risk factors of loss of natural and cultural values (natural processes, natural disasters, social cataclysms, etc.).

[2]Currently, there are 33 UNESCO World Heritage sites in Russia, including 22 cultural and 11 natural heritage sites, which is 2.6% of their total number (1,223 as of 2024).

The manifestation of the above factors determines the regular formation of stable territorial combinations of heritage objects and phenomena and the corresponding differentiation of the territory (regions, countries, and the world as a whole). This phenomenon is quite clearly manifested at the global level. Thus, Western Europe and the Mediterranean are a region of dominance of tangible cultural heritage with virtually lost natural heritage. South and South-east Asia in this regard represent an organic combination of tangible and intangible cultural heritage. The circumpolar region of the planet is a clear predominance of natural heritage, as are the vast spaces of the New World.

A similar differentiation is also evident in Russia. The fact of the spatial expression of the heritage phenomenon allows for its mapping, which is observed in both domestic and foreign practice (UNESCO publications, maps of the Russian Heritage Institute, the Atlas of the Cultural Heritage of Sweden, etc.). Cartographic recording of objects and other territorially expressed manifestations of heritage allows for the transition to mapping the heritage phenomenon itself (primarily through the spatial "binding" of its functions), which seems especially valuable for identifying its regional potential as a development factor.

4. Traditional forms of heritage policy

The imperative of unconditional preservation of heritage throughout human history has been firmly integrated into the behaviour of people and society as a whole everywhere in the world. This is also fully true for Russia, where its own special forms of organization of natural and cultural heritage and its management have been found. In relation to natural heritage sites, the most common forms have become wildlife sanctuaries and nature reserves—spaces with strict regulation of nature management up to its partial or even complete ban. Sacred groves and other cult landscapes and natural objects (mountains, hills, streams, rivers, erratic boulders, etc.) of indigenous peoples played an important role in preserving the natural heritage. The very fact of the long-term existence of such objects is evidence of the widespread use of folk ecological culture among the population, which has survived until the 20th century mainly in the less industrially developed regions of the country—the European North, Siberia, the Far East (Kazannik, 1999).

The preservation of the country's nature as the heritage of its peoples was largely facilitated by their spiritual traditions, associated primarily with the commitment of the majority of the country's population to their traditional faiths—Orthodoxy, Islam, Buddhism, as well as pagan cults that survived in a number of regions of the country. However, beginning in the late 19th century, under the influence of industrialization and urbanization, traditional ecological culture began to lose its significance as a decisive factor in preserving the heritage. It was gradually replaced by a "bookish" ecological culture associated with the education system. Its manifestation on the national arena was the emergence of many private nature reserves in Russia, the first of which was the Chapli steppe reserve in 1875, now Askania-Nova in the Kherson province, created on the lands of a large landowner F. E. Falz-Fein.

At the same time, Count Potocki established a reserve on his estate Piliavin in Volyn, where bison, deer, beavers, and other animals were protected. A strict reserve regime was observed in the forests along the Vorskla River, which belonged to Count Sheremetev (now it is the "Forest on the Vorskla" state nature reserve). Entry there was possible only with special permits issued by the forest guard. Reserves were also created on the Karamzin

estate in the Saratov province, on the estate of Countess Panina in the Valuysky district, near Voronezh. The creation of the first private reserves was a manifestation of the sense of responsibility of national business for the fate of native nature and a demonstration of ecologically oriented innovations based on the adaptation of traditional Russian forms of preserving natural values to modern conditions.

During the same period, there was a growing interest of the Russian scientific community in the issues of preserving the country's natural resources. Scientists understood that it was impossible to solve the problem by organizing reserves only in individual private estates. In this regard, at the end of the 19th century, a movement for the creation of state reserves unfolded. Almost all prominent biologists and geographers of that time contributed to the creation of the concept of the nature reserve system of Russia. Moreover, from the very beginning, it was about the system—an entire network of protected areas that should cover all natural communities typical and rare for our country. Already in 1895, Professor V. V. Dokuchaev put forward the idea of creating a network of steppe virgin land reserves, at which he proposed to establish research stations for detailed observation of natural processes. It was supposed to use such areas as natural standards, to compare the development of soil-forming processes on them and on economically transformed lands. These ideas of Dokuchaev were actively in demand both during his lifetime and later, already in the Soviet period of Russian history.

In 1912, the Imperial Russian Geographical Society (RGS) created the Permanent Nature Conservation Commission, which united the country's leading scientists—biologists and geographers. The first and most famous result of this commission's work was the creation of a project for a network of nature reserves and national parks in Russia, which was presented to the public in the country, as well as at the first ever international conference on nature conservation, held in Bern, Switzerland in 1913. Russia was represented at it by members of the RGS and authors of the project for a network of nature reserves and national parks in Russia (Borodin, 1915).

These and a number of other similar actions within the framework of the national environmental policy that was emerging in Russia prepared the country for the emergence of state specially protected natural areas. The first of these was the Barguzinsky Nature Reserve on the southern shore of Lake Baikal. The decision to create it came from the very top of the Russian government—from Emperor Nicholas II. It is symptomatic that the creation of the second state reserve in Russia also took place with the support of the country's top leadership. We are talking about the Astrakhan Reserve in the Volga Delta, established in 1919 with the assistance of the Chairman of the Government of Soviet Russia V. I. Lenin. The protected Volga Delta is now rightfully considered to be the most important wetland of global significance, classified, in accordance with the Ramsar Convention, as a priority site of world natural heritage.

The development of the state system for the protection of the country's natural heritage by forming a network of reserves and other categories of specially protected natural areas continued successfully during the Soviet era and in the post-Soviet period. The facts presented here indisputably testify to the reliable continuity in the development of the policy for the preservation of natural heritage based on a scientifically substantiated synthesis of traditions and innovations. It is important to note that the veneration of nature,

respect for it, and care for it are part of the cultural code of the peoples of Russia, an important element of their spiritual heritage. In modern conditions, this is manifested in the fact that one of the essential features of Russian culture is its nature-centeredness. The idea of caring for nature is a constant theme of Russian literature and art. Poets, writers, artists, and composers are those people who, together with teachers and scientists, form the modern ecological culture of the nation.

The sphere of cultural heritage protection has developed in Russia in many ways similarly. The first steps in this direction were taken back in the 17th century (Karpova et al., 2000). In the 18th century, thanks to the reforms of Peter I, public museums appeared in Russia, and unique archaeological and art collections were formed. By now, Russia has become "a country of museums", there are more than 3,500 of museums, where 71 million objects of movable cultural heritage are displayed. In 2023, more than 43 million people visited museums. And this applies only to state museums. In addition to them, there are many private museums in the country, in schools, factories, etc. The most visited are traditionally the Hermitage (3,27 million visitors; Figure 2) and the Russian Museum (2,9 million) in St. Petersburg, as well as the Tretyakov Gallery in Moscow (2,1 million guests).

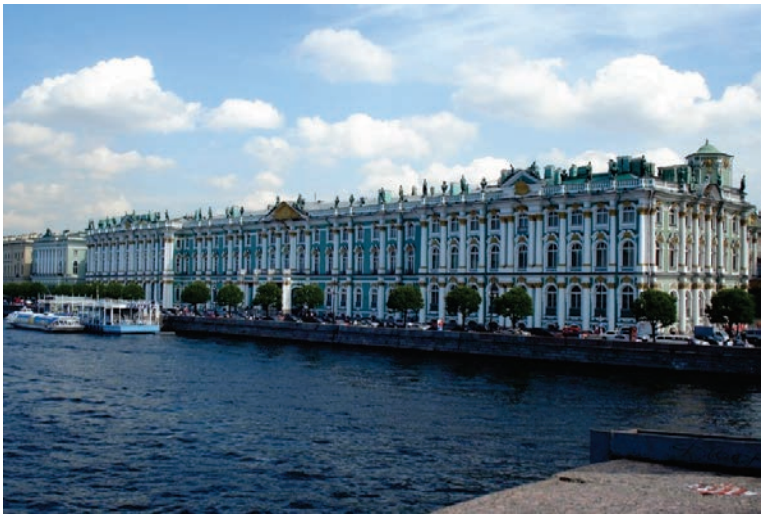

Figure 2. The largest museum in Russia is the Hermitage, located in the Winter Palace in St. Petersburg.

In 1834, the first in the country open-air museum was created in Russia on the site of the historic Battle of Borodino. Subsequently, the number of such sites has steadily increased and has now reached almost one and a half hundred. The most popular in recent years remains the Peterhof Museum-Reserve in the vicinity of St. Petersburg, visited annually by more than five million tourists. Among the most visited are also the Battle of Stalingrad Museum (more than 3,6 million people per year), Pavlovsk and Tsarskoye Selo near St. Petersburg, the Vladimir-Suzdal and Novgorod Museum-Reserves (more than one million people per year in each of them). Their main function is to form the spiritual heritage of the country's citizens.

5. Diversity of new manifestations and interpretations of heritage

Along with the historically established traditional forms of natural and cultural heritage in Russia, as in other countries of the world, new forms of this phenomenon are emerging. More precisely, as society develops, certain artefacts, historical events, or phenomena begin to be perceived as heritage, i.e., as categories of special value, in the preservation of which certain social groups or even the population of the entire country are objectively interested. It is significant that geographers are often involved in identifying new categories of heritage—both by education and by the nature of their professional activity. Some of them are considered below.

5.1. Soviet heritage

In recent years, the term "Soviet heritage" has been increasingly used in analytical and journalistic publications in Russia (Maslakova-Clauberg, 2022, etc.), usually used without ideological or emotional connotations. Soviet heritage is usually understood as a set of historical artefacts from the Soviet period of Russian history that are in demand in society in the post-Soviet period. This category usually includes a number of architectural styles (Russian constructivism, Stalinist Empire style), Soviet literature, music of that period, achievements in science and education, industrialization of the country, successes in space exploration, and, most importantly, the victory in the Great Patriotic War over Nazi Germany and militaristic Japan. To a lesser extent, the achievements of the Soviet era in industry, agriculture, science, and technology are still recognized as a heritage. One of the most significant of these achievements is the development and partial implementation of a grandiose project to transform nature in the southern part of European Russia.

The essence of the plan was the targeted transformation of agricultural landscapes to ensure their optimal efficiency through scientifically based systemic melioration measures. It so happened that the multi-year program of this project was not fully implemented. However, even in this situation, this project left behind a unique historical legacy. One of the manifestations of this legacy is the transformed steppe landscapes on vast territories with such iconic elements as forest belts and water bodies. These landscapes are unmistakably determined from the ground and when observed from the air, and are clearly visible on aerial photographs and images from space. But, most importantly, they really ensure the agro-economic sustainability of the corresponding regions, convincingly demonstrating the advantages of a scientifically based culture of nature management. Having the characteristics of objects of mixed natural and cultural heritage, these landscapes, with rare exceptions, do not have the corresponding status. However, in our opinion, they undoubtedly deserve it due to their value from the standpoint of the history of nature management and environmental culture.

The plan was adopted on the initiative of I. V. Stalin and put into effect by the Decree of the Council of Ministers of the USSR and the Central Committee of the Communist Party of October 20, 1948, "On the plan for shelter-belt afforestation, the introduction of grass-field crop rotations, the construction of ponds and reservoirs to ensure high sustainable yields in the steppe and forest-steppe regions of the European part of the USSR" (1948). The plan had no precedents in world experience in terms of scale. According to this plan, it was necessary to plant forest belts to block the road of dry winds and change the climate on an

area of 120 million hectares, equal to the territories of England, France, Italy, Belgium, and the Netherlands combined. The central place in the plan was occupied by shelter-belt afforestation and irrigation. The project, designed for the period 1949–1965, provided for the creation of eight large state forest belts in the steppe and forest-steppe regions with a length of over 5,300 km.

Stalin's plan for the transformation of nature is perceived in our time as an outstanding event in the history of nature management in Russia. This project received an unprecedented scientific basis, it was enthusiastically supported by the entire vast country. It has become one of the national development priorities. However, the fate of this plan turned out to be dramatic, it was actually curtailed without any real reason (Mazurov, 2021). At the same time, its story is highly instructive. This plan largely anticipated the emergence of the domestic concept of rational nature management and, to a certain extent, the Western concept of sustainable development. This is especially true for our time—the era of transition to a "green" economy as the main condition for sustainable development. This plan left behind numerous valuable artefacts, a kind of legacy of the scientific ideas of great scientists and a grandiose implemented project. Now, after seven decades, this legacy is increasingly perceived as the particularly valuable historical heritage of Russia, and possibly of neighbouring countries.

5.2. Common heritage of the peoples of historical Russia

It is known that many monuments on the territory of the Soviet Union had universal value for all or many peoples of the country. They played an important role in preserving the natural environment and in forming ecological culture (lakes Baikal, Sevan, Issyk-Kul, the mountain ranges of the Caucasus and Pamir, oases of Central Asia, etc.). The role of the ruins of ancient settlements in the Black Sea region; Kyiv—"the mother of Russian cities"; the ancient cities of Derbent, Ganja, Mtskheta, Echmiadzin on the Caucasus; Samarkand, Bukhara, Khiva, and other historical settlements-monuments of ancient civilizations of the East; the capital Russian cities—Veliky Novgorod, Suzdal, Vladimir, Moscow, and St. Petersburg with their environs was invaluable in introducing them to national and world history.

A special place in our common history is occupied by monuments to the real friendship of peoples and their joint heroic work: the Dnieper Hydroelectric Power Station in Zaporozhye, the Nurek Hydroelectric Power Station in Tajikistan, the Toktogul Hydroelectric Power Station in Kyrgyzstan; the Karakum Channel in Turkmenistan; Ashgabat, Tashkent, Spitak, revived after catastrophic earthquakes; the Baikonur Cosmodrome in Kazakhstan. However, apparently, the most significant part of our common historical and spiritual heritage are the monuments-symbols of the joint struggle of the peoples of the USSR against fascist aggression in 1941–1945, as well as the struggle of the peoples of historical Russia against other enemy aggressions in previous eras. Among them are such world-famous objects that have become shrines of our peoples as the complexes of monuments in Volgograd/Stalingrad (Figure 3), Sevastopol, Moscow, Brest, and many others.

Figure 3. Memorial complex on Mamayev Kurgan in Volgograd (Stalingrad).

The named objects are undoubtedly part of the common history of the peoples of historical Russia. And in this respect they objectively form the common heritage of the countries of the post-Soviet space. They do not have such a status yet, but the question about it has been raised for quite some time (Vedenin & Mazurov, 2000). And there can be no doubt that this question will sooner or later be resolved positively, because it meets the fundamental interests of all the the post-Soviet peoples and states.

5.3. Promising heritage formats

Heritage of any category is a historical phenomenon, which means the emergence of new categories of heritage depending on the change in the attitude of society to certain values of natural or cultural origin. Most often, such changes can be caused by factors associated with the increase in the value of certain objects or phenomena in people's perceptions or with the emergence of significant threats to their existence. The two relatively new categories of cultural heritage mentioned above confirm this pattern.

In Russia and a number of other countries in the world, new categories of heritage have been constantly emerging in recent decades and, what is especially noteworthy, gaining legitimacy in society. The most popular among them have become: pedagogical heritage, sports (Olympic) heritage, gastronomic and wine (oenological) heritage, medical (healing) heritage, and a number of other types of tangible and intangible heritage. Each of them deserves attention and research. Here, in conclusion of the presented discourse, we consider it important to draw attention to two promising formats of heritage.

Foreign heritage of Russia. The most common type of this category of heritage are burials of Russian and Soviet soldiers abroad, as well as monuments to them. They are widely represented in China, Mongolia, Korea, Japan, and European countries. They are protected at the international level, although not in all cases. Their condition is monitored in Russia. In addition, the number of objects of foreign heritage of Russia legitimately includes

monuments to outstanding cultural figures and historical persons, as well as memorial sites and individual objects associated with Russian history in foreign countries. In most cases, they are protected within the framework of national jurisdictions and with the voluntary participation of the local population. However, recent years have become a time of mass vandalism in some countries against heritage sites related to Russian history. Neglect of them and desecration of the historical memory of the peoples of Russia causes an extremely negative reaction from the population of the country. The question of the Red Book of Foreign Heritage of Russia and a more active role of the Russian state in protecting its heritage abroad is being raised.

The heritage of the Slavic peoples in Russia is represented in tangible and intangible manifestations, which we have already written about earlier (Mazurov & Slipenchuk, 2016). Since 1986 and to this day, the Day of Slavic Literature and Culture has been widely celebrated in the country on May 24. It was on this day in 1992 that a monument to the Moravian brothers Cyril and Methodius (sculptor—Vyacheslav Klykov) was unveiled in the city center of Moscow (Figure 4)—educators, creators of the Slavic alphabet, preaching Christianity, and conducting services in the Slavic language. Monuments to Cyril and Methodius are also in other Russian cities, in particular: Dmitrov, Kolomna, Murmansk, Sevastopol, Saratov, Samara, Khanty-Mansiysk. Together with monuments to Saints Cyril and Methodius in other Slavic countries, they form a kind of network of memory of these outstanding Slavic educators and ascetics.

Figure 4. Monument to Cyril and Methodius in Moscow.

It is no coincidence that the Moscow monument to Cyril and Methodius was erected near Slavyanskaya Square, after which the nearest metro station is named. In addition to it, the following stations in the Moscow metro evoke Slavic associations: three Kievskaya, two Belorusskaya, Minskaya, Varshavskaya, Prazhskaya, and Bratislavskaya stations. The Kievskaya ring station is an architectural monument and is rightfully considered as a masterpiece of design. Slavic names are generally widely represented in the toponymy of Moscow—streets, squares, hotels, shops, etc. Among them are the respectable Belgrade

Hotel, the Belgrade and Jadran brand stores beloved by Muscovites, the Sofia restaurant, and much more. All this is a manifestation of respect for the fraternal Slavic peoples, a manifestation of the desire to strengthen the ties of friendship with them.

The formation of the phenomenon of the Slavic peoples heritage reflects the desire of the Slavs living in Russia for spiritual unity both within the country and for integration at the international level. A similar trend is easy to notice among other peoples in the modern world: Arabs, Africans, Latin Americans, Anglo-Saxons, etc. We believe that the congresses of Slavic geographers, initiated a century ago by authoritative representatives of the Western and Southern Slavs, are also a manifestation of the same tendency, worthy of all kinds of support in our time.

6. The mission of geography

The emergence of heritage as a subject of management and a corresponding sphere of activity at the global and practically all other levels down to the individual is a natural phenomenon. Since the 1970s, heritage has become an object of study for many disciplines, including geography. Heritage exists and manifests itself in the space of land and the hydrosphere. And this is equally true for both tangible and intangible heritage. This determines the role of geography in the study and preservation of heritage.

For Russia, taking into account the heritage factor in geographical descriptions is not an absolute innovation. Since the end of the 19th century, a significant share of the volume in geography textbooks (often even more than for the description of the economy) covered various kinds of attractions and other valuable advantages of the described areas, in other words—heritage of the territories. In post-Soviet Russia, there has been a clear demand for geography to identify historical heritage and develop policies in this area, primarily in commercial interests—tourism, construction, insurance, etc. At present, the emphasis is increasingly shifting to studying the phenomenon of heritage as a factor in the education of the population, the formation of its civic positions, and patriotism, in other words—a factor in the sustainable development of the country.

In this regard, the mission of geography in the study and promotion of the phenomenon of historical heritage can be defined:

- improving existing and developing new scientific approaches and methodological techniques for identifying heritage objects and phenomena, distinguishing them from the concepts of environment, resources, values, etc.;
- developing a theory and practical algorithms for identifying environmental, social, economic, and other functions of heritage;
- justifying techniques for identifying the value of natural and/or cultural heritage, assessing, and calculating the potential of natural and cultural diversity;
- systematization of objects and phenomena of natural and cultural heritage, as well as heritage territories;
- work on the concept of the territory framework (natural, ecological, socio-cultural, etc.), substantiation of scientific approaches to the formation of systems of heritage territories;
- identification of patterns of interaction of objects and phenomena of historical heritage of various origins;

- development of scientific foundations of territorial planning for the purposes of management in the field of historical heritage, introduction of heritage conservation imperatives into regional and national policies;
- systematization of risk factors for heritage, identification of problems of its conservation, development of scientific foundations for monitoring the state of heritage, and its forecasting taking into account risk factors; and
- identification of the state of natural and cultural heritage as an indicator of the degree of sustainability of development of countries and regions.

The implementation of the above-formulated provisions of the mission of geography in the sphere of management of the heritage of Russia will require significant efforts from representatives of this science. However, for the successful fulfilment of this mission in the country there are many prerequisites, including the glorious traditions of our science and the modern social order of the Russian state.

7. Conclusion

Preservation of heritage and its transmission from generation to generation, especially in the context of the manifestation of increasingly numerous problems of humanity, is becoming the most important factor in ensuring favourable dynamics of environmental processes and preserving the cultural identity of peoples, a necessary condition for the successful development of society. This circumstance determines the relevance and necessity of a scientifically based policy in the field of heritage. An important role in substantiating such a policy will have to be played by geography—a science that has historically long been associated with understanding the phenomenon of heritage and developing academic approaches to its reasonable use.

Historical heritage as a geographical phenomenon is fully inherent in Russia, which is characterized by its own special forms of organization of natural and cultural heritage, its study, and management. The country has a rich heritage and unique experience of its use. Scientists and management practitioners are constantly expanding the subject field of the historical heritage phenomenon, thus reflecting the challenges of the time and the objective interests of the country's population. By participating in this huge and important work, Russian geographers realize their professional mission and are aware of their responsibility for its final results.

References

Borodin, I. P. (1915). *Report on a trip to Bern for the Conference on International Nature Conservation*. Imperatorskoe Russkoe Geograficheskoe Obshchestvo. (In Russian)

Federal Law "On Cultural Heritage Objects (Historical and Cultural Monuments) of the Peoples of the Russian Federation", No. 73-FZ (2002). https://www.consultant.ru/document/cons_doc_LAW_37318/?ysclid=m0tdgiqv6x150187048

Karpova, L. V., Potapova, N. A., & Sukhman, T. P. (2000). *Protection of cultural heritage of Russia in documents of the 17th–20th centuries* (Vol. 1). Izdatelstvo VES MIR. (In Russian)

Kazannik, A. I. (1999). *People's nature conservation of Siberia*. Omskiĭ dom pechati. (In Russian)

Maslakova-Clauberg, N. I. (2022). Cultural heritage of the USSR in modern international relations. *Vestnik Instituta mirovykh tsivilizatsiy*, *13*(4), 44–47. https://cyberleninka.ru/article/n/kulturnoe-i-nauchnoe-nasledie-sssr-v-sovremennyh-mezhdunarodnyh-otnosheniyah/viewer

Mazurov, Y. (2021). Great Plan of Environmental Transformation: from the history of nature management in Russia. *Explore Rural India*, *8*(1), 41–44.

Mazurov, Y, & Slipenchuk, M. (2016). Historical heritage of Slavic peoples as a field of academic and applied studies. *Journal of the Geographical Institute "Jovan Cvijić" SASA*, *66*(1), 157–167. https://doi.org/10.2298/IJGI1601157M

"On the plan for shelterbelt afforestation, the introduction of grass-field crop rotations, the construction of ponds and reservoirs to ensure high sustainable yields in the steppe and forest-steppe regions of the European part of the USSR", No. 3960 (1948). https://web.archive.org/web/20220120130710/http://istmat.info/node/17970

UN Secretary-General, World Commission on Environment and Development. (1987). *Report of the World Commission on Environment and Development. Note by the Secretary-General.* https://digitallibrary.un.org/record/139811?v=pdf

USSR Law "On the Protection and Use of Historical and Cultural Monuments" (1976). https://normativ.kontur.ru/document?moduleId=1&documentId=27778&ysclid=m0tcv551wh474977535

Vedenin, Yu. A., & Mazurov, Yu. L. (2000). On the protection and use of the cultural and natural heritage of the CIS countries. *Ekologiya kul'tury: Al'manakh Instituta Naslediya*, 31–34. (In Russian)

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THE ISSUE OF TRADITIONAL CULTURE'S LEGACY IN A POST-INDUSTRIAL SOCIETY

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Abstract: This paper intends to tackle the problems of protection of traditional culture in the modern world in particular and in the nowadays Russia especially. Clearly, the cardinal changes in the process of creation of the material environment caused by technological progress transformed the role of traditional culture in the whole world. At the same time, its role as a form of ethnic consciousness remains. Therefore, traditional culture in the modern world is rather of a spiritual importance, not utilitarian. It is a form of ethnic consciousness to the same extent as art as a whole is the form of public consciousness and a guardian of aesthetic feelings of a single person and groups of people, including ethnic ones. Whether or if culture should be protected is the central question. The contemporary modern liberal tradition strongly rejects the idea of preserving what makes people unique while accepting and supporting the preservation of what unites us all. Can universalism and cultural plurality coexist harmoniously? We maintain that these two can be understood in their oneness and as two opposites of the Hegelian dialectic. We are witnesses that throughout the world, there are many changes, uniqueness, and standardization of civilized, scientific, and technical innovations. Continuous and most important symbols of ethnic identity are maintained in this way. They are also kept and they stay as a paragon, reference, and inspirational source that provide national values and reveal them.

Keywords: traditions; identity; heritage; culture; Russia

1. Introduction

This paper intends to tackle the problems of protection of traditional culture in the modern world in particular and in the nowadays Russia specifically. What are traditional cultures? You can get the opinion that traditional cultures are those that are organized around elements of the past, such as customs and habits of previous societies. In this sense, they hold in high esteem the inheritance of the ancestors, that "the traditional cultures are organized in small communities, mainly tribes, that allow to preserve the values (rituals, religious practices, among others) more efficiently. In larger societies, the transmission of values would be more difficult" (Life Persona, n.d.).

Can we agree with that opinion? Some researchers assumed and even claimed that in the modern world, there would be no interest in the existence of national and ethnic identity and that it would happen gradually. Reasons for this lie in the disintegration of traditional communities and the conveniences for psychological enclosure of the communities. Creation, reproduction, and maintenance of customs and traditions as well as other ethnic features and giving genuine simplicity and ancient power which is taken from connection to tradition, would not be found in these communities.

Do European societies have traditional cultures? For instance, is traditional culture still alive in European communities? According to the British anthropologist Jack Goody, "the transmission of cultural forms from one generation to another is the very essence of tradition". As he said, "The idea of an earlier, static, 'primitive', non-rational society has been maintained by many sociologists and historians, including Marx and Weber, but it is quite foreign to most of those who have engaged in 'participant observation' among such peoples" (Goody 2012, p. 290). Jack Goody explains the cultural difference by technological change: "Academic study always tends to drift away from its more practical cousin, technology, pulled aside by the existence of literacy and a scholarly elite; in this way 'science' became concerned with the more abstract topics and with more general subjects like the order of the world, which had previously been the domain of religions" (Goody 2012, p. 297).

So traditions are not static, because historical processes modify their values. They reflect the changing needs of society. The idea that cultures are not pure but mixed is not a new one (Cumont, 2010). However new trends in contemporary life have encouraged new questions in this discussion.

Clearly, the cardinal changes in the process of creation of the material environment caused by technological progress transformed the role of traditional culture in the whole world. At the same time, its role as a form of ethnic consciousness remains. Therefore, often traditional culture in the modern world is rather of spiritual importance, not utilitarian. It is a form of ethnic consciousness to the same extent as art as a whole is the form of public consciousness and a guardian of aesthetic feelings of a single person and groups of people, including ethnic ones.

The abstract human nature that unites all people is something that the modern liberal tradition embraces and supports, but it vehemently rejects the idea of preserving what makes people unique. Can universalism and cultural plurality coexist harmoniously? We maintain that these two can be understood in their oneness and as two opposites of the Hegelian dialectic. To begin with, universalism is not inherently universal. It is defined philosophically, historically, and geographically. It is a part of European modernity, the only civilization to ever set aside exclusive access to universality for itself. Secondly, particularism lacks radical particularity. These days, culture is less of a strict set of values and more of a hodgepodge. It must be acknowledged that the universalist conceptions of cultural protection draw their universality from their own particularity and singularity—that is, from European culture.

The aforementioned thesis suggests a dramatic divergence between two terms—universalism and universality—that are frequently employed interchangeably in modern legal parlance. The claim to universality is implied by the term "universalism". Although they are not and cannot be universal, human rights are a universalist value. Diverse strategies are used worldwide to safeguard human rights.

Some researchers assumed and even claimed that in the modern world, there would be no interest in the existence of national and ethnic identity and that it would happen gradually. In the context of globalization, as French economist and social adviser Jacques Attali writes, there is an active formation of a cosmopolitan type of person who feels free anywhere in the world (Attali, 1992). Reasons for this lie in the disintegration of traditional communities and the conveniences for psychological enclosure of the communities.

Creation, reproduction, and maintenance of customs and traditions as well as other ethnic features and giving genuine simplicity and ancient power which is taken from connection to tradition, would not be found in these communities. Those researches were not right. They might have been observing alienated parts of society, some sub-cultural occurrences, or nostalgically sustained, repeated, and continued with lost utterance in certain opportunities and periods of crises.

Those were only passing, accessory, and marginal manifestations in comparison to global social moving and culture. They only left pale traces. We witness that throughout Europe and the whole world, there are many changes, uniqueness, and standardization of civilized, scientific, and technical innovations. Continuous and most important symbols of national identity are maintained in this way. They are also kept and they stay as a paragon, reference, and inspirational source that provides national values and where self-knowing is revealed. Connections with general cultural and civilized flows, i.e., processes of development are reached in this way. In that context, ethnic/national contacts, whether they are conflicts or meetings of cultures, we should observe as processes of cultural development and identity. Ethnic contact, encounters, and conflict are some of the main factors that shape global relations between nations. That is why we focus our attention on that issue.

Globalization and mundialization of culture are processes that are accelerating individuality and searching, affecting every country in the world in an uneven manner. Nonetheless, the ways in which these processes were embraced varied among the nations. For instance, different regions of the same country and national minorities responded differently to the same stimulus.

Subsequent to the 1990s, there has been a questioning of pre-existing notions of social, economic, and political identity. Two levels of analysis are required to fully understand the place of traditional culture in contemporary society: a macro level that looks at the movement as a whole and a micro level that pays attention to individual and even local variations.

2. Symbolic dimensions of cultural identities

The issue of cultural identity for Russia, which is one of the most polyethnic countries in the world, is especially important. According to the recent population census, there are 193 ethnic groups in Russia. Russians is the largest ethnic group; they make 80.85% of the population according to the 2021 census (Federal State Statistics Service, 2021). Alongside traditionally areas with Russian majority in the country, there are many territories where the share of Russians is much lower than it is average for Russia. There are even such territories where Russians are in the minority. These are first and foremost ethno-territorial units—republics and autonomous regions. Even though ethnic Russians prevail on the state level, Russia is distinguished by the exceptional ethnic diversity of other population groups, evident discrepancies of ethnic composition in different regions, and quite uneven dynamics in populations of different ethnic groups. Several major cultural regions can be singled out in Russia, including Central Russia, the Northern Caucasus, the Urals and the Volga region, Russian North, and Siberia. Each region is populated with peoples who are close in their cultures and who are quite different.

People living in Russia also belong to different confessions. There are more than 20,000 registered religious organizations and more than 40 confessions, with dominating positions occupied by Christianity and Islam. Most religions prescribe the regular performance of certain behaviors and prohibit others. Etiquette is greatly influenced by religion.

Over the past thirty years, Russia, and particularly Moscow, its city, has emerged as a global leader in the field of migration, providing a great space for cultural fusion and interaction. Is it possible to discuss the common culture of Russia and the identity that shall be uniform for all its residents as a complex of generally shared values, modes of behavior, and thinking? In what forms such identity is preserved today? Is ethnic identity important in Russia? Many members of ethnic minorities in Moscow (Buryat, Armenians, Kyrgyz, etc.) start to forget their mother-language, the basic cultural identity element. Ethnic identity is distinguished from other forms of social identity first and foremost by understanding the generally shared culture. The above examples show that sometimes it is sufficient just to believe that you belong to such a culture.

In the Soviet Union, there was such an identity as Soviet people. This was not an ethnic category but a state one. The ethnic and national identities existed as though they were parallel. To a substantial extent, the situation repeats in today's Russia. As a result of living in the country, all its residents acquired a set of common cultural qualities. Many characteristics in their behavior and way of life will distinguish them from other nations of the world as ex-Soviets.

Russia as well as the territory of the entire former Soviet Union is the country with dominating Russian-speaking culture. The Russian language is spoken by more than half of the population of all countries in the post-Soviet area, and practically all residents of Russia can speak Russian. Non-Russian nationals are usually bilingual (or know the Russian language better than their native one). In many regions, children of different nationalities are taught in Russian (in any case, Russian has been a compulsory school subject all over the country). Nevertheless, in the 2000s, more than 100 languages in Russia were teaching languages or taught as special subjects (Martynova, 2021).

Russia as well as the rest of the world is embraced by globalization, urbanization, and Europeanization processes. The way of life has been strongly uniformed under the impact of technological progress; many cultural peculiarities began to disappear. But it would be an exaggeration to say that they have disappeared completely. We discuss such issues as the particular mentality of people from the Caucasus, peculiar Northern civilization, or the modernized Islamic world.

Traditional cultures are preserved; cultural distinctions existed and still exist in Russia. The efforts of the previous political regime in support and development of ethnic cultures yielded their results. Ethno-cultural differences were treated with special attention, including the official registration by the state in passports of its citizens and the establishment of statehoods on an ethnic basis. Noteworthy is the fact that the USSR consisted of 15 Union Republics, where a particular ethnic group had priority. Within these republics, ethnic distinctions were used again to establish autonomies. The remaining distinctions are a more than sufficient basis for establishing identity in post-Soviet history.

Russia's cultural landscape saw primarily new tendencies following the fall of the USSR. These patterns are especially significant for the reciprocal assessment of the cultural distance

and contact between peoples. Over the past thirty years, the ethnic component has played an increasingly significant role. Every conceivable tactic is used to influence and highlight the cultural differences. All non-Russian nations have a strong inclination toward restoring ethnic values and cultural traditions. According to a sociological survey carried out in four Russian republics by a team of researchers led by professor Leokadia Drobizheva at the Institute of Ethnology and Anthropology (Ossetia in the Caucasus, Tatarstan in the Volga region, Tuva, and Yakutia in Siberia), only ethnic Russians appreciate values of the civil society higher than the development of language and culture of their people. Responding to the question "What conditions are of prime necessity for the revival of your people?" on average 40% of Tatars, Tuvinians, Yakuts, and Ossetians voiced their support of the language and more than 60% favored the development of ethnic culture. Ethnic Russians in the above republics responded at 9%–14% and 32%–47%, correspondingly (Drobizheva, 2013).

Religion is another dividing factor. Various surveys show that despite the domination of atheism during the Soviet rule, more than 72% of people nowadays view themselves as believers (VCIOM, 2023). There is a remarkable trend—ethnic Russians are more religious in those republics where the native people are more religious. Thus, ethnic Russians in Tatarstan are more religious than in Yakutia. This is important as believers understand the religious feelings of people belonging to another religion better. The rise of religiosity of two contacting ethnic groups will hardly contribute to the increase in ethnic estrangement.

Another trend revealed in the course of sociological polls conducted by the Drobizheva group is that senior age groups and young people above the age of 25 become more religious. Only recently, religious were mostly older people. The current increase in religiosity can be explained by certain trendy behaviors after the ideological ban on exercising religion existed during the Soviet era was lifted and by personal moral needs. Noteworthy is another trend: people are more religious in the areas of ethnic conflicts where they feel insecure about their families and themselves.

There has been a widespread change in public opinion toward the idea that using one's ethnic and cultural identity to organize oneself in the fight for social, political, and economic concerns. In his article "Anthropology and Multiculturalism", which was published in 1993 and had nothing to do with problems in Russia, Terence Turner (1994) discussed a certain global trend in the issues of culture research used as an ideological instrument in the new forms of identity policy. Russia is not an exception in this connection.

In Northern Caucasus, for example, Islam has always been not only a religion and the corresponding mode of behavior, but also a way of life, a factor in the organization of rural communities, and a feasible political force. In recent years, local religious leaders performed both religious and secular functions in rural communities. They settled minor conflicts on the basis of existing religious norms. The fact that the Arab language is still widely spoken, even among the mountainous rural people, is the primary cause of the vibrant and, more importantly, ongoing tradition of Islamic learning and instruction. In remote areas, new educational facilities with Arab language teachers on staff have opened. The tradition of transferring sacred knowledge from the teacher to the student is highly valued. For the teacher, dissemination of knowledge by using the sacred Arab language is a part of his religious ministering. Therefore, the classes are full of students, especially the boys, though there is a shortage of teachers.

The circumstance has a significant impact on identity conflicts, which are nonexistent in Central Russia. Cultural distancing is based on involvement (or noninvolvement) in the classical Islamic culture and on such obvious cultural indicators as one's knowledge of the Arab language. The future leaders with such background are quite respected in today's Dagestan.

Tatarstan may serve as an example of a changing cultural identity. The policy of strengthening the republican identity proclaimed by its government yields positive results. Self-perception of being a citizen of Tatarstan irrespective of individual ethnicity eases relations between people of various ethnic groups within the republic and diminishes the importance of existing ethnic proportions. Meanwhile, a struggle is underway for demographic recognition of the strength of the title nationality, especially in connection with the upcoming all-Russia census.

The above example is not the only case of emerging new identities in Russia during the past decades. Since the 1990s, the movement in favor of singling out ethnic groups was very active. Some groups previously included in some people were recognized as a separate ethnic group. This applies to Kamchadals, the indigenous population of Kamchatka, and Teleuts, a group in Altai. Mari, the people in the Volga region, split into Erzya and Moksha. The Russian ethnic group Cossacks also demands recognition of its identity (Drobizheva, 2013).

The problems related to changed cultural distance sprang up in Dagestan (North Caucasus), Kalmykia (South of Russia), in Siberian republics with the largest title nationalities living in Buryatia, Yakutia, and Tuva. In these regions are noticeable reductions in the share of ethnic Russians alongside shifts in population ratios in favor of the title ethnic groups. Cultural distancing has become quite tense even in the regions populated exclusively by ethnic Russians as these regions experience a massive inflow of Russian nationals from other former Soviet republics where they lived for years in different cultural environments and absorbed many behavioral traits of their neighbors. Their adaptation to the new conditions is not always smooth and is accompanied by a number of problems.

3. Contemporary traditional culture: general discussion

The relevance and timeliness of the topic are increased by the fact that the search for and elaboration of new identities that followed after the emergence of newly independent states over the former USSR realm in the late 20th century were based upon mobilizing various kinds of resources. The fear of losing distinctive features makes many people treat their historic roots, language, traditions, and popular customs with special and almost morbid attention. In this respect, such events as the Venice Spring Carnival or the Brazil Carnival, Oktoberfest in Bavaria, or Chusok in Korea stripped of their tourist flavor may be viewed as a means to preserve traditional specifics. Similar cultural symbols exist in Russia. Take, for instance, the world-famous Matryoshka nested doll or lacquered Palekh boxes, or all possible folklore events.

The issues of preservation of Russia's cultural heritage are treated with great attention. More than 20,000 monuments of history and culture have the status of federal importance. In 2022, Russia adopted Federal Law N 402-FZ "On Intangible Ethnocultural Heritage of the Russian Federation" (Register of intangible cultural heritage objects, 2024). In the UNESCO

list of the nonmaterial heritage of humanity, there are two masterpieces submitted by Russia. They are the Yakut folk epic "Olonkho" and the "Cultural Space and Oral Culture of Semeiskie" (UNESCO, n.d.-a). The last one encompasses the traditional culture of the Old Believer communities living in the Trans-Baikal region. The customs and rituals of the community, particularly the renowned religious music, have their roots in medieval Russian culture, as are its legends and proverbs.

For instance, among the Russian masterpieces in her own list is the so-called "throat singing" with origins in prehistoric times. It is a solo singing performed in two voices without text. The existence of such "throat" phonation is considered an evolutionary stage in the development of human talking during the anthropological genesis. The bearers of this rare form of cultural expression live in such Russian regions as Altai, Bashkortostan, Caucasus, Kalmykia, Tuva, Yakutia, and also in Mongolia. It is typical for the storytellers whose art served as replacement for books and theater under the nomadic way of life in the above areas. It was always in line with their profound aspirations. "Throat singing" is a joint masterpiece of Russia and Mongolia (UNESCO, n.d.-b). The list of priorities also includes shamanism, a religious-magical phenomenon spread in Siberia and some other areas.

Naturally, lifestyles have become highly unified under the influence of technological progress, and many cultural peculiarities have begun to disappear. But to say that they have completely disappeared would be an exaggeration. It is not by chance that people speak, for example, of a specific Caucasian mentality, a special North civilization, or a modernized Islamic world. Although the balance of the two components is different, the global and traditional components are present in the modern culture of every country and every nation, not excluding both the most backward tribes and highly industrialized societies. The global component is most noticeable in large megacities, none of which represents the culture of only one ethnic group.

Indeed, the spread of global urban culture has created conditions for contact between people of different ethnic traditions. This is especially evident in business, industrial, organizational, and other spheres, and etiquette conventions in society have become much simpler. But does this mean that the ethno-cultural diversity of the world can be completely discounted? Or is it important to realize that each culture reflects only a part of the experience accumulated by mankind, it is neither worse nor better, it is just different?

The main types of human activity are common for all people in their content, to a certain extent they are set by biology. But the forms this activity takes in different human collectives are different. There is great variability of forms of labor behavior, be it hunting, fishing, farming, animal husbandry or crafts, different labor techniques and methods in all these branches of economy, different forms of organizing one's rest or leisure, and different methods of bringing up children. Cultural differences are manifested in the way people dress, the way they eat, in their favorite standing or sitting postures, although all people on earth dress, eat, stand, and sit. These differences also show that different ethnic groups possess and are characterized by different cultures.

The example given by the Russian anthropologist Sergey Arutyunov in his book People and Cultures is highly appreciated. He wrote: Let us take the simplest, most elementary form of human behavior—"sleep". The concept of "sleep" is expressed in different words in different languages. In addition, the most common ways of sleeping and, consequently, the

first concrete images arising among people of different ethnic groups in connection with this word differ. For the South American Indian, "to sleep" means, first of all, to sleep in a hammock; for the Korean, it means to sleep on an ondol (a heated elevated part of the floor) (Arutyunov 1989, p. 6). It means that in parallel with the speech-language, there is also the language of the extra-linguistic, i.e., material and behavioral part of the culture. So in our own culture, we are equipped with a code of behavior. Different cultures have different norms of conduct. But the ethnic boundary should not be exaggerated. Even in the same ethnic group etiquette culture is significantly differentiated by social groups and varies depending on profession, property status, age, etc. For example, student etiquette or officer etiquette will differ from the etiquette of business circles, etc., and at the same time have commonality with the corresponding groups in other ethnic groups.

4. Contemporary traditional culture: the case of Russia

As in any other European country, traditional clothes in Russia can be seen in a full set only at folklore festivities though its separate elements may be used in everyday life. Thus, for instance, "valenki" felt boots are indispensable in severe climate conditions of the Russian winter and still popular in rural areas. Men from the Caucasus almost always wear hats. Clothes are also attributed with symbolical importance and revived. Not long ago, for example, a group of women in Tatarstan appealed to the court with a demand to allow them to be photographed for passport photos in headdresses, saying that this is a Moslem standard of the local people. Earlier such a demand would seem wild while now it is perceived quite normally.

Food forms is an important part of personal and family tradition. But as conservative as it might be, it is still subject to cultural transmission and, being influenced by various circumstances, including fashions, does not stay unchanged. In Russia, porridge, or kasha, is a common breakfast food. Not just porridge but cereal prepared with various grains is also very popular. There are, of course, additional classic Russian foods such as pancakes. But since most individuals are rushing to go to work, school, or another place, a typical breakfast can consist of cornflakes or muesli, fried or scrambled eggs, sandwiches, or something similar.

The main meal of the day is lunch, or dinner. It is divided into multiple courses. Soup is the first course served. Although Russia offers a wide variety of soups, "borsch"" is the most well-known. In Russia, they also cook a cold soup okroshka, shchi, and rassolnik. These are the most well-liked traditional Russian soups, though there is a longer list. Meat, cabbage, carrots, potatoes, tomatoes, and onions are the ingredients of shchi soup. In Russia, traditional salads are also available. The bread is a major component of the meal.

5. Acculturation and assimilation processes

The necessity for its members to replicate their customary lifestyles, including eating patterns, arose from the formation of large and stable diasporas in Russia. For instance, as a large number of immigrants work at the marketplaces, a variety of Central Asian tearooms (chaikhonas), Chinese cafes, and other establishments that target immigrants as their primary clientele have begun to spring up at the city marketplaces.

Another noteworthy example would be the Tajik and Uzbek bakeries (nonvoykhonas), which have been popping up in Moscow's marketplaces and other cities over the past few years. They make flatbreads using traditional Central Asian recipes. They imported ceramic tandoors, or furnaces for baking flatbread, specifically from Central Asia. Three people typically run these bakeries: the head baker and his two assistants. They fall short of the conventional benchmarks for baking techniques and technologies, nevertheless.

They make flatbreads that are far smaller than traditional ones, with less variation in shape and dough type, among other things. It's possible that they've been partly tailored to the likes of the Moscowites, since individuals who purchase them are actually not only Central Asians but also, and maybe even more frequently, locals. The native Muscovites' diet is subsequently altered as a result, as they now favor flatbreads over their customary rye or yeast wheaten breads.

Nowadays, Moscow is home to a large number of eateries with Oriental or other ethnic flavors. Another recent development in the lives of the Moscowites is the presence of ethnic delicacies on the streets. Formerly limited to snack shops that served burgers and pelmeni meat dumplings, the fast food sector has expanded to include not just McDonald's but also pizzerias and booths selling doner kebab.

The process of acculturation is two-way. Many of the immigrant-introduced customs are also adopted by native Muscovites. A rare Muscovite used to purchase ramsons, or wild garlic, at a market, although these days they are frequently grown in kitchen gardens. Due to its widespread production and availability in almost every food shop and marketplace, Korean pickled veggies and salads are primarily purchased by non-Korean people. Russian cuisine has been heavily influenced by the cuisines of many different ethnic groups ever since the Soviet era. Beyond the borders of their own cultures, people are familiar with dishes like Siberian pelmeni meat dumplings, Caucasian shashlik or shish kebab, Ukrainian borsch, and Uzbek pilaf. But the Russians are increasingly enhancing their diet with even more novel delicacies.

There are also fresh developments in other sectors. Although a city dweller's wardrobe may appear impersonal, it is actually rather individualized. Ethnic music is often played in public spaces like cafes, markets, stores, and the like—not to create an exotic atmosphere, but just because the people who work here like listening to their own music. In Moscow, one can hear non-Russian languages being spoken more and more frequently: Tajik, Ukrainian, different Caucasian languages, or Russian with an accent that isn't Moscovite. There have also been new activities to fill one's free time. Backgammon is becoming a highly popular game. Backgammon is currently played not only by immigrants but also by long-time Moscowites in parks where chess and dominoes players congregate. Acculturation, as I've already mentioned, is a two-way process. Both Tajiks and Azerbaijanis have picked up the game of dominoes in Moscow; Tajiks are also known to play football and participate in other sports that they are unfamiliar with. Chinese and Georgians enjoy gambling, whereas Tajiks and Vietnamese people hardly occasionally gamble.

“Every morning started with drinking some coffee together with the female neighbors back home” they stated. When people don't understand each other's customs, it can lead to miscommunication and unfavorable opinions of one another. While it is not customary for us to visit one another without an invitation, in Central Asia it is the new settler's

responsibility to introduce themselves to the local population. In Moscow, not many people are aware of this, so when one of the "new Muscovites" prepared a pie and rang the doorbell of her neighbors' apartment, there was, to put it bluntly, some confusion. The immigrants are unable to prevent the loss of a whole cultural stratum. For instance, in their home nations, the authority of one's elders is unquestionable; yet, in the city, this is not always the case.

In general, schools can support kids' assimilation while still encouraging, if wanted, their cultural uniqueness. Russia is currently experiencing both of these tendencies. Ethnic cultures, including Korean, Lithuanian, Georgian, Armenian, and many more, are taught in schools. The initiatives of the roughly 150 ethno-cultural autonomies and ethnic and religious associations in Moscow also contribute to the upsurge of the movement for the preservation of historical and cultural assets. But the issues surrounding the migrants' adjustment and assimilation into the city's cultural milieu are also being resolved.

The most effective and systemic approaches here are the educational initiatives targeted at youngsters and teenagers, for whom understanding Moscow's customs and social codes is far easier than it is for the more experienced immigrant generation. Similar responsibilities are carried out in preschools and schools that specialize in teaching Russian to kids from non-Russian immigrant households. All of this allows Moscow's residents, who are representatives of diverse ethnic groups, to select between numerous behavioral models (Martinova, 2006).

6. Conclusion

Many laws and programs have been developed with the account for Russia's polyethnic specifics. The adopted "Concept of the State National Policy of the Russian Federation" pays special attention to the development of traditional cultures and different languages of Russian people. The law "On National-Cultural Autonomy" manifests increased attention of the government to the issues of preservation and development of cultural traditions. The autonomy units allow various ethnic groups including very small ones, dispersed peoples, and ethnic minorities resolve the problems of preservation and development of their originality, traditions, language, culture, and education. There are special laws guaranteeing the rights of small indigenous peoples, which are the most vulnerable in respect to the preservation of their traditional cultures. The social and ecological issues in the preservation of languages and cultures of the indigenous and small peoples of the Russian North, Siberia, and Far East are of pivotal importance. Special emphasis is attached to establishing conditions for their traditional economies.

Special programs for the preservation and development of cultures, languages, and traditions have been adopted. Some of these programs are regional and have the purpose of reviving folk art culture in such Russian cities as Arkhangelsk, Belgorod, Vladimir, Vologda, Tver, and Nizhny Novgorod. It is noteworthy to mention that the Moscow government has created several targeted programs with the goal of integrating all societal strata into the city. This is demonstrated by creating favorable conditions for the cultural advancement of all ethnic groups with a sizable population in Moscow. The Moscow City Government promotes the growth of many cultures through a goal-oriented policy. The Moscow government has a special department, "Committee for Public and Interregional Relations", which is in charge of social policy's ethnic issues. The Moscow government established the so-called House of

Nationalities, which closely interacts with all ethnic and cultural associations of the city. There are more cities with similar establishments. In order to achieve integration, it is also necessary to take into account the unique needs of the people who belong to ethnocultural autonomies, which strive to preserve their respective languages and cultures inside the boundaries of the city. In this way, the globally acknowledged idea of "unity in diversity" is applied while accounting for Russia's unique characteristics as a multiethnic nation with a clearly defined Russian dominance.

Even in the Russian-language environment, parents try to teach their children the language and culture of their people. Many cities have schools with teaching in various languages of Russia's peoples. There are preschool institutions where special attention is paid to accommodating children to their traditional culture, including Russian. Kids learn how to make their national toys, sing old songs, and play almost nonexistent musical instruments. Unfortunately, the role of ethnology as a general school subject is being underestimated. Ethnology is being taught at some schools as an extracurricular subject.

At places where traditions are lost and cannot be revived, the so-called folklorisms are being established as a secondary form of tradition. Folk songs and dances are restored based on folklore records and performed as a variety show. Pieces of ancient folk art are copied. Artists imitate old masters. These products made within the framework of folk traditions are not the development of these traditions. They simply add an ethnic element to the existing palette of colors making the world look brighter.

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References

Arutyunov, S. (1989). *Народы и культуры: развитие и взаимодействие* [People and cultures: Development and interaction]. Наука.

Attali, J. (1992). *Millennium: Winners and losers in the coming order*. Three Rivers Press, Times Book.

Federal State Statistics Service. (2021). *On the All-Russia Population Census 2021. Vol. 5. Tab.1. The National Composition of the Population of the Russian Federation.* https://eng.rosstat.gov.ru/folder/76215

Cumont, F. (2010). *Les religions orientales dans le paganisme Romain (1906)* [The oriental religions in Roman paganism]. Kessinger Publishing.

Drobizheva, L. (2013). *Этничность в социально-политическом пространстве Российской Федерации. Опыт 20 лет*. [Ethnicity in the Socio-Political Space of the Russian Federation. The experience of 20 years]. Новый хронограф. https://www.isras.ru/files/File/publ/DROBIZHEVA.pdf

Goody, J. (2012). *The Theft of History*. Cambridge University Press.

Life Persona. (n.d.) *What are Traditional Cultures? (With Examples)*. https://www.lifepersona.com

Martinova, M. (2006). Uticaj cavremenih migracionih proceca na svakodnevnu kulturu Moskovljana [The Influence of Recant Migration Processes on Moscow everyday Culture]. In D., Radojičić & Z. Divac (Eds.), *Svakodnevna kultura u postsocialističkom periodu* [Everyda3y culture in post-socialist period] (pp. 75–88). Institute of Ethnography, Serbian Academy of Sciences and Arts. https://dais.sanu.ac.rs/bitstream/id/29568/bitstream_29568.pdf

Martynova, M. (Ed.). (2021). *Язык и идентичность: антропологическое исследование ситуации в России* [Language and Identity: An Anthropological Case Study in Russia]. Institute of Ethnology and Anthropology RAS.

Register of intangible cultural heritage objects. (2024). *Objects of the Intangible Cultural Heritage of the Peoples of Russian Federation*. https://rusfolknasledie.ru/?ysclid=m1dmj5mrh3953535431

Turner, T. (1993). Anthropology and multiculturalism: What is anthropology that multiculturalists should be mindful of it? *Cultural Anthropology*, *8*(4), 411–429. https://doi.org/10.1525/can.1993.8.4.02a00010

UNESCO. (n.d.-a). *Cultural Space and Oral Culture of Semeiskie*. https://ich.unesco.org/en/RL/cultural-space-and-oral-culture-of-the-semeiskie-00017

UNESCO. (n.d.-b). Mongolian art of singing, Khoomei. https://ich.unesco.org/en/RL/mongolian-art-of-singing-khoomei-00210

VCIOM. (2023). *Религия и общество: мониторинг* [Religion and Society: Monitoring]. https://wciom.ru/analytical-reviews/analiticheskii-obzor/religija-i-obshchestvo-monitoring?

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ELEMENTS OF THE INTANGIBLE CULTURAL HERITAGE OF UKRAINE IN THE CONSTRUCTION OF THE NATIONAL IDENTITY

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Abstract: The construction of national identity has been a most discussed topic in Ukraine since 1991 when the second-largest European country gained independence and particularly since the Euromaidan protests and revolution in 2014. The everyday and political life, various forms of literary and artistic creations, or historical cultural heritage are the areas where it is possible to observe the phenomenon. The paper focuses on the area traditionally studied by ethnology—traditional vernacular (folk) culture and selected elements of intangible cultural heritage (ICH). The main goal of the study is to show how specific phenomena from the originally vernacular culture of different regions of Ukraine, such as clothing components or traditional dishes, are being actively used, reshaped, and reinterpreted as important symbols in the process of the formation of national identity in the contemporary world. I will discuss three specific cases, which are of high popularity in Ukraine and in the international context: an embroidered shirt known in Ukrainian as the vyshyvanka, a borscht soup, and a decorated Easter egg pysanka. The following text summarizes the initial phase of the study, drawing on scholarly literature and interviews with Ukrainians currently living in the Czech Republic.

Keywords: vernacular culture; intangible cultural heritage; national identity; Ukraine

1. Introduction

Mrs. Halyna used to say every day: Come and have some borscht. She meant a vegetable soup with meat. There was necessarily beetroot, but the other ingredients varied and were different each time. The meat was rarely beef, she usually used much cheaper and more available chicken or pork, sometimes even canned. Such borscht was often a reason for arguments and dissatisfaction within the family. Quarrels between the granddaughters and the grandmother Halyna were not unusual either: their mother does not put corn in the borscht! These were the everyday home struggles about the borscht, an intimate dish on a family table. How did it happen, becoming an object of interethnic and international disputes, and why? Can we consider borscht an intangible cultural heritage? Are there similar phenomena in everyday life, originating from the complex of traditional folk culture, that now serve entirely new functions in the modern world?

During the summer of 2022, I hosted four Ukrainian women from three different generations, which allowed me to closely observe their everyday culture, language, and customs. It was like a reverse field study, where the field came to me. Mrs. Halyna stayed at our house for six weeks with her daughter and two granddaughters, until we found them suitable accommodation. After the Russian military intervention in the spring of 2022, many Ukrainian refugees were coming to the Czech Republic—temporary protection status was assigned to about 600,000. In the first quarter of 2024, the Czech Republic remained the most burdened country in Europe regarding the number of active holders of temporary protection per capita (Ministerstvo vnitra ČR, 2024). Nevertheless,

even before the war, the citizens of Ukraine were the most numerous members of foreign states with long-term and short-term stays and those who acquired Czech citizenship (Ministerstvo vnitra ČR, 2022). The long-standing migration connections between the Czech Republic and Ukraine are rooted in historical, social, and economic factors. A Czech-speaking minority in north-western Ukraine, primarily in Volhynia, also contributed to these ties, emigrating to Tsarist Russia in the 19th century. After 1945 and again in the 1990s, many returned to Czechoslovakia, but today, around 6,000–10,000 people of Czech origin still live in Ukraine (Uherek, 2016). For these very reasons, we focused more intensively on the issue of Ukrainian culture and identity at the Department of European Ethnology at the Masaryk University in Brno, as part of the lectures and seminars on Slavic Cultures and the Ethnology of Eastern Slavs. In 2022, the topic emerged with great urgency.

In this article, I summarize the findings of ongoing research on phenomena traditionally classified within historical ethnology as characteristic elements of folk culture. However, today these phenomena are more appropriately understood as elements of everyday culture or intangible cultural heritage (ICH). Some of them have taken on new significance by being elevated from their ordinary, everyday contexts to the public or national sphere. It is a long-term process whose beginnings can be traced back to the Romantic era and the early formation of modern nations. Today, we can scarcely study vernacular cultural phenomena in isolation, separate from contemporary society's context. Various aspects of national identity can be studied through the lens of everyday life practices and objects. I will discuss three specific cases of high popularity in Ukraine: the embroidered shirt known in Ukrainian as the vyshyvanka, a decorated Easter egg called pysanka, and a popular everyday dish—a borscht soup. These three elements can serve as representative examples and are likely the most well-known internationally. Along these phenomena, there are many others with similar new functions, such as traditional hair adornments for girls, the floral wreath vinok, craft pottery, or kobzarstvo, an oral tradition of blind traveling singers—bards—who accompanied their singing typical epic songs dumy with the kobza, bandura, and hurdy-gurdy musical instruments.

The vyshyvanka and pysanka as creations of artistic expression have gradually accumulated new symbolic meanings over time. Borscht, an intimate, everyday experience, has also emerged as a platform through which identities can be redefined, reshaped, and constructed, particularly in affirming a distinct Ukrainian culture, separate from broader Russian and Soviet cultural traditions. The international context plays a crucial role, as all three phenomena, in their new functions, serve not only within the national sphere but, importantly, as representatives of "Ukrainianness" to the outside world.

Before delving into the analysis of the phenomena, I would first like to present the important context and the methodology. This includes, firstly, the ethnographic regionalization of Ukraine to clarify the geographical and historical background. Secondly, I will outline the current social issues related to the national identity of the Ukrainian population. Finally, the role of UNESCO as a protector of the ICH in Ukraine will be discussed. These contexts will provide a framework for the more detailed research I plan to conduct with our Ethnology students in the coming years. The following text summarizes the initial phase of the study and its main premises. The text draws on scholarly literature and interviews with Ukrainians currently living in the Czech Republic—interviews conducted with Mrs. Halyna during our time together in the summer and fall of 2022, as well as four interviews carried out by our master's degree students in the fall semester of 2023 as part of the East Slavic Ethnology course.

2. Ethnographic regionalization, identity, and ICH

2.1. Historical and ethnographic regions of modern Ukraine

Vernacular culture developed locally and regionally over centuries, distinct from national culture tied to modern nations. It evolved within small groups, often differing more within an ethnicity than among neighbouring communities. This makes ethnographic regionalization a key focus of historical ethnology.

Ukraine's vast territory of 603,500 km² (State statistics service of Ukraine, 2013) contains numerous ethnographic units, shaped by specific historical events and regional differences. The borders of the historical regions often do not correspond to the current state borders; they extend into the territories of neighbouring states, and some regions with traditionally Ukrainian populations lie entirely outside the present borders of Ukraine (for example, the Kuban, Starodub region in Russia, western Galicia in Poland). The historical regions of Ukraine include (from northwest to southeast): Volhynia, Galicia, Transcarpathia, Bukovina—part of which is in Romania, Podolia, Polesia, Dnipro Ukraine, Budjak—the southern part of Bessarabia, Siveria and Sloboda—part of which is in Russia, Zaporizhzhia, Donbas—part of the historical Don region, and some others (Magocsi, 2010; Rychlík et al., 2015). Ethnographic regionalization also considers geography and natural landscapes. Ukrainian ethnology identifies four major macroregions (Kosmina, 2005):

- Polesia—a sparsely populated, forested area with wetlands and swamps on the Belarus–Ukraine border, extending into Poland and Russia;
- Forest-steppe areas—covering western and central Ukraine;
- Steppe areas in southeastern Ukraine; and
- The Carpathians—a small mountainous region in southwestern Ukraine.

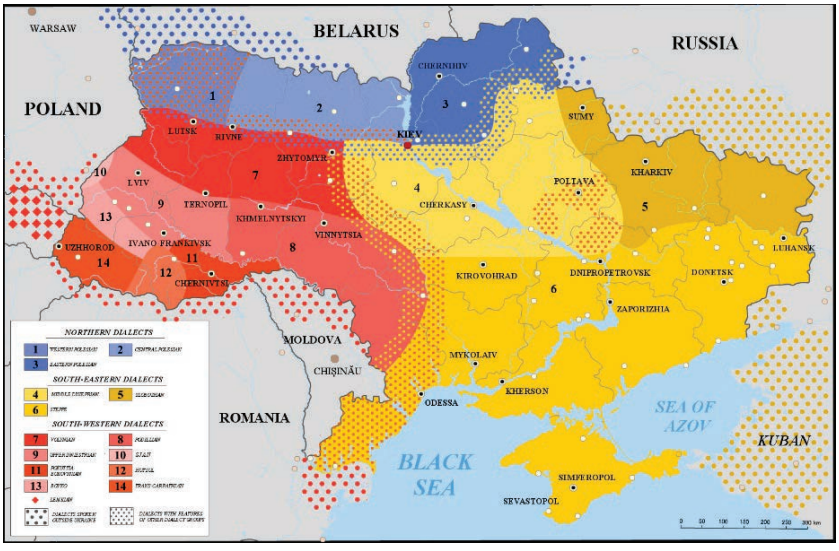

Figure 1. A map of Ukrainian dialects clearly illustrates the division of cultural and geographical zones in Ukraine. *Note.* From Map of Ukrainian dialects and subdialects (2005), by Alex K., 2010 (https://en.wikipedia.org/wiki/Ukrainian_dialects). CC BY 3.0

The third division, which we will examine in more detail, arose from interdisciplinary research of traditional vernacular culture and folklore, Ukrainian dialects, and historical and natural contexts in the 1960s, considering data from the late 19th and early 20th centuries. Ethnologists divided the vast territory of Ukraine into three large cultural-geographical zones, corresponding to the main dialect groups, within which they described individual smaller ethnographic regions and groups—Central–Eastern zone, Ukrainian Polesia, and the Western (southwestern) zone (Makarchuk, 2015) (Figure 1).

Central-Eastern Zone includes the largest part of Ukraine—the central, eastern, and south–eastern parts of the country, including the capital Kyiv, and the largest cities (Dnipro, Zaporizhzhia, Kharkiv, and Odesa), as well as the Crimean Peninsula. Traditionally, the northern part of this area is divided into the Left Bank (east of the Dnipro River) and the Right Bank (Rychlík et al., 2015). Additionally, Ukrainian ethnologists divided this zone into three large subregions—Dnipro Ukraine, Sloboda Ukraine, and the Southern steppe regions (Makarchuk, 2015).

Dnipro Ukraine is considered the heart of the country, a highly urbanized and the most developed region within modern Ukraine. Ethnic Ukrainians predominate here (up to 90%), and in addition to Ukrainian and Russian, a mixed language Surzhyk is commonly used for communication. The region has the oldest inscriptions on the UNESCO (n.d.-a) list of Ukraine's intangible heritage—Petrykivka's decorative painting in 2013 and Cossack's songs of Dnipropetrovsk Region in 2016. The region includes smaller ethnographic regions, such as Poltava, known for its traditional handicrafts, including pottery, weaving, embroidery, and the production of musical instruments. Sloboda Ukraine was a borderland of the Russian Empire. The word sloboda (freedom) referred to frontier villages that were exempt from imperial taxes in exchange for guarding the borders against Tatar raids from the southern steppes (Magocsi, 2010; Rychlík et al., 2015). The Southern steppes, known as Zaporizhzhia or the Wild Fields, were inhabited by nomadic tribes like the Cumans, Pechenegs, and later the Mongols. The region came under Tatar influence (Crimean Khanate and Nogai Horde). In the 14th century, it became part of the Grand Duchy of Lithuania, with Slavs settling there. To counter Crimean Tatar attacks, fortified stations, and Cossack units were formed in the 16th century. Ukrainian Cossacks established the Zaporizhzhia Sich on the Dnipro, leading to the Cossack Hetmanate in the 17th century, seen as a precursor to the Ukrainian state and holding a strong position in the Ukrainian national myth. Multiethnic and multicultural free Cossack communities were influenced by Turkic nomads and runaway serfs from Russia and Poland (Magocsi, 2010; Rychlík et al., 2015).

The southern regions also include the Donbas, an extensive mining and industrial region with coal and salt mines, and the distinctly multiethnic Budjak with Bulgarians and Moldovans. Crimea (called also Tavriya) is typically included, where one of the five elements on UNESCO's World List of ICH has been inscribed—the Crimean–Tatar ornament Ornek in 2021 (UNESCO, n.d.-a).

These regions have the highest concentration of ethnic Russians. Historically, the entire central–eastern area was under the direct influence of Tsarist Russia and experienced multiple waves of Russification. Today, it is a heavily industrialized part of Ukraine, where traditional vernacular culture has been steadily disappearing since the late 19th century (Makarchuk, 2015).

Ukrainian Polesia is a marshy region in the northern Ukraine. It is divided into the western (Right Bank) and eastern (Left Bank) parts according to the Dnipro River. In the West, the western Polesian dialect, a mixture of Ukrainian and Belarusian, is spoken. Over the centuries, different parts of Polesia have alternately belonged to Poland or Russia. Due to the natural

conditions, the local population engaged extensively in fishing, hunting, and beekeeping. Polesia was considered the core area of the old and "authentic" Slavic culture. Polish ethnologist Kazimierz Moszyński, who was the first to systematically study the vernacular culture of the Slavs from the 1920s, regarded Polesia's culture as the most preserved and original material, the most typical for the Slavs, without the Western, Byzantine, or Oriental influences prominent in other Slavic communities (Moszyński, 1929). Archaic elements of folk culture, such as bark-woven footwear, shirt patterns, the system of annual customs, embroidery, strong patriarchal family relations, or, unlike other regions of Ukraine, a still-functioning complex of customary law that regulated the use of pastures, meadows, forests, hunting grounds, and a system of mutual neighbourhood assistance and communal courts, were recognized here at the end of the 19th and the beginning of the 20th centuries (Makarchuk, 2015).

Western (Southwestern) Regions—this zone is the most diverse from an ethnological perspective, and unlike, for example, the Southern steppes, it is characterized by the historical continuity of settlement, mostly of Slavic origin. Over the centuries, the entire zone or its various parts have been under the control of different political entities—the Polish–Lithuanian state, Russia, the Moldavian Principality, the Habsburg Monarchy, Poland, and Czechoslovakia. It includes the eastern part of historical Galicia with its centre in Lviv, which was Polish until World War II, and more than half populated by Poles, and more than 10% were Jews (Rychlík et al., 2015).

Ethnologists (Makarchuk, 2015) define the following ethnographic regions within this zone: Volhynia, Podolia, Opole, and Pokuttya (within the so-called Prykarpattia), Hutsulshchyna, Boikivshchyna, and Lemkivshchyna. These last three Carpathian regions were named after the inhabitants there, the ethnographic groups of Hutsuls, Boikos, and Lemkos, whose ethnicity is also debated, as they often consider themselves not Ukrainians, but a separate nation. An overarching ethnonym, Rusyns, is used for them, which is the self-designation of the group members (in Ukraine, the preferred term is Transcarpathian Ukrainians, because Ukraine refuses to recognize their right to self-determination).

Volhynia partially overlaps with Polesia, which was defined primarily geographically and dialectologically. There are still Czech, Polish, Jewish, and Belarusian national minorities and a community of Roman Catholics (State statistics service of Ukraine, 2013). We can find many archaic elements here on dresses, embroidery, or the celebration of annual customs, e.g., summer celebrations of the Feast of St. John the Baptist, Ivan Kupala, with typical flower wreaths on the women's head), weddings, similar to those in Polesia (Makarchuk, 2015).

Podolia lies in the southern part of western Ukraine and extends into northern Moldova. It has not undergone significant industrialization, and even today, agriculture, especially the cultivation of fruits, grapes, and vegetables, holds a strong position here. Along with Volhynia, these are rural regions with a rich history, culture, and deeply rooted Ukrainian folklore, which was reflected in the works of the most famous Ukrainian writer, Lesya Ukrainka. In Podolia, there was a significant manifestation of spring ritual song folklore, and colourfully embroidered women's shirts (Makarchuk, 2015).

Transcarpathia was part of Hungary from the 11th century and belonged to Czechoslovakia from 1918 to 1945. Transcarpathian Ukraine was densely populated by Jews, Germans, Roma, and Hungarians before the Holocaust (Rychlík et al., 2015)—the latter still make up 12% of the area's population today (State statistics service of Ukraine, 2013) To the east of Transcarpathia, the distinctive Hutsulshchyna is situated, considered by Ukrainian

ethnologists to be the most attractive and best-documented ethnographic region in all of Ukraine (Makarchuk 2015), as well as Pokuttya and Bukovina with rich vernacular culture and a multiethnic character. In the Hutsul region, decorative ceramics from the Kosiv village were inscribed on the UNESCO list in 2019 (UNESCO, n.d.-a), with its typically green and brown dishware and tiles with figurative ornaments.

2.2. What does "the Ukrainian identity" mean?

Due to its ethnographic diversity, historical experiences, vast territory, and linguistic complexity, Ukraine lacks a singular national process or identity. Ukraine is described as "a laboratory of political and cultural identities" (Puleri, 2020, p. 48) and scholars often refer to a supranational or transnational identity. Serhii Plokhy notes Ukraine's role as a borderland not only of various states but also cultural zones, contributing to its fragmented identity (Plokhy, 2007; Puleri, 2020). Ukraine has historically faced a choice between two civilizations: Western, European values and Eastern, Slavic, and Orthodox traditions. Under the Soviet regime, another binary opposition emerged—between the imperial past and the Soviet communist present (Puleri, 2020).

These binary oppositions are being reflected in the contemporary public sphere, often intensified in political rhetoric: "European values vs. the Russian world, Ukrainian-speaking vs. Russian-speaking, terrorists vs. fascists, patriots vs. compatriots" (Puleri, 2020, p. 161–162). The binary opposition between the traditional and European West and the industrial, modern, and Soviet East of Ukraine is highly reflected in Ukrainian society, and it is also present in the reflections on identity among the Ukrainian community in the Czech Republic (Čermák & Lupták, 2015). Sociological surveys (Semenova, 2020) reveal significant regional differences in Ukraine, particularly between the Western and Eastern areas, with some also identifying Central and Southern regions. These variations in identity stem from historical development and ethnic composition. Furthermore, other social or political indicators vary regionally, like election results or the level of nostalgia for the Soviet era. A 2016–2018 SeeD survey shows that 31% of Ukrainians feel nostalgic for the USSR, with 61% in the South, 42% in the Center, 43% in the East, and only 7% in the West (Semenova, 2020, p. 161). The East and South were unified under Soviet identity, while Western Ukraine preserved its vernacular culture, which continues to shape its identity (Korostelina, 2013).

However, is it possible to define a boundary between East and West? These two entities cannot be completely separated—except of extreme nationalists on both sides. Historical circumstances have determined that most Ukrainians have been developing not in one but in two or even more parallel and mutually influencing cultures and language milieus—the Ukrainian and the (all)Russian. Many writers and artists operated between the stark oppositions mentioned above—between languages, cultures, and traditions, like Nikolaj Vasiljevič Gogol'/Mykola Vasylyovyč Hohol' (Puleri, 2020). Additionally, the regional or, on the other hand, supranational identity of an individual can often be much stronger than the national (Ukrainian or Russian) one. Even today, society has not been so strictly polarized, although the escalation of military conflicts since 2014 (and 2022) has significantly changed the situation, leading to greater polarization.

In this context, efforts are made more likely to deconstruct established and well-defined categories such as territory, language, or ethnicity, because they are insufficient to capture the complex reality. Korostelina's (2013) research, based on interviews with Kyiv's political

and intellectual elites, identifies five distinct national identity narratives in modern Ukraine and examines the process of identity formation since independence in 1991. The narratives are often in direct conflict, for example, regarding their relationship to national history, such as the interpretation of Holodomor (Korostelina, 2013), or the issue of official languages. The first three narratives were evenly represented, while the multiethnic civic and Soviet narratives were less common. Those are:

1. Dual Identity Narrative was represented most, by 28% of respondents. This narrative highlights Ukraine's connection to both Russian (all-Russian) and Ukrainian cultures, promoting a dual identity that embraces both;

2. The Fight for Ukrainian Identity Narrative was represented by 23% of respondents. This narrative centres on the struggle to establish and solidify a distinct Ukrainian identity, often in opposition to Russian influence;

3. Recognition of the Ukrainian Identity Narrative was represented by 23% of respondents. This narrative describes Ukraine as a democratic nation and homogenous culture of ethnic Ukrainians with ethnic minority groups: Russians, Crimean Tatars, and Hungarians;

4. Multicultural-Civic Narrative was represented by 16% of respondents. It describes Ukraine as a multicultural society with co-equal ethnic groups that should build a civic, not ethnic, concept of national identity; and

5. Pro-Soviet Narrative was represented by 7% of respondents. This perspective is aligned with nostalgia for the Soviet Union, emphasizing strong ties with Russia (Korostelina, 2013).

Research on national identity has focused not only on the top-down processes of making identity but also on the role of ordinary people and their everyday practices. According to some scholars, the development of nationalism during the Orange Revolution in 2004 and then during the Euromaidan protests and subsequent military conflict in East Ukraine demonstrated that nation-building in Ukraine appeared to be spontaneous or informal (Polese, 2009, Seliverstova, 2017), which suggest that ordinary people are not only bearers of national identity but also participate in its production (Seliverstova, 2017).

In her qualitative research in Lviv, Seliverstova examined how people express their relationship to the nation using everyday objects, particularly household items. She found, for example, that by displaying objects with national or folk themes, some respondents sought to shape national consciousness in their young children (with items such as ceramics with decorative patterns, Ukrainian traditional cloth dolls motanki, or maps of Ukraine) (Seliverstova, 2017). She also identified certain differences between Russian- and Ukrainian-speaking individuals. Russian speakers did not usually mention having official national symbols in their homes; they preferred national objects with aesthetic features, such as ceramic dishware, linen cloths, or pieces of traditional Ukrainian clothing. Ukrainian speakers, in most cases, would first mention things like the red and black flag of the Ukrainian People's Army in 1917–1921, Kobzar (a novel written by Taras Shevchenko, which became a symbol of Ukraine's national and literary revival), and religious icons (Seliverstova, 2017).

Interviews with respondents in our preliminary study revealed that national identity issues were more prominently addressed by newly arrived Ukrainians (from the 2022 refugee wave) than by those living in the Czech Republic longer. There were also differences in how identity factors were perceived. While respondents from Western Ukraine considered traditional folk culture a significant identity factor, those from Central and Eastern Ukraine emphasized the

importance of good employment opportunities. For all our respondents, family ties and religious traditions were crucial, and they identified them as key identity factors. Strong national identity positions primarily reflected political views—solidarity with the Ukrainian nation and the need for unity was expressed as a fundamental rejection of the Russian military intervention.

2.3. The ICH

ICH is a broad umbrella term that, in its widest sense, encompasses all forms of human linguistic and artistic expression. Today, the term mainly refers to folklore, traditional knowledge, customs, rituals, crafts, and production techniques (UNESCO, n.d.-b). Influenced by UNESCO, the concept of cultural heritage now includes not only monuments and objects but also intangible aspects like traditions and knowledge passed down through generations. ICH defined by the UNESCO Convention is "dynamic, inclusive, representative, and community-based, reflecting both traditional and contemporary practices that contribute to social cohesion and identity. In today's world, while fragile, it plays a crucial role in preserving cultural diversity amid globalization" (UNESCO, n.d.-b). Prominent expressions of regional folk culture around the world since 2008 have been inscribed on UNESCO's World List of IHC. So far, five elements from Ukraine have been inscribed (UNESCO, n.d.-a).

After the start of the military conflict in 2014, and especially in 2022, we are witnessing the physical endangerment of ICH, especially in local and regional museums devoted to local lore (Jiang, 2023). In this context, the inscription of Ukrainian borscht culture on the list of safeguarding practices of UNESCO, which has been criticized as a political decision, was entirely understandable.

3. What do we wear, what do we have at home, and what do we eat? Vyshyvanka, pysanky, and borscht

Folk culture and national identity interplay can both foster a sense of belonging and serve as a political strategy. Since the late 18th century, the Romantic era, elements of vernacular culture have been recontextualized and elevated to national symbols (Gellner, 1983). The same author highlighted how state elites extract and repurpose folk elements—like costumes, decorated dishware, or music—as metaphoric symbols of the state. This process helps legitimize the state and facilitates the assimilation of ethnic minorities into the dominant national identity (Greet, 2024).

These processes are not uncommon in the post-Soviet space, particularly among nations culturally closest to Russia. Similar processes can be observed in Belarus, where textiles and embroidery continue to be symbols and visual expressions of Belarusian cultural identity (LaVey, 2021) and became a symbol of Belarusian opposition after the 2020 elections. In this context, scholars often discuss postcolonialism, but it is important to recognize that Ukraine was not a typical colony of the Russian Empire. Instead, it functioned more as a core territory due to its geographical, ethnic, and cultural proximity (Kappeler, 2003; Puleri, 2020).

3.1. Vyshyvanka: an embroidered shirt from Ukraine

Traditional costumes exhibit significant local and regional variability, making it difficult to distinguish ethnic or national boundaries, such as between Ukrainian and Russian costumes. Although it is generally believed that ethnicity expresses cultural differences, the relationship between ethnicity and culture is highly variable and complex (Eriksen, 2012).

A shirt, an element of traditional textile production, historically marked social status and gender, and served protective, magic, aesthetic, and ceremonial functions, often expressed through decoration and embroidery, which was exclusively girls' and women's work. Colours also held symbolic meaning—red was strongly associated with wedding ceremonies, while white was prominent in funeral rites. The vyshyvanka shirt was also a traditional bride's gift to her groom (Makarchuk, 2004).

In the late 19th and early 20th centuries, embroidery became widely used, and local stylistic, artistic, and technical approaches became clearly defined. For example, embroidery with plant motifs—in red, blue, green, and yellow colours from Yavoriv in the Lviv region, and monochrome (black), often geometrically styled, from Sokal in the same region. Rich in local variations is Hutsul embroidery, such as the orange-yellow Kosmach style with purely geometric patterns, which differs from the embroidery of the Dnipro region with its more developed plant motifs. Ukrainian embroidery also includes zoomorphic, anthropomorphic, and ornithomorphic motifs (Makarchuk, 2004).

In Ukraine, the embroidered shirt became a symbol of the nation itself, largely because it was predominantly associated with peasants and their everyday culture. Similar processes we observe among many other Slavic-speaking nations. Later, in the Russian Empire and the Soviet Union, wearers of vyshyvanka from Ukrainian regions were often decried as political dissidents or bourgeois nationalists (Greet, 2024). The Ukrainian diaspora played a pivotal role in the process throughout the 20th century, fostering various forms of folk art within clubs and associations, which have served—and continue to serve—as key facilitators in preserving and promoting these cultural practices. A good example is the Vyshyvanka Association (n.d.), established in 2016 in Canada.

Today vyshyvanka represents a concentrated embodiment of cultural traditions and values. Moreover, it has become a significant symbol of Ukrainian national identity in the public sphere, a means of self-expression, and a fashion statement, showcased in diverse regional variants. For Ukrainian men and women wearing the shirt symbolizes heroism and resistance to aggression and strengthens their national pride (Denisyuk, 2022). In May 2007, Ukrainian student Lesya Voronyuk initiated the annual observance of Vyshyvanka Day and in 2014, the Ukrainian government officially recognized it as a nationwide celebration. Vyshyvanka began to appear increasingly frequently in the public sphere and has become even more popular recently since the escalation of the conflict, which "allowed" the Ukrainian national movement and its symbols to gain international prominence. Many Ukrainians "took to social media to express their commitment to Ukrainian sovereignty, photographing themselves in their vyshyvanka" (Greet, 2024, p. 178). The vyshyvanka was one of the phenomena of cultural heritage that received international recognition in 2022 (European Heritage Awards, n.d.).

By wearing embroidered shirts, also Russians in Ukraine and members of minority ethnic groups express their affiliation with Ukraine and its culture (Lesiv, 2021). A Crimean-Tatar woman, a refugee in continental Ukraine after the annexation of Crimea, was cooking borscht at a TV show and wearing vyshyvanka in combination with a traditional Crimean-Tatar fez to symbolically communicate her support for the Ukrainian cause (Lesiv, 2021). The vyshyvanka has become a platform for expressing political views.

According to Greet (2024), who conducted her research among the Ukrainian diaspora in Australia, to fully understand these crafted items, it is important to consider their

gendered dimensions. Thus, not just the physicality of folk craft but also the gendered conception of the peasant woman and the symbolic meanings contribute to the national identity. There is a metaphorical connection between the original magical protection of the embroidery and maternal protection (Greet, 2024). Even in the public sphere, the function of the embroidered shirt is emphasized as the "spiritual armour" of the Ukrainian nation (see e.g., the promotional video for Vyshyvanka Day 19 May 2022; Vyshyvanka day, 2022).

Today, it's not just traditional embroidery designs being used—entirely new designs with symbolism related to the fight are increasingly appearing (Denisyuk, 2022). Since 2014, however, the vyshyvanka has transitioned into a popular mass-market product, becoming a mainstream element of everyday life. According to Seliverstova (2017), the initial symbolic meaning got lost for some people. Several respondents complained that they are no longer willing to wear vyshyvanka because it no longer represents "a person who loves Ukraine and feels Ukrainian in his heart" but a person who just wants to follow a trend (Seliverstova 2017, p. 72). On the other hand, there were a couple of informants who never had this type of shirt before and who finally bought it. They said that they were proud to wear it, as besides its aesthetic value, it represented an element that could connect people in a kind of fraternity, helping to understand and materialize their belonging to the Ukrainian nation (Seliverstova, 2017).

The Vyshyvanka is undoubtedly one of the most popular ways to demonstrate one's "Ukrainianness." However, respondents in our preliminary research more often mentioned other elements of traditional culture, such as the vinok (flower crown), Ukrainian ceramics, or music—not only folk music, even though one respondent had performed in a folk ensemble for years, but primarily nationalistic and anti-war songs learned from viral videos. Online postcards and short videos—greetings for significant anniversaries and religious holidays—were also very popular. Their design was quite similar, whether for Christmas, Easter, or Mother's Day. It often featured a woman, girl, or a woman with a young girl in a colourful embroidered shirt with a prominent flower crown on her head, symbolizing the protective "Mother Ukraine."

3.2. Pysanka: Ukrainian Decorative Art

Although decorated Easter eggs are known in many regions of Europe and not only in Slavic areas, this phenomenon has developed extraordinarily richly in the Ukrainian context. The name "pysanka" derives from the verb pysaty—"to write", because the decorations are not painted but written in wax. The traditional pattern is applied to the egg with a special stylus and after that, the egg is dipped into dye. The procedure is repeated until the desired pattern and colours are applied to the egg (Makarchuk, 2004).

Easter egg writing was one of the numerous cultural sectors such as embroidery, dance, choral and dramatic performances, and literature, that were influenced by national ideals and came to serve to varying degrees as national or ethnic symbols among the Ukrainian diaspora in Canada as early as the interwar period (Nahachewsky, 2003). The pysanky, decorated using the wax-resist technique, became one of the symbols of Ukrainian culture and cultural identity during the 20th century, first among the Ukrainian diaspora, and after 1991 it also spread across modern Ukraine itself. Behind all of this are not only organizations and clubs but also passionate individuals who make (and keep) this tradition alive (Pysanka, n.d.) In the Canadian town of Vegreville, Alberta, an annual Ukrainian Pysanka Festival is held. In 1975, a twelve-meter-tall Easter egg was constructed there from aluminum plates

(Glebe, 1975). In the Ukrainian "motherland", an attraction is the Pysanka Museum (n.d), established in 2000 in Kolomyia (Ivano-Frankivsk Oblast, western Ukraine). The museum houses a vast collection of painted eggs, with over 12,000 pieces representing various styles and techniques from across Ukraine. It also features a giant wooden pysanka, 13 meters tall, highlighting the importance of this traditional art form. And importantly, Ukraine's 2024 UNESCO candidacy, alongside the Ukrainian community in Estonia, emphasizes painted eggs as a key element of contemporary intangible cultural heritage (UNESCO, n.d.-c).

During Easter 2022, Easter eggs, a traditional symbolic gift, became one of the many platforms of resistance against the Russian military intervention, illustrating how previously known artifacts can acquire new symbolic meanings (Bobrus', 2022). For example, in the cultural centre in the city of Vinnytsia, Ukrainian women, and girls decorated Easter eggs with the Ukrainian state emblem, golden trident (tryzub), and inscribed national slogans such as "I Believe in the Armed Forces", or controversial ones "Glory to Ukraine" and "Glory to the Heroes," initially intended as gifts for soldiers (Bobrus', 2022). The new symbolic significance of dying eggs has persisted in the following years. A young man from Kharkiv, who currently lives in Prague, mentioned in an interview conducted on 3. 1. 2024 (interviewer T. Zlínská), that one of the most important Easter customs in his family, besides preparing the traditional paska cake, was painting Easter eggs, primarily in red, but in recent years also in yellow and blue—the colours of the Ukrainian flag.

3.3. "Borscht runs through our veins"

Since ancient times, vegetable dishes have held a significant place in vernacular cuisine in Ukraine. According to Ethohrafiya Ukrainy (Makarchuk, 2004), the most popular was borscht (in Ukrainian spelled borshch), which was consumed almost daily as a main lunch dish, as evidenced by numerous examples of oral folk wisdom (Makarchuk, 2004, p. 272):

- "Borshch ta kapusta—v khati ne pusto" ("Borscht and cabbage—the house is not empty");
- "Borshch ta kasha—maty nasha" ("Borscht and porridge—our mother"); and
- "Svii borshch nesolonyi lipshyi, yak chuzha yushka" ("Your borscht, even if unsalted, is better than a foreign soup").

Moreover, borscht was always served at weddings and memorial feasts, during harvest celebrations, at Christmas, and other important holidays. According to ethnographic sources (Makarchuk, 2004), there were three main types of borscht: beet (red), green, and cold. Beet borscht was, and remains, one of the most common liquid vegetable dishes. Its main food components are beets and cabbage. At the same time, housewives used various other plant-based products to prepare this daily dish, such as beans, carrots, parsley (or parsnip), garlic, and from the late 18th century, potatoes as well. Traditionally, for red borscht, beet kvass was prepared in advance, poured into a pot, diluted with water to taste, and cooked in the oven. Then finely chopped beets, potatoes, cabbage, carrots, and other components were added to the boiling broth. On weekdays, this dish was usually cooked without meat, with fat added only to taste, while on Sundays and holidays, it was made with meat broth. Beet borscht was seasoned with fried onions in oil or fat, or with crushed old fat, onions, and garlic. It was consumed hot, seasoned with red pepper, and garnished with sour cream. During Lent, Ukrainians also prepared suitable borscht with fish or mushrooms (Makarchuk, 2004). However, not only Ukrainians but also Russians consider borscht their own.

Recently, Ukrainian cultural activists have moved the traditional soup from intimate vernacular settings into the political spotlight, and as Mariana Lesiv mentioned (2021), borscht is no longer just borscht for many in Eastern Europe. It has become the subject of a dispute over whether it is an excellent example of Russian or Ukrainian cuisine (Lesiv, 2021). According to the Ukrainian renowned chef and cultural activist Klopotenko, borscht is not only a symbol of Ukrainian identity but simultaneously serves as a unifying tool for people within Ukraine (Lesiv, 2021). In 2020 the Ukrainian borscht was recognized by UNESCO and added to the safeguarding list (UNESCO, n.d.-d). This was, however, criticized as a nationalist and politically oriented action, because according to the UNESCO Convention, such shared traditions are usually recognized as ICH of multiple countries, and explicit appropriation by a single nation is considered unacceptable. Although disputes over the ownership of borscht may seem petty from an outside perspective, these seemingly trivial squabbles often reflect serious political and social contexts—borscht is just the tip of the iceberg in the complex Russian–Ukrainian relations.

However, other ethnic cookbooks, including Jewish and Polish, present borscht as a traditional dish of their respective cuisines (Lesiv, 2021). The dish is well known in other Eastern European countries such as Lithuania, Belarus, and Moldova. It is not surprising that neighbouring nations share common traditions regarding popular dishes, with their preparation depending on regional variations and the ingredients available. Disputes about the origin of borscht, such as where it was first cooked, are unimportant. Our focus should be on the intersection of the vernacular culture and identity, analysed through the framework of borscht. This movement can be studied as a creative dimension of protest, resistance, and activism. Through a traditional dish, Ukrainian cultural activists attempt to voice a response to Russia (Lesiv, 2021). The movement transformed the dish from a traditional habitual meal into what folklorist and ethnochoreologist Andriy Nahachewsky (2003) would refer to as an objectified cultural symbol serving as a commercial logo of "Ukrainianness" (Lesiv 2021).

In our preliminary study, respondents more frequently mentioned festive foods like kutia (for Christmas and Epiphany), paska, and a more common dish varenyky, which was considered typical Ukrainian. They most often prepared varenyky, if they wanted to honour a guest with a Ukrainian delicacy. Borscht was seen as an everyday, routine dish, only considered special when respondents prepared it for special occasions as "a Sunday borshch", or for Czechs, among whom it is widely favoured—one respondent from Transcarpatia described how she often cooked borscht on request for her Czech husband's relatives and "it was always eaten down to the last drop" (interview conducted in November 2023, interviewer N. Lambotová). However, respondents frequently noted that dishes in the Czech Republic don't taste the same as they do at home, mainly because the ingredients here are generally less flavourful.

4. Conclusion

The analysis of vyshyvanka, pysanka, and borscht underscores the connection between folk culture and national identity, illustrating how everyday objects can transcend their immediate functions to embody entirely new meanings. As explored in this paper, these cultural artifacts have evolved from traditional elements of vernacular culture into potent symbols of national identity and resilience.

The vyshyvanka, a richly embroidered shirt, exemplifies the interplay between cultural tradition and national branding. Initially serving various ceremonial and protective functions, it has become a powerful symbol of Ukrainian identity. From its role as a bride's gift and a marker of social status to its emergence as a symbol of national pride and heroism, the vyshyvanka's journey reflects its adaptation to contemporary contexts.

Similarly, the pysanka, a Ukrainian decorated Easter egg, demonstrates the evolution of traditional art forms and a symbolic gift into symbols of cultural identity. Recently, it has also become one of many platforms for visual art through which individuals express their national identity.

Borscht, a staple of the Eastern European diet, appeared to be not only an everyday dish but also an agent on a cultural battleground. The recognition of Ukrainian borscht by UNESCO and the cultural campaigns surrounding it reflect its status as an emblem of national pride and a tool for cultural diplomacy. However, our preliminary research has not yet confirmed the significance of borscht as a symbol of national identity—it was understood more as an ordinary everyday matter.

Vyshyvanka, pysanka, and borscht have each, in their way, contributed to the reinforcement of Ukrainian national identity. These examples collectively reveal that folk cultural artifacts are not merely objects of ICH but are imbued with meanings that evolve in response to socio-political dynamics.

References

Alex K. (2010). *Map of Ukrainian dialects and subdialects* (2005). https://en.wikipedia.org/wiki/Ukrainian_dialects

Bobrus', O. (2022, Apr 13). "Viryu v ZSU". U Vinnytsi zaproshuiut' stvoryty pysanky dlia nashykh viiskovykh ["I believe in the Armed Forces." In Vinnytsia, they invite you to create Easter eggs for our military]. *20khvilin.* https://vn.20minut.ua/Podii/viryu-v-zsu-u-vinnitsi-zaproshuyut-stvoriti-pisanki-dlya-nashih-viysko-11558030.html

Čermák, Z. & Lupták, M. (2015). Socioekonomický kontext česko-ukrajinské migrace [Socioeconomic context of Czech-Ukrainian migration]. In Drbohlav, D. (ed.). *Ukrajinská pracovní migrace v Česku. Migrace – remitence – (rozvoj)* (pp. 53–66). Karolinum.

Denisyuk, Z. Z. (2022). Vyshyvanka as an Object of Ukrainian-Centric Narrative and National-Cultural Identity in the Information Space. *Art History Notes: Collection of Scientific Papers, 41*, 21–28. https://doi.org/10.32461/2226-2180.41.2022.262936

Eriksen, T. (2012). *Etnicita a nacionalismus* [Ethnicity and Nationalism]. SLON.

European Heritage Awards. (n.d.). *World Vyshyvanka Day*. https://www.europeanheritageawards.eu/winners/world-vyshyvanka-day/

Gellner, E. (1983). *Nations and Nationalism*. Cornell University Press.

Glebe, H. J. (1975): *Now, that's an egg! The story of the Vegreville Pysanka*. Vegreville and District Chamber of Commerce. https://diasporiana.org.ua/wp-content/uploads/books/27865/file.pdf

Greet, W. (2024). "Spiritual Armour": Crafting Ukrainian Identity through Vyshyvanka. *Czech Journal of International Relations, 59*(1), 177–210. https://doi.org/10.32422/cjir.776

Jiang, Z. (2023). How Identities Become Crucial in Contemporary Conflicts and Interactions: Intangible Heritage in the Russo-Ukrainian War. In *Proceedings of the AHM Conference 2023: 'Diasporic Heritage and Identity'* (pp. 109–118). Amsterdam University Press. https://www.aup-online.com/content/papers/10.5117/978904856222/AHM.2023.012

Kappeler, A. (2003). Mazepintzy, Malorossy, Khokhly: Ukrainians in the Ethnic Hierarchy of the Russian Empire. In A. Kappeler, Z. E. Kohut, F. E. Sysyn, & M. von Hagen (Eds.), *Culture, Nation, and Identity: The Ukrainian-Russian Encounter (1600–1945)* (pp. 51–80). Canadian Institute of Ukrainian Studies Press.

Korostelina, K. V. (2013). Mapping national identity narratives in Ukraine, *Nationalities Papers, 41*(2), 293–315. http://dx.doi.org/10.1080/00905992.2012.747498

Kosmina, O. Y. (2005). Etnohrafichni rehiony Ukrainy. In *Entsyklopediya istorii Ukrainy* (Vol. 3). Naukova dumka. Retrieved September 23, 2019, from http://www.history.org.ua/?termin=Etnografichni_regiony_Ukrainy

LaVey, A. M. (2021). Reading Belarus: The Evolving Semiosis of Belarusian Textiles. *Journal of Belarusian Studies, 11*(2), 175–205. https://doi.org/10.30965/20526512-12350011

Lesiv, M. (2021). Not All Quiet on the Culinary Front: The Battle Over Borshch in Ukraine. *FOLKLORICA - Journal of the Slavic, East European, and Eurasian Folklore Association, 25*, 58–77. https://doi.org/10.17161/folklorica.v25i1.18334

Magocsi, P. R. (2010). *A history of Ukraine: The land and its peoples*. University of Toronto Press.

Makarchuk, S. A. (Ed.). (2004). *Etnohrafiya Ukrainy*. Svit.

Makarchuk, S. A. (Ed.). (2015). *Etnohrafyia ukraintsiv*. LNU I. Franka.

Ministerstvo vnitra ČR. (2022). *Čtvrtletní zpráva o migraci za IV. čtvrtletí 2021*. [Quarterly Migration Report for the 4th Quarter of 2021]. https://www.mvcr.cz/migrace/clanek/ctvrtletni-zprava-o-migraci-za-4-ctvrtleti-2021.aspx

Ministerstvo vnitra ČR. (2024). *Čtvrtletní zpráva o migraci za I. čtvrtletí 2024*. [Quarterly Migration Report for the 1st Quarter of 2024]. https://www.mvcr.cz/clanek/ctvrtletni-zprava-o-migraci-za-i-ctvrtleti-2024.aspx

Moszyński, K. (1929). *Kultura ludova Słowian: Vol. 1. Kultura materialna*. Polska akademja umiejętności.

Nahachewsky, A. (2003). Avramenko and the Paradigm of National Culture. *Journal of Ukrainian Studies, 28*(2), 31–50. https://cius-archives.ca/files/original/88e5954253e6acb72264b76626291dc3.pdf

Plokhy, S. (2007). Beyond nationality. *Ab Imperio, 4*, 25–46. https://doi.org/10.1353/imp.2007.0059

Polese, A. (2009). Ukraine 2004: Informal Networks Transformation of Social Capital and Coloured Revolutions. *Journal of Communist Studies and Transition Politics, 25*(2–3), 255–277. https://doi.org/10.1080/13523270902860618

Pysanka. (n.d.). *Pysanky*. https://www.pysanky.info

Pysanka Museum. (n.d). *Museum Collection*. https://pysanka.museum/collection/

Puleri, M. (2020). *Ukrainian, Russophone, (Other) Russian: Hybrid Identities and Narratives in Post-Soviet Culture and Politics*. Peter Lang Verlag. https://doi.org/10.3726/b17031

Rychlík, J., Zilinskyj, B., & Magocsi, P. R. (2015). *Dějiny Ukrajiny* [History of Ukraine]. NLN.

Seliverstova, O. (2017). "Consuming" national identity in Western Ukraine. *Nationalities Papers, 45*(1), 61–79. https://doi.org/10.1080/00905992.2016.1220363

Semenova, O. (2020). Radyanska identychnist u sotsio- ta etnokulturnomu prostori suchasnoi Ukrainy. [Soviet identity in the socio- and ethnocultural space of modern Ukraine]. *Ukrainian Studies, 77*(4), 159–169. http://dx.doi.org/10.30840/2413-7065.4(77).2020.217763

State statistics service of Ukraine. (2013). *Statystychnii zbirnyk Rehiony Ukrainy 2013 Chast I* [Statistical publication Regions of Ukraine 2013 Part I]. http://www.ukrstat.gov.ua/druk/publicat/kat_u/2013/sb/12_13/part1_2013.zip

Uherek, Z. (2016). Migration From Ukraine to the Czech Republic with Respect to the War Conflict in Eastern Ukraine. *Centre of Migration Research Working Papers, 93*(151), 3–16. https://open.icm.edu.pl/handle/123456789/11159

UNESCO. (n.d.-a). *Browse the Lists of Intangible Cultural Heritage and the Register of good safeguarding practices*. https://ich.unesco.org/en/lists

UNESCO. (n.d.-b). *What is Intangible Cultural Heritage?* https://ich.unesco.org/en/what-is-intangible-heritage-00003

UNESCO. (n.d.-c). *Files 2024 under process*. https://ich.unesco.org/en/files-2024-under-process-01303

UNESCO. (n.d.-d). *Culture of Ukrainian borscht cooking*. https://ich.unesco.org/en/USL/culture-of-ukrainian-borscht-cooking-01852

Vyshyvanka Association. (n.d.). Vyshyvanka/ https://www.vyshyvanka.ca/

Vyshyvanka day. (2022, May 19). *World Vyshyvanka Day 19/05/2022* [Video file]. YouTube. https://www.youtube.com/watch?v=v7IxVmtq4aA

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RETHINKING REGIONS IN SLOVAKIA—AN IDYLL OF TRADITIONAL CULTURE VERSUS INSTITUTIONAL FLUIDITY

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Abstract: Slovakia, as an important part of the former Habsburg Monarchy, was extremely administratively fragmented already in the Middle Ages due to developed mining, forestry, and related industry, but also due to geomorphological conditions forming significant natural barriers. Each political regime operating in this territory imposed its own idea of its territorial-administrative affiliation on the territory and its population, pursuing specific geographical interests (defense of the territory against further secession, e.g., in favor of Poland) and political goals (dimensioning of districts with the aim of minimizing the dominance of the Hungarian national minority). The frequency of these reforms was so high during the 20th century that many of the territorial-administrative reforms didn't even have time to properly establish and integrate into people's consciousness. Since 1996, Slovakia has not been able to decide how to reform public administration and its territorial-administrative structure. In fact, people, experts, and politicians rarely agree on its absolute need. Nevertheless, changes in spatial organization of regional units in Slovakia mostly come "from below" (local level) and partly "from above" (national level) influenced by dynamic socio-cultural processes, economic factors, and regional development strategies (caused by joining European Union [EU], particularly related to the implementation of European structural and investment funds). Therefore, new micro-regional units are created, so called "local action groups", appearing as regional tourism organizations or functional associations of municipalities. In order to conduct new regionalization of Slovakia, in its basic and final concept, a rational approach on the stratification of the territory through the division into geographical regions, historical regions, and cultural regions is necessary, observed as separate sets of regionalization. In view of the above, the submitted contribution will attempt to answer a set of selected questions: Is traditional folk culture a basic parameter of identity in a historically predominantly rural country? Don't regional and national institutions take over the role of bearers of territorial identity? Which institutional aspects are essential for the creation of regions? What is the position of the stakeholders in the complex system of territorial identities and rethinking regions? Doesn't every period transformation bring about a certain transposition of defining self-determination and identity, and don't stable regions become fluid regions?

Keywords: regions; Slovakia; cultural background; identity; territory

1. Introduction

For the topic of this study, it is important to consider three types of regionalization of the same territory – division into geographical regions, historical regions, and cultural regions. These are separate, but immediately connected sets.

Geographic regions are generally fixed and stable within the framework of physical geography; however, within social geography, these regions are dynamic and constantly evolving entities. Various forms of geographic regionalization exist, including urban regions, natural regions, tourism regions, etc. In Slovakia, the geographical regions are also subject

to a rigid administrative division, which remains largely unchanged. This contrasts with the more flexible and adaptive approach observed in the neighbouring Czech Republic as a former part of the common federal republic.

Historical regions (in the case of Slovakia, especially "stolice"/"župy", or "slúžnovské okresy" and notary districts) play important roles in the creation of cultural identity, especially in those territories whose administrative structure has been unchanged throughout the centuries. These regions have developed a certain level of autonomy within their respective contexts (Žudel, 1984). However, it's not appropriate to uncritically apply these historical divisions to the present, particularly in light of ongoing cultural changes and evolving perceptions of identity among contemporary societies.

Cultural regions most accurately reflect the contemporary social perception of regional belonging and identity. They may, or may not, be based on the conditions defined by geographical and historical regions. For example, the municipality of Kraľovany, which historically belonged to the Turiec region, now is considered part of the Orava region.

Several facts and key developments testify to the relevance and validity of cultural regions in the current and future public discourse. The Statistical Office of the Slovak Republic has requested the Institute of Ethnology and Social Anthropology of the Slovak Academy of Sciences to provide a comprehensive list of all Slovak municipalities, along with their accurate classification into individual cultural regions. However, the latter, at the initiation stage used a map of tourism regions instead of one of the numerous (but often incorrect maps) of cultural regions of Slovakia. Additionally, the Ministry of Culture of the Slovak Republic has expressed interest in the characteristics of specific cultural regions to facilitate a more systematic and, perhaps, more authentic support of regional culture. Similar demands came from the well-known state folklore ensemble Lúčnica, requiring a precise descriptions of Slovak cultural regions to effectively represent Slovakia during a tour folklore performance in China.

With the increasing degree of globalization experienced within the country, the institutional (at national level), but also individual community-based regional uniqueness, is becoming increasingly emphasized. It seems like a natural process, triggered by the need for self-identification. Current trends show that the dominance of administrative functions for the creation of the region was the most essential element in the conditions of Slovakia until roughly the middle of the 20th century. In this line, Slovakia is divided into eight administrative regions (kraje) established in 1949, with minor changes over the years, corresponding to great extent to the European Union's (EU) NUTS 3 level classification of local administrative units, further subdivided into districts (okresy). They are: Bratislava (Bratislavský kraj), Trnava (Trnavský kraj), Trenčín (Trenčiansky kraj), Nitra (Nitriansky kraj), Žilina (Žilinský kraj), Banská Bystrica (Banskobystrický kraj), Prešov (Prešovský kraj), and Košice (Košický kraj). They have their own self-governing bodies and play a significant role in local administration and governance.

Since then, the importance of institutional and cultural stability or institutional stabilization is starting to assert itself more and more in the same geographical area. The continuity of these phenomena can, and sooner or later will, result in the re-evaluation/rethinking of existing regions and the creation of a new regional (especially micro-regional) network. The interconnectedness of these three types of regions is a partial subject of this study, taking into account Slovak realities and contexts. So, how does Slovakia stand up to this challenge?

2. Regionalization—our daily bread

2.1. Original regionalization approaches and conventions

The issue of territorial identities has not yet been developed within the framework of Slovak cultural geography and therefore it's not surprising that Slovak geographical science has so far not dealt much with the topic of cultural regionalization of Slovakia. Slovak ethnologists are in a similar situation. It is a paradox, especially considering that every relevant research must be clearly spatially defined at the beginning.

Even the earliest, albeit modest publications of ethnographic studies (*Časopis Muzeálnej slovenskej spoločnosti*, *Sborník Muzeálnej slovenskej spoločnosti*), served as authentic sources of what is now considered rare source of information during the period of intense "magyarization" as well as the First Czechoslovak Republic. However, when identifying documented information and phenomena, these publications often relied on county divisions rather than the traditional designations of Slovak regions. The truth is that the concept of each of the currently known and resonant cultural regions developed differently (Figure 1, Table 1).

The development of Slovak regions cannot be completely generalized and based on the principle of historical regions, especially in the southern flat areas (territories without significant natural borders with overlaps of former Hungarian (monarchy) counties from the territory of present-day Hungary); an example of the Hont and Novohrad regions, whose original counties were divided by the "new" administrative border of Slovakia and Hungary.

Figure 1. Map of 31 (traditional) cultural regions of Slovakia.
Note. The gray lines indicate the cadastral boundaries of municipalities (as of 2023) and the black lines indicate the administrative boundaries of districts (according to the territorial-administrative reform of the territory of Slovakia from 1996). Created by: Martin Lukáč Kinčeš.

The First Czechoslovak Republic's division of Slovakia into grand counties and the subsequent socialist reforms of territorial division, as well as residential hierarchization, didn't help strengthen cultural regions at all, on the contrary. Paradoxically, the socialist period was an excellent opportunity to tackle the regionalization issue, given that a large amount of funds flowed into culture and research. Under the leadership of the well-known Slovak ethnologist Soňa Kovačevičová (1990), the heretofore unsurpassed (and perhaps

perpetually unsurpassed) encyclopaedic work *Etnografický atlas Slovenska* [Ethnographic Atlas of Slovakia] was realized. Also great emphasis was placed on regional research in order to gradually build regional expositions in the national outdoor museum (Museum of the Slovak Village) in the town of Martin.

Table 1. Current concept of cultural regionalization of Slovakia

Name of the region	Number of inhabitants (2021)	Number of villages (2023)	Number of towns/cities (2023)	Metropolis of the region	Territorially affected areas	Number of territorially relevant districts (also partially)
Abov	117,079	99	2	Košice	KE	2
Bratislava	475,503	0	1	Bratislava	BA	5
Dolná Nitra	207,936	42	3	Nitra	NR	2
Dolné Považie	351,539	101	8	Trnava	BA, NR, TT	7
Dolný Zemplín	234,681	198	7	Michalovce	KE	3
Gemer	130,595	173	5	Rožňava	BB, KE	3
Hont	84,730	121	4	Krupina	BB, NR	5
Horehronie	75,697	43	1	Brezno	BB, PO	3
Horná Nitra	131,693	48	4	Prievidza	TN	1
Horné Považie	282,167	98	6	Žilina	TN, ZA	4
Horný Zemplín	193,271	202	5	Humenné	KE, PO	6
Kopanice	42,756	23	3	Myjava	TN, TT	3
Košice	229,040	0	1	Košice	KE	4
Kysuce	121,341	33	4	Čadca	ZA	2
Liptov	137,104	81	3	Liptovský Mikuláš	PO, ZA	3
Malohont	50,188	30	3	Rimavská Sobota	BB	3
Malokarpatsko	142,188	44	3	Pezinok	BA, TT	4
Novohrad	113,632	113	5	Lučenec	BB	6
Orava	138,082	59	4	Dolný Kubín	ZA	3
Podpoľanie	43,746	25	2	Detva	BB	3
Podunajsko	77,600	47	3	(Komárno)	NR	2
Spiš	363,210	150	11	Poprad	KE, PO	7
Stredné Pohronie	210,011	79	7	Banská Bystrica	BB	5
Stredné Ponitrie	186,588	155	3	Topoľčany	NR, TN, TT	6
Stredné Považie	285,666	100	9	Trenčín	TN, TT	5
Šariš	378,614	341	8	Prešov	KE, PO	8
Tekov	157,723	108	5	Levice	BB, NR	5
Turiec	110,332	65	4	Martin	ZA	2
Záhorie	249,629	67	7	Malacky/Senica	BA, TT	3
Zamagurie	10,022	19	1	Spišská Stará Ves	PO	3
Žitný ostrov	260,283	88	6	Dunajská Streda	BA, NR, TT	3

Note. 1) The table is processed in accordance with Figure 1. 2) As a metropolis of the region is usually mentioned the demographically largest municipality in the region, with the exception of the Abov region, where the city of Košice is the center; the Hont region, where the second largest town, Krupina, is more often considered to be the center of the region than the largest town of the region, Banská Štiavnica; and the Podunajsko region, where the town of Komárno is the center (even as a part of the Žitný ostrov region, which is a geographical part of the Podunajsko region). 3) Listed acronyms of individual administrative regions (higher territorial units) in Slovakia: BA—Bratislava, BB—Banská Bystrica, KE—Košice, NR—Nitra, PO—Prešov, TN—Trenčín, TT—Trnava, and ZA—Žilina. Created by: Martin Lukáč Kinčeš.

The preparation and scientific conception of the *Ethnographic Atlas of Slovakia* prioritized the effectiveness of results achieved within the framework of the research of specific elements of folk culture, rather than focusing on regionalization. In contrast, the staff at the Slovak National Museum in Martin utilized a fundamental framework of regionalization for their research (Podolák, 1957). This framework was also employed to divide Slovakia into research areas for individual research teams. However, it is the fact that this division brought unprecedented micro-regional names in some cases (for example, Podjavorníky as part of the Horné Považie region—but within the scope of the research, it was attached to the Kysuce region, which extends on the other side of the Javorníky mountains; Podolák, 1957). It was obvious that there was an effort to establish a geographical anchorage, as the Kopanice region was referred to rather as the "region of the Myjava Hills" (*Oblasť Myjavskej pahokatiny*, where the town of Myjava is the center of the Kopanice region). In addition, Kopanice is not only a regional designation, but also one of the four known Slovak synonyms for scattered settlements—this confirms the importance of this labeling for ethnographic science as well.

2.2. Did socialism divide or unite Slovak regions and municipalities?

When discussing the socialist thinking about regions and settlements, we must first of all realize that socialism didn't recognize (for the sake of power centralization) local governments as an effective tool of public administration. Socialism within the higher administrative hierarchy chose a spatial-generalization philosophy: only three large regions were created (*Západoslovenský*—West Slovak, *Stredoslovenský*—Central Slovak, and *Východoslovenský*—East Slovak) and in their structure only the so-called "large districts". Self-governments at the local level de facto didn't even exist during the period of socialism (Volko & Kiš, 2007).

Socialism, mainly during the 1970s, brought standard by establishing cultural institutions of a regional nature in peripheral and often unchained areas from the once large counties (for example, Horná Nitra in the original Nitra County, Kysuce in the original Trenčín County, among others). Due to the fact that these specific regions didn't have their own administration or autonomous history until then, the creation of these cultural institutions significantly helped their full establishment. These were mainly galleries, museums, and educational centers, acting in a "softer" form through regional media (especially the press). These institutions usually integrated the name of the established region directly into their official name. This institutional principle in the creation of new regions is noticeable even today. Such a case is observed in delimitation of the Zamagurie region within the historical territory of Spiš, as well as in the case of the region of Žitný ostrov within the original region of Podunajsko.

During the post-war reconstruction of the country, the socialist regime did not pay much attention to the cultural boundaries of the regions. An example is the village of Liptovská Teplička: although this village has its regional affiliation directly in its name (Liptovská, i.e., belonging to the Liptov region), it administratively falls into the district whose center is the metropolis of the neighboring Spiš region—the town of Poprad. The reason? A local or regional legend claims that the village of Liptovská Teplička would have been a part of the Liptovský Mikuláš district, but the representatives of the Poprad district at the time of the

conception of new districts in the middle of the 20th century promised the representatives of Liptovská Teplička the construction of an asphalt road to the district town, and thereby acquired this village to their district. In reality: the end mountain village of Liptovská Teplička had only a train connection to the catchment area of Liptov via a narrow-gauge railway for weighing wood. Passenger transport to the town of Liptovský Hrádok also operated three times a week. The first bus connection along the asphalt road was established in 1960 and connected the village with the district town of Poprad in the Spiš region.

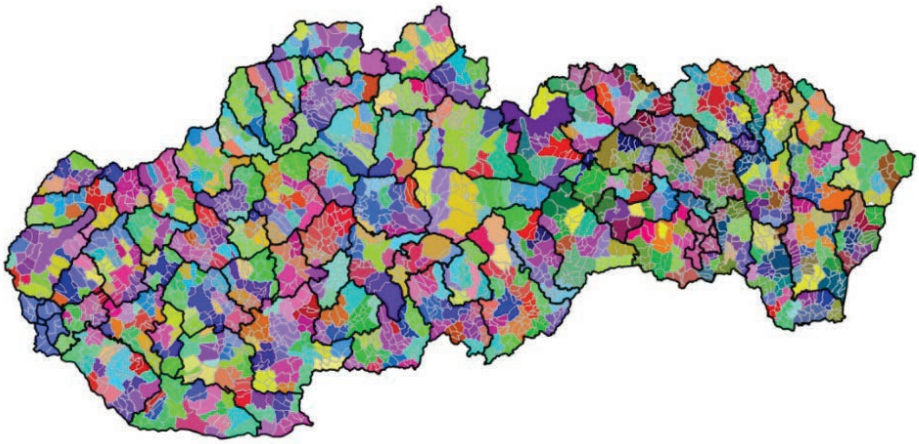

Figure 2. Map of administrative districts of socialist central municipalities ("strediskové obce") in Slovakia. *Note*. The gray lines indicate the cadastral boundaries of municipalities (as of 2023) and the black lines indicate the administrative boundaries of districts (according to the territorial-administrative reform of the territory of Slovakia from 1996). This overview material (existing also in a written form) was created by compiling data from the periodical *Urbanita*—specifically volume *51* from 1986 ("Organization of settlement of the Slovak Socialistic Republic," 1986) and Milan Majtán's publication *Názvy obcí Slovenskej republiky (Vývin v rokoch 1773–1997)* (Majtán, 1998) on the nomenclatural development of the naming of Slovak villages and towns and marginally also on the development of territorial-administrative relations in Slovakia. Their field confrontation led to their own authorial revision.

In the 1980s, the regime's attention turned to the local level. The government's construction agenda, based on regulated (and therefore obviously not objective) research into the residential network, elaborated the concept of hierarchizing municipalities and cities into three residential categories ("Organization of settlement of the Slovak Socialistic Republic," 1986). Thanks to this, the following were created: central municipalities, so-called "strediskové obce" (some of them were also the seats of districts uniting several central municipalities), subordinate municipalities, so-called "spádované obce", and defunct municipalities, so-called "zánikové obce". This concept would be very similar to notary offices from the period of the Habsburg Monarchy and the First Czechoslovak Republic, if it didn't limit the municipalities in terms of their infrastructural and building development—the effects of these limits are still being borne by a large part of the municipalities, and numerous defunct municipalities were unable to continue their previous organic development, and their (especially demographic) extinction is a matter of time and the near future (Figure 2).

The result of this fatal and uncompromising philosophy was the widening of differences between individual settlements—excessive degradation (in the case of defunct municipalities) or relocation of rural municipalities (in the case of center municipalities). This led to the fragmentation of the former regions and the strengthening of cities as regional centers, which, in the regime's perception, played an important role in the industrialization and urbanization of the country and, above all, in the concentration and consistent political control of the population masses.

2.3. The development of Slovak cultural regionalization after the Velvet Revolution

During socialism, the cultivation of awareness of regional affiliation and the general discourse on territorial (i.e., local and regional) identities were limited to a narrow group of regional cultural institutions, which, together with national institutions in Martin, took on the role of carrying the torch of identity awareness. This was otherwise only consolidated organically, within families or the community environment of municipalities. Inter-residential rivalries arose sporadically (as well as, for example, within the Czech Republic, the rivalry between the cities of Prague and Brno) and inter-regional stereotypes, which can also be seen, for example, in numerous American films and series (New York vs. New Jersey, Texas vs. Oklahoma, etc.).

Socio-political relaxation in the form of a new democratic regime also brought new horizons to the field of science and research. After rarer regionalization works from the 1950s to 1980s (Podolák, 1957; Pranda, 1966; Švecová, 1988), there was an evaluation of the issue of regions and also its renaissance within Slovakia. In the post-revolutionary period, several useful regionalization concepts were published by Slovak authors, which are also applicable to current considerations about the dimensioning of the cultural regions of Slovakia (Beňušková et al., 1998, 2005; Benža, 2011; Čukan, 2011).

The territorial organization of public administration was also reformed (the reform took effect in 1996 and is still valid today). Full-fledged self-governments emerged at both local (municipalities) and regional (regions) levels. The districts remained only an "extended hand" of the Ministry of the Interior of the Slovak Republic and, so far, they are not separate self-governing units, they are only territorial units for the transfer of state administration competences. Cultural regionalization was not taken into account at all. From a general point of view, we can state that administrative boundaries relatively correspond to the boundaries of cultural regions only in the case of four Slovak regions (Horná Nitra, Kysuce, Orava, and Turiec). The remaining units are new pseudo-structures that were conceived without a deeper meaning, only partially based on the structure of districts of central municipalities from the socialist period.

In the final, the number of regions increased from three to eight and the number of districts increased from 38 (including two city districts for Bratislava and Košice) to 79 (including five city districts of Bratislava with its 17 urban districts and four city districts of Košice with its 22 urban districts; Law on Territorial and Administrative Organization of the Slovak Republic, 1996). Up to this day, these still "newly created" districts are mockingly referred to as "Mečiar" districts (according to the then Prime Minister Vladimír Mečiar, who thus tried to support the regional political interests of his supporters, as well as members of his political party Hnutie za demokratické Slovensko [HZDS]).

Several district offices created in 1996 do not even currently have the capacity to fully cover the administration of the district (an example is the Púchov District, whose district office declares directly on its official website that several selected competences are carried out by the district office in Považská Bystrica—district Púchov was a territorial part of the former "big district" Považská Bystrica in the period before 1996). An example of this "Mečiar" political approach is the district of Poltár, while the size of the town of Poltár barely resembles a central municipality and certainly not a district town capable of providing services and infrastructure to the surrounding settlements (Poltár is also the birthplace of Ivan Gašparovič, the later president of the republic, who—at the time of designing the territorial and administrative reform—was an important member of the ruling political party HZDS). This "homegrown phenomenon" clearly points to a persistent populist problem when, despite the necessity of municipal reform, political parties do not proceed with it as needed (optimization of Slovakia's territorial fragmentation), but will try to preserve their regional structures within individual municipalities.

The unpreparedness of the young state (and the related benevolence and even disorientation) was used by local governments: already during the first few years after the Velvet Revolution (1989), there was a significant increase in the number of local governments or separate municipalities. In the 1970s and 1980s, the socialist regime ordered not only the annexation of surrounding rural villages to growing towns and cities (to strengthen their position—for example Košice, Liptovský Mikuláš, Nitra, Považská Bystrica, or Žilina), but also the merging of individual rural villages into larger territorial units. Some of these residential mergers were applied in people's consciousness (since they were often a reaction to a long-standing connection without its transformation into an official form), others were not. There was no methodology, and in democratic enthusiasm senseless and long-term unsustainable self-governments were thus created (either demographically small—up to 100 inhabitants, or territorially and structurally integrated units of originally unified cities—e.g., the separation of the town of Vrútky as a former part of the town of Martin, which is with this town still structurally fused).

There are just a few positive examples of the division of united municipalities under socialism, but they do exist. For example the village of Malé Dvorníky in the district of Dunajská Streda (has approximately 1,200 inhabitants), which during socialism, together with the neighbouring village of Veľké Dvorníky, became part of the merged village of Dvorníky na Ostrove for 30 years. In 1990, it became independent again, and in 2013 it won the *Village of the Year* competition (*Súťaž dedina roka*), because it built all the basics (municipal office and cultural center with a large area) that it lost during the merger.

These changes are often more a manifestation of rooted local and regional identity and over-the-top local patriotism than a responsible effort to self-administer public affairs. However, the law is not able to react to this social development in time (a situation known as "vacuum iuris" arises)—this was also the case in this example: the excessive fragmentation of local governments was stopped only in 2001 by an amendment to the Act on Municipal Establishment (Zákon Slovenskej národnej rady zo 6. septembra 1990 o obecnom zriadení, 1990), which enabled the creation of a new local government only if this new municipality will have at least 3,000 inhabitants at the time of its establishment (Ištok & Tej, 2004). However, the amendment of this focal point law came relatively late, and so to this day

there is a situation with too many municipalities, a high proportion of which are demographically very small settlements.

3. Current cultural and microregional regionalization of Slovakia

Despite the fact that even the stable and at first glance (giving the wrong impression) immutable cultural regions of Slovakia know their internal division (for example, according to the river axis, it is the "lower" and "upper" part of the region) or, in a more generalized view, in some regions there are their broader and narrower concepts—the most famous case is the Horehronie region, but also Podpoľanie region (Beňušková & Kotradyová, 2023; Lukáč Kinčeš, 2024), for example—even at first sight stable regions are re-evaluated with the coming time and new impulses. Such an impulse—in the 21st century the most significant for Slovakia so far—was the entry of Slovakia into the EU. At the same time, this meant and means the inclusion of this country among the countries receiving financial resources from European funds. The European Commission (and specifically the organizational component of its administration—General Directorate for Agriculture and Rural Development) understood very well that perhaps the most effective tool for identifying undersized spheres, suitable for the implementation of the necessary financial resources, are local stakeholders. For this reason, within the framework of the structures of the European funds, the European Commission created a separate LEADER/CLLD (Community Led Local Development) approach, which "in translation" means the agenda of local action groups as public-private partnerships or communities (Figure 3).

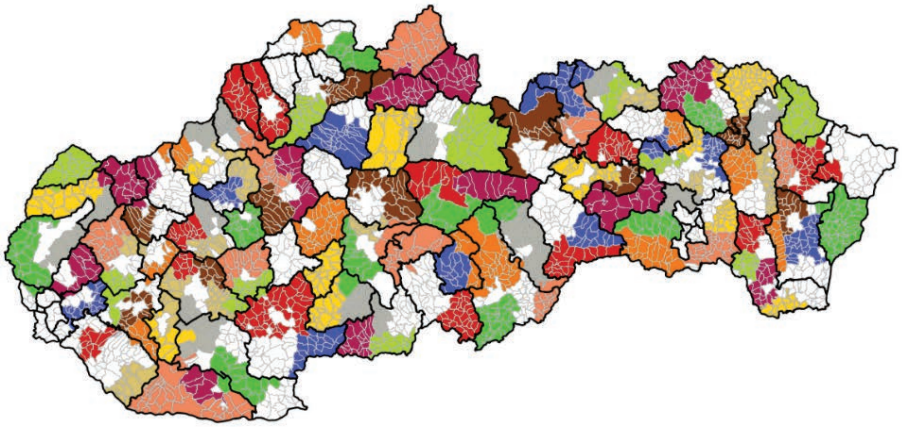

Figure 3. Map of the territorial coverage of Slovakia by the network of local action groups (program period 2014–2020 for EU funds).
Note. The gray lines indicate the cadastral boundaries of municipalities (as of 2023) and the black lines indicate the administrative boundaries of districts (according to the territorial-administrative reform of the territory of Slovakia from 1996). As is evident from this cartographic overview, a substantial part of Slovakia lacks full coverage by a network of local action groups and thus potential inclusion in new functional microregions. Created by: Martin Lukáč Kinčeš—from the database of the Ministry of Agriculture and Rural Development of the Slovak Republic.

Unfortunately, within Slovakia, the state apparatus did not sufficiently understand the benefits of the LEADER/CLLD approach, as a result of which the potential of local action groups is only used to a small extent (and compared to the neighbouring Czech Republic, Slovakia is unable to draw sufficient designated financial resources). However, we plan to take a closer look at this issue in another study. Anyway, even local action groups (similar to micro-regional associations of municipalities) form new regional entities with their member bases and territorial scope. An example can be the largest (in terms of the number of member municipalities) local action group in Slovakia—Orava, which created new, previously unknown microregions (Oravské podhradie) in the interest of creating common development strategies of groups of municipalities on its territory.

An example of an original approach to the delimitation of regions (literally) is the effort of the local action group Stredné Ponitrie, which marks the entrances to its territory, as well as individual member municipalities, with entrance boards (Figure 4). The new program period for EU funds (2021–2027) brought the format of integrated territorial investments (for rural municipalities) and areas of sustainable urban development (for the largest cities/towns and their agglomerations) to the territory of Slovakia, in addition to the usual local action groups. This format also contributed to the territorial transformation of existing structures. In addition to the Department of Territorial Self-Government at the Ministry of the Interior of the Slovak Republic, the Department of Methodology and Coordination of Integrated Territorial Strategies was created at the Ministry of Investments, Regional Development, and Informatization of the Slovak Republic. However, these organizational units strictly adhere to their administrative agenda, without closer analytical input or creation of territorial strategy and reshaping of Slovak regions.

Figure 4. Consolidation of the identity of the Stredné Ponitrie (micro)region under the management of the local action group.
Note. As part of its project, the local action group Stredné Ponitrie also ensured a very explicit and yet effective consolidation of identity in the form of a proper definition of its territory. Photo source: the local action group Stredné Ponitrie.

Even the current situation with the existence of municipal or construction offices common to several municipalities (not to mention common chief controllers, territorial

plans, or programs of economic development and social development) indicates that the merging of municipalities into common administrative units (a process called "municipalization") is inevitable and is already taking place organically. However, many municipalities refuse to give up their—albeit relative—independence. Their attitude could be expressed in the words: we would rather be poor, but independent (sometimes it is a generational relic of former nobility—"zemianstvo"). Inclinations towards other municipalities are nevertheless often induced due to job opportunities, marriage partnerships of citizens and families, as well as the structure of the parish. On this occasion, it is necessary to appreciate the participatively solved tool *Hidden treasure in local government* (Černěnko et al., 2017), created by the Institute of Financial Policy at the Ministry of Finance of the Slovak Republic, which generates for each local government in the territory of Slovakia the recommended volume of local government consolidation (although it must be recognized that in some cases it is dealt with quite fatally and even excessively).

For Slovakia, the Czech Republic, which is historically connected, can serve as a grateful model for preventing the rigidity of territorial division, which, since its last municipal reform, managed not only to establish a municipalization platform called "municipality with extended scope", but at the same time managed to reevaluate some divisions of districts and carried out the transfer of several municipalities from the original district to a neighbouring district.

4. Conclusion

For a long time, Slovak geography preferred a rather mathematical view and an approach to regionalization (for example, through data from daily attendance at work or schools—from the latest outputs: Halás & Klapka, 2024). This abstract, little analytical, and slightly generalizing approach is on the decline, without questioning its importance for other areas of geographical research (except for central regionalization).

Selected publicly published articles with debatable professional relevance (Kolárik, 2023) even consider an even deeper fragmentation of Slovakia's territory than the one that took place in the 1990s, the effects of which still primarily affect several urban settlements and peripheral rural areas. The majority of the interested professional (and even general) public considers the current territorial-administrative division of Slovakia (originally from 1996) to be limiting, illogical, and not reflective of the cultural characteristics of the territory. The obvious territorial deformations of Nové Zámky, Rimavská Sobota, and Trebišov districts are caused by an explicit attempt at gerrymandering with a national subtext (achieving a Slovak majority in areas inhabited by ethnic Hungarians).

The interested populations of the regions, in turn, criticize the territorial delimitation of the Trnava Region, regardless of the cultural diversity of the territories covered (from the border with the Czech Republic to the Danube River) or the excessive extent of the Košice and Prešov Regions (from the Tatras or the Slovak Ore Mountains to the border with Ukraine). In a constructive manner, even at the level of the central state administration (Ministry of the Interior of the Slovak Republic), proposals for a new administrative reform, based on the basis of organic cultural regions, are emerging.

An example is the proposal to establish a new region with its seat in the town of Martin, which falls under the traditional cultural regions: Horná Nitra, Liptov, Orava, and Turiec

(Volko & Kiš, 2007), while the ministry incorrectly proposes to name this region as "Liptovsko-oravsko-turčiansky kraj" in its material (which would be in opposition to the remaining regions, named after their seat cities/towns and omitting one of the regions potentially forming this region—Horná Nitra). Anyway, the trend is reversing and Slovak geographers, when researching regional disparities (Ďurček et al., 2024), recommend reconsidering the administrative division of Slovakia in favor of cultural regionalization. In their opinion, the current administrative districts are too small units for the full performance of the entrusted competences and ensuring the sustainable development of the regions.

Even now, there is the creation of new micro-regions (cultural, development, and self-governing) or the re-evaluation of more established—and perhaps spatially larger—regions. When designing the new administrative reform of Slovakia, it will be necessary to approach a new division based on the principle of subsidiarity, which should also include elements of cultural regionalization as the most natural form of human self-determination in space.

The effort should be for cultural regionalization to be the result of the subjective, but logical development of the awareness and perception of the population. In the past, the awareness of the population was overshadowed by selfish intentions in the interest of increasing the comfort of life.

Innovativeness in this regard can lie in the creation of a hybrid system on the border between administrative division and cultural regionalization of Slovakia. Given that cultural identity is often the product of two or three generations (as confirmed by the institutionalized examples of Slovak regions established in the second half of the 20th century), it is possible to give cultural regionalization a hidden administrative role. Newly created administrative districts should be designed based on geographical logic (proximity of settlements, absence of geomorphological or other natural barriers). The higher hierarchies of the administration (districts and regions) are to be made up of them, and on the basis of this structure, future generations can form their cultural identity (of course, only if the self-governing units also pay attention to the identity awareness of the population).

As a result, we can conclude that every period transformation really brings about a certain transposition of defining self-determination and identity. To a certain extent, the fluidity of the regions occurs, which is, however, directly linked to the territorially relevant tradition and previous development.

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References

Beňušková, Z., Bitušíková, A., Garaj, B., Chlebana, M., Koma, J., Kostovská, I., Liptayová, Z., Maráky, P., Mlynka, L., Nociarová, D., Paličková, J., Sedláková, V., & Zuskinová, I. (2005). *Tradičná kultúra regiónov Slovenska*. VEDA. https://kmkt.sk/wp-content/uploads/2020/06/49743-Benuskova.pdf

Beňušková, Z. et al. (1998). *Tradičná kultúra regiónov Slovenska*. VEDA.

Beňušková, Z., & Kotradyová, V. (2023). *Podpoľanie* (*Regionálna materiálna kultúra: východiská pre súčasnú prax 1*). Vydavateľstvo SPEKTRUM STU, Ústav etnológie a sociálnej antropológie Slovenskej akadémie vied, v. v. i. https://doi.org/10.31577/2023.9788022753678

Benža, M. (2011). Regionalizácia Slovenska. *Kontexty kultúry a turizmu*, *2*, 13–19. https://kmkt.sk/wp-content/uploads/2020/06/kontexty-022011.pdf

Černěnko, T., Harvan, P., & Kubala, J. (2017). *Skrytý poklad v samospráve* [Hidden treasure in local government]. https://www.mfsr.sk/files/archiv/priloha-stranky/19968/70/Skryty-poklad-samosprave.pdf

Čukan, J. (2011). Kultúrne regióny Slovenska v kontexte školskej výučby. *Kontexty kultúry a turizmu*, *2*, 19–20. https://kmkt.sk/wp-content/uploads/2020/06/kontexty-022011.pdf

Ďurček, P., Fitalová, A., & Vizváry, L. (2024). Endogenous determinants and regional policy: Challenges in reducing regional disparities in Slovakia. *Acta Geographica Universitatis Comenianae*, *68*(1), 27–48. http://www.actageographica.sk/stiahnutie/68_1_02_Durcek_et_al.pdf

Halás, M., & Klapka, P. (2024). Aktualizácia vymedzenia funkčných regiónov Slovenska: hierarchia, neurčitosť a využiteľnosť. *Geografický časopis*, *76*(2), 141–163. https://doi.org/10.31577/geogrcas.2024.76.2.08

Ištok, R., & Tej, J. (2004). Perspektívy reformy územnej samosprávy na miestnej úrovni v kontexte sídelnej štruktúry Slovenska. *Folia geographica*, *7*, 62–74.

Kolárik, A. (2023). Ktoré zo zaniknutých okresov obnoviť? In A. Marcinčin & J. Csabay (Eds.), *Ročenka regionálneho rozvoja 2023* (pp. 75–86). SPEKTRUM STU.

Kovačevičová, S. (Ed). (1990). *Etnografický atlas Slovenska* [Ethnographic Atlas of Slovakia]. VEDA.

Law on Territorial and Administrative Organization of the Slovak Republic, No. 221 (1996).

Lukáč Kinčeš, M. (2024). Zuzana Beňušková, Veronika Kotradyová: Podpoľanie (Regionálna materiálna kultúra: východiská pre súčasnú prax 1) [Podpoľanie (Regional Material Culture: The Basis for Contemporary Practice 1)]. *Slovenský národopis/Slovak Ethnology*, *72*(2), 273–276. https://doi.org/10.31577/SN.2024.2.22

Majtán, M. (1998). *Názvy obcí Slovenskej republiky (Vývin v rokoch 1773–1997).* VEDA.

Národná sieť rozvoja vidieka SR – Zoznam schválených miestnych akčných skupín pre obdobie implementácie 2014–2020. [Data set]. https://www.nsrv.sk/?pl=91

Organization of settlement of the Slovak Socialistic Republic. (1986). *Urbanita*, *51*.

Podolák, J. (1957). Etnografické oblasti na území Slovenska ako podklad k monografiám o ľudovom staviteľstve. *Slovenský národopis/Slovak Ethnology*, *5*(5), 529–537.

Pranda, A. (1966). K otázke vzniku oblastí ľudovej kultúry na Slovensku. *Slovenský národopis*, *14*(4), 511–562. https://www.sav.sk/journals/uploads/10061539SN_4_1966%20reduced%20[56%20Pages].pdf

Švecová, S. (1988). Etnografické skupiny na Slovensku. *Národopisné informácie*, *2*, 7–102. https://ekniznice.cvtisr.sk/view/uuid:3e770f37-b8a9-46cc-b048-9ce8be71bbe1?page=uuid:ea0645cf-33c4-4694-8d0f-3c8c8841d3a8

Volko, V., & Kiš, M. (Eds.). (2007). *Stručný prehľad vývoja územného a správneho členenia Slovenska*. Ministerstvo vnútra Slovenskej republiky. https://www.minv.sk/?strucny-prehlad-vyvoja-uzemneho-a-spravneho-clenenia-slovenska

Zákon Slovenskej národnej rady zo 6. septembra 1990 o obecnom zriadení, Slov-Lex, No. 369 (1990).

Žudel, J. (1984). *Stolice na Slovensku*. Obzor.

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CULTURAL HERITAGE OF THE REPUBLIC OF SRPSKA—IDENTITY CODES OF THE PAST, PRESENT, AND FUTURE

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Abstract: The study examines the preservation of the cultural heritage of the Republic of Srpska and its significance for the cultural identity of the region and its community. Cultural heritage serves as a testimony to the past and plays a crucial role in shaping the present and future of society. The study outlines the historical development of the protection system, beginning with the socialist Yugoslav period, during which the first institutions were established and legal frameworks for the systematic protection of cultural heritage were created. The foundations laid during this period remain of key importance today.

Contemporary challenges in protecting the cultural heritage of the Republic of Srpska arise from the complexity of Bosnia and Herzegovina's administrative structure, which is divided into two entities (Republic of Srpska and Federation of Bosnia and Herzegovina) and the Brčko District. This division results in fragmented responsibilities and overlapping jurisdictions across various levels of government, complicating the coordination and implementation of heritage protection laws.

The academic community also plays a significant role through its contributions to research, documentation, and the protection of cultural heritage. Furthermore, the analysis provides an overview of development strategies for cultural heritage and spatial planning documentation, which are crucial for preserving heritage. The study comprehensively reviews the current preservation conditions and presents recommendations for improving the protection system. It emphasizes the need for better institutional coordination and more effective legal enforcement to ensure the proper protection and preservation of the cultural values of the Republic of Srpska, which form the foundation of its identity code for future generations.

Keywords: Republic of Srpska; cultural heritage; protection system; academic approach; planning and strategic perspective

1. Introduction

The concept of cultural heritage is analyzed from various scientific disciplines. This complex concept consists of the term "culture", which refers to both tangible and intangible aspects of cultural heritage, including ethical and social values created by humanity. "Heritage", on the other hand, refers to the entirety of cultural property preserved from the past (Marasović, 2001). In essence, cultural heritage includes both physical tangible artifacts and intangible elements that reflect the identity of a region, people, or society. It comprises property inherited from previous generations or those created in the present that hold specific value and should be preserved for future generations (Medar-Tanjga & Delić, 2019).

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Cultural heritage reflects a specific dependence on the natural environment and economic conditions in which it was created. It connects cultures from different periods, generating unique and recognizable cultural-historical values that serve as an identity card. Furthermore, cultural heritage has symbolic significance for the community it belongs to, contributing to the commonwealth of humanity (Medar-Tanjga & Živak, 2020). As a collection of resources inherited from the past and a reflection of continuously evolving values, cultural heritage gains a "second life" or new function, through which society assigns it special value—"precious", "rare", or "extinct" (Kirshenblatt-Gimblett, 1995).

Preserving cultural heritage is not solely the responsibility of state or local institutions but rather a continuous process in which the community actively participates. Through research, valorization, and protection, we inherit values that connect us to our roots and traditions, safeguarding not only our identity but also the identity of future generations. Heritage thus becomes a national treasure. Its strength as a bearer of a community's identity represents its past while influencing its present and future. Additionally, cultural heritage provides a foundation for understanding and respecting diversity among people worldwide.

Globally, the preservation of cultural heritage as a key segment of the identity of a region and its people represents a responsibility of planetary significance. The development of international law and relations from the mid-19th century led to the establishment of international organizations as an institutionalized form of cooperation in various areas of social life, including the protection of cultural heritage. In 1945, the United Nations Educational, Scientific and Cultural Organization (UNESCO) was established to safeguard the world's cultural heritage. According to its Constitution, UNESCO is responsible for ensuring the protection of global heritage and is authorized to recommend the adoption of international treaties necessary for this purpose (UNESCO, 1945). To date, five UNESCO conventions addressing cultural heritage protection have been adopted[1]. Although these conventions overlap to some extent and form a complex network of structures and provisions, each focuses on specific aspects of cultural heritage protection. In addition to the UNESCO conventions, the Council of Europe (COE) has adopted several documents and conventions focusing on cultural rights and the significance of cultural heritage[2]. The main goal of these conventions is to strengthen and promote policies that preserve and enhance cultural heritage. They emphasize its importance as a factor in the development of local communities, as cultural heritage shapes the identity of a place and should be considered when planning for sustainable management.

[1] Convention for the Protection of Cultural Property in the Event of Armed Conflict (UNESCO, 1954), Convention on the Means of Prohibiting and Preventing the Illicit Import, Export, and Transfer of Ownership of Cultural Property (UNESCO, 1970), Convention Concerning the Protection of the World Cultural and Natural Heritage in (UNESCO, 1972), Convention on the Protection of the Underwater Cultural Heritage (UNESCO, 2001), Convention for the Safeguarding of the Intangible Cultural Heritage (UNESCO, 2003) and Convention on the Protection and Promotion of the Diversity of Cultural Expressions (UNESCO, 2005).

[2] European Cultural Convention (COE, 1954), European Convention on the Protection of the Archaeological Heritage (COE, 1969), Convention for the Protection of the Architectural Heritage of Europe (COE, 1985a), Council of Europe Convention on Offences relating to Cultural Property (COE, 1985b), European Charter for Regional or Minority Languages (COE, 1991), Council of Europe Landscape Convention (COE, 2000), European Convention on the Protection of Audiovisual Heritage (COE, 2001) and Council of Europe Framework Convention on the Value of Cultural Heritage for Society (COE, 2005).

Conventions are key normative instruments due to their binding nature for the states that have ratified them. By ratifying these conventions, Bosnia and Herzegovina has committed to aligning its legislation with European Union standards and international conventions and to implementing new regulations and activities related to cultural heritage protection as part of its European integration process. However, these activities face specific challenges caused by the complex state structure of Bosnia and Herzegovina. The administrative division of Bosnia and Herzegovina into two entities—the Republic of Srpska and the Federation of Bosnia and Herzegovina—and the Brčko District has resulted in an asymmetric division of responsibilities between the entities and the District, significantly complicating the process of managing cultural heritage. Culture falls under the jurisdiction of the entities, and in the Federation of Bosnia and Herzegovina, this responsibility is further delegated to the cantons. For any action at the European and global levels, state-level consent is mandatory.

State complexity creates challenges in coordination between different levels of government in Bosnia and Herzegovina, leading to uneven approaches to protecting and promoting cultural heritage. While the Republic of Srpska has a more centralized approach to managing cultural heritage, the Federation of Bosnia and Herzegovina faces the complexity of divided responsibilities between cantons, which can lead to variations in policies protecting cultural heritage (Živak & Medar-Tanjga, 2021). These challenges require a systematic approach and cooperation among all relevant institutions to ensure the adequate preservation and management of the rich cultural heritage of the Republic of Srpska and Bosnia and Herzegovina for future generations. It is essential to establish effective coordination mechanisms and cooperation between the entities and other levels of government to overcome administrative barriers and ensure that cultural heritage remains vital and accessible to all.

2. Cultural Heritage Protection System in the Republic of Srpska

The hierarchical jurisdiction of Bosnia and Herzegovina's cultural heritage protection system is highly fragmented and inconsistent. Legally, the Ministry of Civil Affairs at the state level is responsible, while at the entity level, the ministries responsible for culture hold jurisdiction. In the Republic of Srpska, cultural heritage is managed by the Ministry of Education and Culture, specifically through the Department for the Protection of Cultural Heritage.

The Dayton Peace Agreement (Organization for Security and Co-operation in Europe [OSCE], 1995) retained all legislative provisions from the former Socialist Republic of Bosnia and Herzegovina until new laws were enacted[3]. The legal framework for cultural heritage protection is based on the Law on Cultural Property and the Law on Museum Activity, supplemented by various regulations, rules, and decisions. Due to Bosnia and Herzegovina's complex state structure, there is no unified state law for cultural heritage protection. Instead, the legal basis consists of acts from the entities and cantons, meaning each entity manages "culture" independently, without vertical or horizontal harmonization.

[3] During the time of former Yugoslavia, each republic, including Bosnia and Herzegovina, had its own legislation regarding the protection of cultural heritage. The Law on the Protection and Preservation of the Cultural, Historical, and Natural Heritage, adopted in 1985, was a significant piece of legislation in Bosnia and Herzegovina for safeguarding cultural heritage (Zakon o zaštiti i korištenju kulturno-historijskog i prirodnog naslijeđa, 1985, 1994). After Bosnia and Herzegovina gained independence in 1992, the 1985 law continued to be in effect in certain cantons of the Federation of Bosnia and Herzegovina without any amendments.

Annex 8 of the Dayton Peace Agreement established the Commission to Preserve National Monuments[4] as the umbrella institution responsible for protecting tangible cultural heritage in Bosnia and Herzegovina. Based in Sarajevo, the Commission essentially continued the work of the former Institute for the Protection of the Cultural-Historical and Natural Heritage of the Republic of Bosnia and Herzegovina. Additionally, two other monument protection institutes were established at the entity level. In the Republic of Srpska, the Institute for the Protection of Cultural-Historical and Natural Heritage was founded in 1992 and confirmed by the Dayton Agreement in 1995. The Law on Cultural Property adopted in 1995, provided a systematic and methodological framework for legally protecting monuments in the Republic of Srpska (Zakon o kulturnim dobrima, 1995, 2008). In 2022, the National Assembly of the Republic of Srpska adopted a new Law on Cultural Property, which includes definitions of intangible cultural heritage in line with international standards (Zakon o kulturnim dobrima, 2022). This new legal framework enhances and refines the normative structure for the protection and use of cultural property, fostering the development of protective measures and advancing professional practices, while ensuring the necessary conditions for protecting both tangible and intangible cultural heritage of general interest to the Republic of Srpska.

The Commission to Preserve National Monuments is responsible for declaring properties as national monuments and creating the List of National Monuments. The National Assembly of the Republic of Srpska declares properties of "exceptional significance", while the Government of the Republic of Srpska designates properties of "great significance". Local self-government units declare other cultural properties based on valuations and reports. These units also propose to the Republic Institute for the Protection of Cultural-Historical and Natural Heritage that cultural properties receive protection status, and it is recommended that they simultaneously submit a petition for inclusion in the List of the Commission to Preserve National Monuments of Bosnia and Herzegovina. When a property is declared a national monument, any spatial planning acts that contradict this designation are annulled.

Since there is currently no unified system for the protection of cultural heritage, it is impossible to provide a precise list of protected tangible cultural properties in the Republic of Srpska. The list, which includes over 700 cultural properties (Table 1), should consist of the following categories: properties declared by decisions of the National Assembly and the Government of the Republic of Srpska; properties from the Register of the Socialist Republic of Bosnia and Herzegovina up to 1992; the List of National Monuments of Bosnia and Herzegovina; the list from the Spatial Plan of the Republic of Srpska; lists from the spatial planning documentation of municipalities in the Republic of Srpska; and the list of properties under previous protection.

[4] The Commission, consisting of five members (three domestic and two foreign) with a five-year mandate, is appointed by the Presidency of Bosnia and Herzegovina. Members of the Commission are selected based on high-level professional qualifications, demonstrated through scientific work and involvement in the protection of cultural, historical, religious, and other heritage. Foreign members are proposed by the Director of UNESCO. The responsibility for implementing the Commission's decisions falls to the "entity governments and ministries responsible for spatial planning and culture, as well as institutions to the protection of cultural monuments" (Medar-Tanjga et al., 2022). For the Republic of Srpska, this includes the Ministry of Education and Culture and the Republic Institute for the Protection of Cultural-Historical and Natural Heritage.

Table 1. The number of immovable cultural properties of the Republic of Srpska (by categories) that belong to the National Lists of Monuments of Bosnia and Herzegovina and properties that have a valuation basis by the Law on Cultural Property of the Republic of Srpska

National List of Monuments (Commission to Preserve National Monuments)	Historical buildings and monuments	58	Total: 767 (some properties are recorded under multiple categories)
	Groups of buildings	82	
	Sites	80	
Other cultural properties established by different criteria	Cultural properties that have a valorization basis	289	
	Archaeological sites (only those that are on the National List of Monuments or in the register of the Socialist Republic of Bosnia and Herzegovina)	102	
	Cultural properties that are listed in the register of the Socialist Republic of Bosnia and Herzegovina	127	
	Cultural properties from the Temporary list of national monuments	246	

Note. Adapted from the Spatial Plan of the Republic of Srpska until 2025 (Vlada Republike Srpske, 2015).

The international protection of tangible cultural heritage in the Republic of Srpska is minimal and limited to two elements inscribed on the World Heritage list: Mehmed-paša Sokolović Bridge in Višegrad (UNESCO, 2007) and Stećci—Medieval Tombstones Graveyards inscribed as a shared cultural heritage of Bosnia and Herzegovina (20 localities), Croatia (2 localities), Montenegro (3 localities) and Serbia (3 localities) (UNESCO, 2016).

The protection of the intangible cultural heritage of the Republic of Srpska is managed through various institutions, including archives, museums, libraries, and film archives, which are established by the Republic of Srpska or local government units. These institutions operate according to specific laws and regulations relevant to their fields of activity, such as the Law on Museum Activity (Zakon o muzejskoj djelatnosti, 2008, 2012, 2017), the Law on Archival Activity (Zakon o arhivskoj djelatnosti, 1999, 2008), and the Law on Library and Information Services (Zakon o bibliotečko-informacionoj djelatnosti, 2016). In 2021, the National Assembly of the Republic of Srpska adopted a new Law on Museum Activity (Zakon o muzejskoj djelatnosti, 2021), to align existing legal solutions with international standards. This new law clearly defines the process of protection measures and the preservation of museum collections, as well as the procedure for digitization of museum collections, documentation, and elements of intangible cultural heritage. Similar to tangible cultural heritage, there is no comprehensive list of intangible cultural heritage in the Republic of Srpska. However, such a list would include items preserved by protection institutions and classified into registers of cultural properties.

For intangible cultural heritage, the umbrella institution under the Ministry of Civil Affairs of Bosnia and Herzegovina is the State Commission for Cooperation of Bosnia and Herzegovina with UNESCO[5] (Odluka o osnivanju Državne komisije za saradnju BiH sa Organizacijom

[5] The State Commission, appointed by the Council of Ministers for a four-year term, consists of 19 members, including the president and the general secretary. Members are proposed by state and entity ministries responsible for UNESCO-related matters, at the request of the Ministry of Civil Affairs of Bosnia and Herzegovina (Živak & Medar-Tanjga, 2021). The Commission includes representatives from educational, scientific, and cultural institutions, parliamentarians, non-governmental organizations, and the academic community. Its responsibilities encompass reviewing all aspects of international cooperation between Bosnia and Herzegovina and UNESCO in the fields of education, science, culture, and information. The Commission evaluates Bosnia and Herzegovina's participation in UNESCO programs and projects, exchanges information with UNESCO, and informs relevant institutions about UNESCO's goals and activities.

Ujedinjenih nacija za obrazovanje, nauku i kulturu—UNESCO, 2009, 2016). Established as an advisory body to the Council of Ministers of Bosnia and Herzegovina in 2009, the Commission facilitates communication between UNESCO and the institutions of the entities and the Brčko District. At the entity level, relevant ministries oversee the management of intangible cultural heritage. In the Republic of Srpska, this responsibility falls under the Ministry of Education and Culture, specifically through the Department for the Protection of Cultural Heritage. Further responsibilities are delegated to the Department for Intangible Cultural Heritage within the Museum of the Republic of Srpska (Medar-Tanjga et al., 2021).

The protection of intangible cultural heritage in the Republic of Srpska is regulated by the Law on Museum Activity. Amendments made to this law in 2012 specifically aimed to incorporate the concept of intangible cultural heritage into the legal framework. The updated Law on Museum Activity from 2021 not only defines the concept of intangible cultural heritage but also establishes the conditions for proposing and registering elements of intangible cultural heritage in the Central Register of Intangible Cultural Heritage, maintained by the Museum of the Republic of Srpska.

By defining the institutional and legal jurisdiction, the conditions for recording and protecting intangible cultural heritage have been established. This led to the creation of the Preliminary List of Intangible Cultural Heritage of Bosnia and Herzegovina. The current list of 48 elements practically consists of the lists of two entities: The Preliminary List of Intangible Cultural Heritage of the Republic of Srpska, with 35 elements (Table 2), and the Preliminary List of Intangible Cultural Heritage of the Federation of Bosnia and Herzegovina, with 15 elements. Two elements found on the lists of both entities were unified and registered under a common name on the list of Bosnia and Herzegovina (Medar-Tanjga & Dojčinović, 2022).

Regarding the nomination of elements to UNESCO, it was agreed at the level of Bosnia and Herzegovina that elements from the Preliminary List of Intangible Cultural Heritage of the Republic of Srpska and the Preliminary List of Intangible Cultural Heritage of the Federation of Bosnia and Herzegovina should be proposed alternately. The State Commission for Cooperation of Bosnia and Herzegovina with UNESCO makes decisions on the nomination of elements to the UNESCO Representative List of the Intangible Cultural Heritage of Humanity (Medar-Tanjga,, 2022). Once the Council of Ministers of Bosnia and Herzegovina approves the decision, it is submitted to UNESCO. As a result, the UNESCO Representative List of the Intangible Cultural Heritage of Humanity includes three elements from the Republic of Srpska: Zmijanje embroidery (UNESCO, 2014), Picking of iva grass on Ozren mountain (UNESCO, 2018) and Lipizzan horse breeding traditions from Republic of Srpska inscribed as a serial nomination of Austria, Bosnia and Herzegovina, Croatia, Hungary, Italy, Romania, Slovakia and Slovenia (UNESCO, 2022).

In the Republic of Srpska, the protection of cultural heritage responsibilities has been devolved to the local community level. Within cities and municipalities, various departments are involved, such as the Department of Social Affairs and the Department of Culture, Tourism, and Social Policy, among others. However, the names and responsibilities of these departments are not standardized across local government units. Consequently, the approach to cultural heritage protection can vary depending on the municipal-level department responsible for it.

Table 2. The Preliminary List of Intangible Cultural Heritage of the Republic of Srpska

1.	Zmijanje embroidery
2.	Picking of iva grass on Ozren mountain
3.	Lipizzan horse-breeding traditions
4.	Nevesinje Olympic Games, traditional games
5.	Mowing the grass in place Balkana (municipality Mrkonjić Grad)
6.	Osaćanski jezik, the language of traditional builders of the area Osat
7.	Slava, a celebration of family saint patron's day
8.	Masla, a celebration of village saint patron's day in the field
9.	Lile torch ignition, the custom of the Serbian people on the eve of St. Peter's Day
10.	Vidovdan Olympics in place Kulaši (municipality Prnjavor)
11.	Gusto kolo, a traditional folk dance on Kozara Mountain and Potkozarje region
12.	Gusle (string instrument), Singing to the accompaniment of Gusle, Oral tradition – epic poetry
13.	Banjalučki ćevap, grilled meat sticks in flatbread from Banja Luka
14.	Paljenje žežnice, traditional charcoal production in eastern Herzegovina
15.	Blacksmith's craft in Mrkonjić Grad
16.	Teslić embroidery
17.	Oj djevojko (ojkača), traditional song
18.	Serbian Cyrillic alphabet
19.	Sarajevsko-romanijski priglavak, short woolen socks from Sarajevo-Romanija region
20.	Lace from Banja Luka
21.	Derventa fair
22.	Sir iz mijeha, the process of making cheese from goat or sheep skin
23.	Culture of Rakija Distillation (Traditional Method of Rakija Production)
24.	Stone Masonry Craft in Ozren (Ozren Stone Masons)
25.	Traditional Dajak boat of the Vrbas River
26.	Ćetenija, a traditional sweet from Tarević
27.	Traditional Una River boat
28.	Podgrmeč embroidery
29.	Banja Luka traditional folk dance
30.	Kalenderovac fatty cheese
31.	Saborovanje, a traditional gathering
32.	Koledarice, Christmas carolers
33.	Basket weaving in Posavina
34.	Violin makers from Doboj
35.	Legends about Stećci—Medieval Tombstones Graveyards

Note. The list is from the Department for Intangible Cultural Heritage of the Museum of Republic of Srpska.

In the professional and legal system of cultural heritage protection, with the interruption of the continuity of protection by the dissolution of the common state of Yugoslavia and the formation of independent states, legal protection and the status of cultural property become a complex issue where the profession and legislation sometimes collide. Disorganized records and the absence of a unified database of cultural property is a problem that threatens their protection. To achieve full integration of cultural heritage into a comprehensive planning system, an organized and regularly updated database is necessary. This integration must be implemented in the planning process with coordination between government institutions. The priority activity is the development of control mechanisms and ensuring the participation of all parties in the process of planning and protection of cultural heritage.

3. Academic Approach to Cultural Heritage Protection

In the process of studying, protecting, and promoting the cultural heritage of the Republic of Srpska within institutional competencies, the participation of the academic community has been limited[6], with its activities mainly carried out through projects. For example, between 2011 and 2015[7], the Ministry of Science and Technology of the Republic of Srpska[8] supported a project titled "Study and Protection of Intangible Cultural Heritage of the Republic of Srpska", led by the Faculty of Philology at the University of Banja Luka. This project was designed to foster connections between fundamental, applied, and developmental research in the humanities, particularly in areas related to intangible cultural heritage. It aimed to identify, research, document, promote, protect, revitalize, and preserve various forms of intangible cultural heritage in the Republic of Srpska. Significant results of this project include the education of the research team; field, and archival research; the creation of the Digital Archive of the Faculty of Philology; international scientific cooperation; the presentation of results; and the establishment of the Center for Folklore and Cultural Studies (CEFISK). The results of the project were presented at over 30 scientific conferences and published in more than 40 academic journals and proceedings. Through the project, the Baštinar Library of the Faculty of Philosophy was created, with three books published: "Folk Toasts. Materials and Comments" (Milekić & JeLić, 2017), "Intangible Cultural Heritage. Theoretical, Methodological, and Administrative Aspects" (Medar Tanjga et al, 2017), and "The Ethnographic Collection of the Archive of the SASA: Overview of Manuscript Materials" (Nikolić, 2019).

As a result of successful collaboration and in response to the lack of organizations, institutions, or study programs that systematically study cultural heritage, the scientists involved in the project established the Center for Folklore and Cultural Studies (CEFISK). The founding of CEFISK created the conditions for participation in competitions for co-financing projects of cultural heritage protection and promotion by the Ministry of Education and Culture of the Republic of Srpska. As a result, three scientific research projects were realized in the following period: "Study, Preservation, and Promotion of Folklore Ornamentation in the Sarajevo-Romanija Region" in 2020; "Study, Preservation, and Promotion of Folklore Ornamentation in the Sarajevo-Romanija Region (second phase—revitalization" in 2021, and "Organization of the scientific conference "Heritage and Identity(ies)" in 2021.

The academic community continued activities in the study, protection, and promotion of cultural heritage through participation in competitions for co-financing scientific research projects by the Ministry of Scientific and Technological Development and Higher Education of the Republic of Srpska. Scientists from various fields came together for four multidisciplinary projects. The Faculty of Natural Sciences and Mathematics at the University

[6] The academic community was formally involved in the process starting in 2011 through its membership in the Commission for Intangible Cultural Heritage at the Ministry of Education and Culture of the Republic of Srpska. When the members' mandates expired in 2015, the Commission ceased its activities, and its role was assumed by ethnologists and ethnomusicologists from the Museum of the Republic of Srpska, organized through the Department of Intangible Culture.

[7] The project was formally concluded in 2017.

[8] After 2018, the Ministry of Scientific and Technological Development, Higher Education and Information Society, which is now known as the Ministry of Scientific and Technological Development and Higher Education.

of Banja Luka led three projects ("Multidisciplinary Dialogue with Cultural Heritage" in 2018, "Cultural Identity—Reality Through a Scientific Vision" in 2020, and "Natural and Cultural Heritage—Identity Codes of the Past, Present, and Future" in 2023), while the Faculty of Philology at the University of Banja Luka led one project ("Neglected Archives of Literary and Cultural Heritage" in 2020). The results of these projects were presented at international conferences and published in international journals and proceedings.

The engagement of the academic community in the study, protection, and promotion of cultural heritage is evident not only in research projects but also in the teaching process at the University of Banja Luka. During the 2019–2020 academic year, the Faculty of Economics introduced a second-cycle study program titled "Cultural Heritage and Cultural Tourism Management". This program explored the possibilities and methods of utilizing tangible and intangible cultural heritage in cultural tourism through the academic curriculum.

By modernizing the curriculum of existing subjects in study programs at the University of Banja Luka, students have become familiar with the concept and significance of cultural heritage. The content on cultural heritage has been integrated into the teaching at the undergraduate level in the following programs: Ethnomusicology at the Academy of Arts; Geography and Spatial Planning at the Faculty of Natural Sciences and Mathematics; Textile Design at the Faculty of Technology; Serbian Language and Literature at the Faculty of Philology, among others, as well as at the second cycle of studies in the Ethnomusicology program at the Academy of Art.

4. Planning and Strategic Perspective on Cultural Heritage Management

The spatial planning system in Bosnia and Herzegovina before 1992 was part of the planning system of the former state, which was largely based on a sectoral approach to spatial planning. This approach led to the separate planning and consideration of key development elements such as the environment, economy, and natural and cultural heritage, resulting in long-term consequences. Since 1996, with the Law on Spatial Planning and Construction of the Republic of Srpska (Zakon o uređenju prostora i građenju, 1996, 2002, 2003, 2013, 2015, 2016, 2019), planning has transitioned to an integrated approach, becoming an activity of national importance.

Cultural heritage is a specific topic in spatial planning and can be treated as a separate component of sustainable development due to its significance and its dependence on the natural environment and economic conditions (Medar-Tanjga et al., 2022). Planners increasingly emphasize heritage protection through spatial planning documents, reflecting a growing awareness of heritage as a key element in preserving spatial identity.

The protection, organization, and use of cultural heritage are based on three groups of principles: sustainable development principles (rational use and protection of space), integrative conservation principles (harmonizing conservation demands with spatial planning goals), and integral planning principles (protecting heritage within its appropriate environment by equating it with other interests in the planning process) (Dželebdžić, 2012).

The spatial plan, as a legally binding document, defines the measures, goals, and instruments necessary for the area's overall development and serves as a binding basis for preparing corresponding sectoral strategies. However, in Bosnia and Herzegovina, there is a specific situation in the field of spatial planning. According to the Constitution of Bosnia and

Herzegovina, the authority for spatial planning and protection of the environment has been transferred to the entity level, meaning that two spatial planning systems (the Republic of Srpska and the Federation of Bosnia and Herzegovina) operate entirely independently and without coordination. In addition, Brčko District has its constitution and laws. This specific situation and division of jurisdiction prevent the creation of a common spatial plan at the Bosnia and Herzegovina level, which would serve as a foundation and obligation for all other levels of spatial planning (entities, cantons, local self-government units), complicating the achievement of territorial coherence and integration.

The Republic of Srpska has developed and adopted three national-level spatial plans[9]. Cultural heritage was extensively analyzed and emphasized only in the current Spatial Plan of the Republic of Srpska until 2025. The issue of cultural heritage was treated through an analysis of spatial development conditions, where cultural heritage was highlighted as one of the crucial elements of social development, impacting social cohesion. By analyzing the strengths of the space, the diversity of religious, tangible, and intangible heritage was recognized, with the conclusion that documenting cultural heritage presents a challenge, given the diverse approaches within the state and entity frameworks. The importance of protecting cultural property for the cultural, and consequently spatial, identity of the Republic of Srpska was emphasized.

The solutions for the planning period until 2025 include promoting cultural heritage that enjoys international protection. Furthermore, plans will include promoting cultural heritage of national and regional significance through cultural institutions, education, and cultural events. The spatial plan also identified the need to define cultural landscapes and cultural routes, which would be integrated into the Republic of Srpska's tourist offer (Vlada Republike Srpske, 2015).

An analysis of overarching planning documents reveals a low level of implementation of planning solutions. The factors contributing to the unsatisfactory level of implementation in terms of protection include an inadequate institutional network, unaligned legal acts and regulations, and a low level of education and awareness about the role and importance of preserving cultural property as key elements of the identity system. Therefore, priority activities for improving protection and enhancing cultural property should include establishing a reference institution for comprehensive or individual protection. The institution should prepare complete documentation for each property, including criteria for their categorization. Furthermore, the institution will establish a register of protected cultural property, develop a monitoring system, and draft planning documents that cover individual protected areas and promote inter-regional, cross-border, and international cooperation.

The Strategy for the Development of Culture, as a sectoral document, defines the long-term goals and priorities for cultural development, determining the organizational, financial, and administrative measures necessary for achieving them. This document sets cultural policy for the period for which it is adopted. In the current Strategy for the Development of Culture of the Republic of Srpska for the period 2023–2030, cultural heritage is valued as a significant segment, emphasizing elements recognized by UNESCO as globally significant.

[9] The first spatial plan, titled "Spatial Plan of the Republic of Srpska 1996–2015–Phase Plan 1996–2001", was adopted in 1996 (Vlada Republike Srpske, 1996). The second spatial plan, titled "Spatial Plan of the Republic of Srpska until 2015", was adopted in 2008 (Vlada Republike Srpske, 2008).

The strategic goals of the document are aimed at the effective management of cultural heritage, requiring a responsible and transparent cultural policy that strengthens the cultural system domestically and increases its presence on the international stage. Among the strategic goals are: the development of human resources in all areas of culture, including all aspects from cultural heritage to contemporary artistic creation; fostering cooperation with the education and economic sectors to meet the cultural needs of citizens and contribute to the economic development of the Republic of Srpska, including tourism and entrepreneurship; and the development of spatial, organizational (institutional), and technical-technological infrastructure for cultural activities (Vlada Republike Srpske, 2024).

The need to strengthen and develop cultural tourism is highlighted as a key measure. The goal can be achieved through the promotion and valorization of cultural heritage in collaboration with institutions, public cultural institutions, and the private and civil sectors.

The Tourism Development Strategy of the Republic of Srpska for the period 2021–2027 identifies cultural heritage as an important factor in tourism development. Cultural heritage recognized by UNESCO holds special tourism value. Despite its significant potential, the inclusion of cultural heritage in tourism development processes is limited, and in some cases, completely blocked. Negative factors in this process include underdeveloped infrastructure, the absence of supporting tourist content (accommodation, information points, shopping facilities), a lack of awareness of the importance of heritage preservation, and poor integration of active environments, events, and intangible components of cultural heritage. There is also a near-total absence of a receptive tourism concept and a lack of ideas about how to market the rich cultural-historical heritage of the Republic of Srpska as a developmental resource in tourism. Furthermore, the guide services are insufficiently prepared. To address these issues and improve the situation, the development vision and strategic goals outline guidelines for enhancing tourism products such as utilizing heritage resources, including assessing the tangible and intangible heritage of the Republic of Srpska for potential UNESCO nominations. Furthermore, diversifying tourism experiences; assessment of existing capacities, and the need to harmonize cultural property and heritage with international standards; ensure the acquisition of knowledge in the field of cultural property and heritage necessary for the inclusion of cultural property and heritage in tourist products.

Although cultural heritage has been highlighted as a significant tourism potential, the primary focus of the Strategy is on creating an environment for new infrastructure investments, improving access to finance through public-private partnerships and concessions, creating new jobs, and linking tourism with other economic sectors (Vlada Republike Srpske, 2017).

Both the Strategy for the Development of Culture and the Tourism Development Strategy recognize cultural heritage as a key resource for enhancing cultural and tourism activities. While cultural heritage is recognized as having significant potential for cultural and tourism development, numerous challenges persist, such as infrastructure deficiencies, limited awareness of heritage preservation, and a lack of integration between cultural and tourism resources. To overcome these challenges, efforts should focus on developing infrastructure, strengthening financial capacities through public-private partnerships, and improving capacities and standards in line with international norms.

5. Conclusion

Cultural heritage represents the foundation of the identity code of people and places, bridging the past, present, and future. It encompasses a variety of tangible and intangible property passed down through generations. By preserving heritage, communities strengthen their collective identity and emphasize the unique features that distinguish them on a global level. Heritage is not only a guardian of historical values but also an active factor in shaping the future and adapting to contemporary changes and challenges.

In Bosnia and Herzegovina, as well as in the Republic of Srpska, cultural heritage is distinct from that of other countries in the region due to the damage caused during the war from 1992 to 1995, when many objects of architectural heritage were destroyed or damaged. During this period, some heritage protection institutions lost their status, budget, and documentation, and there was a noticeable shortage of experts. These personnel, financial, and organizational problems made it difficult to perform the basic functions of heritage protection.

The system for protecting cultural heritage in the Republic of Srpska is characterized by a complex legal and institutional structure, a result of Bosnia and Herzegovina's specific state organization. Although Bosnia and Herzegovina has ratified numerous European and global conventions on cultural heritage protection, fragmented jurisdiction between the state, entity, and local levels creates challenges in coordination and effective management. Legal regulations from the former Yugoslavia have been improved with new entity-level laws, such as the 1995 Law on Cultural Property of the Republic of Srpska and the 2008 Law on Museum Activity. Amendments have included intangible cultural heritage in the legislative framework. A major issue is the disorganization of records and the lack of databases, complicating the valuation and protection of cultural property. National lists are crucial for effective cultural heritage management, providing a systematic approach to preservation, protection, and valuation. International visibility is also important for preserving cultural heritage as it raises awareness, contributes to strengthening national identity and pride, provides additional protection and resources, and attracts global attention and tourist interest. Unfortunately, international protection in the Republic of Srpska is limited to a few elements listed on UNESCO's lists.

The academic community plays a significant role in researching and promoting cultural heritage. Although institutionally marginalized, it contributes to the preservation and revitalization of cultural heritage through projects realized in collaboration with universities and institutions. Projects at the University of Banja Luka, for example, encourage the integration of cultural heritage into the educational process, ensuring the long-term valuation and preservation of identity.

The planning and strategic perspective on managing cultural heritage in Bosnia and Herzegovina has shifted from a sectoral to an integrated approach. The current spatial plan recognizes cultural heritage as a key element of identity and spatial development, defining measures and goals for its protection and valuation. However, due to specific jurisdictional divisions and a lack of coordination, implementation faces challenges. Although strategic documents have identified cultural heritage as a key resource for cultural and tourism development, problems in implementation persist. The lack of adequate infrastructure, unaligned legal frameworks, and limited connectivity between cultural and tourism resources indicate the need for a stronger integrative approach.

Despite these challenges, preserving cultural heritage in the Republic of Srpska requires a systematic approach and stronger cooperation among all levels of government. Effective coordination mechanisms are crucial for overcoming administrative barriers and ensuring the vitality of cultural heritage, further strengthening the identity of this unique region.

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References

Council of Europe. (1954). *European Cultural Convention*. Council of Europe. https://www.coe.int/en/web/conventions/full-list?module=treaty-detail&treatynum=018

Council of Europe. (1969). *European Convention on the Protection of the Archaeological Heritage*. Council of Europe. https://rm.coe.int/1680072318

Council of Europe. (1985a). *Convention for the Protection of the Architectural Heritage of Europe*. Council of Europe. https://www.coe.int/en/web/conventions/full-list?module=treaty-detail&treatynum=121

Council of Europe. (1985b). *Council of Europe Convention on Offences relating to Cultural Property*. Council of Europe. https://www.coe.int/en/web/conventions/full-list?module=treaty-detail&treatynum=221

Council of Europe. (1991). *European Charter for Regional or Minority Languages*. Council of Europe. https://rm.coe.int/1680695175

Council of Europe. (2000). *Council of Europe Landscape Convention. Council of Europe*. https://www.coe.int/en/web/conventions/full-list?module=treaty-detail&treatynum=176

Council of Europe. (2001). *European Convention on the Protection of Audiovisual Heritage*. Council of Europe. https://www.coe.int/en/web/conventions/full-list?module=treaty-detail&treatynum=183

Council of Europe. (2005). *Council of Europe Framework Convention on the Value of Cultural Heritage for Society*. Council of Europe. https://www.coe.int/en/web/conventions/full-list?module=treaty-detail&treatynum=199

Dželebdžić, O. (2012). Kulturno nasleđe Podunavlja u Srbiji—ocena stanja i planski koncept zaštite i korišćenja [Cultural heritage of Danube area in Serbia—assessment and planning concept for conservation and use]. In S. Milijić, B. Josimović, T. Crnčević (Eds.), *Održivi prostorni razvoj Podunavlja u Srbiji, knjiga 1* [Sustainable Spatial Development the Danube Region in Serbia, book 1] (pp. 168–185). Institut za arhitekturu i urbanizam Srbije, Beograd.

Kirshenblatt-Gimblett, B. (1995). Theorizing Heritage. *Ethnomusicology, 39*(3), 367–380. https://doi.org/10.2307/924627

Marasović, T. (2001). *Kulturna baština 1* [Cultural heritage 1]. Veleučilište u Splitu.

Medar-Tanjga, I (2022). Proučavanje i zaštita nematerijalnog kulturnog nasljeđa Republike Srpske [The study and protection of the intangible cultural heritage of the Republic of Srpska], In J. Pandurević (Ed.), *Nasljeđe i identitet(i): tematski zbornik radova* (pp. 69–91).Centar za folkloristiku i studije kulture (CEFISK), Filološki fakultet Univerziteta u Banjoj Luci.

Medar-Tanjga, I & Delić, D. (2019). Туристическое предложение этнических объектов в службе охраны и продвижения культурного наследия Республики Сербской [Ethno localities as tourist attractions in service of the protection and promotion of the cultural heritage of the Republic of Srpska]. In Б. Н. Миннахматович (Ed.), *Сборник докладов X научная Ассамблея "Общественная география в меняющемся мире: фундаментальные и прикладные исследования"* (pp. 427–432). Ассоциации российских географов-обществоведов (АРГО).

Medar-Tanjga, I., Delić, D. & Garić, B.. (2021). Нематериальное культурное наследие в функции сохранения культурной идентичности на примерах республик бывшей Югославии [Intangible cultural heritage in the function of preserving cultural identity on the example of the republics of the former Yugoslavia].. In А. Геóргиевич Друзи́нин, В. Петро́вич Си́доров (Eds.), Материалы международной научной конференции *"Настоящее и будущее России в меняющемся Мире: общественно-географический анализ и прогноз"* (pp. 224–235). Ассоциации российских географов-обществоведов (АРГО).

Medar-Tanjga, I.., & Dojčinović, I. (2022). Banjalučka kera: nematerijalno kulturno nasljeđe Republike Srpske [Kera Lacing from Banja Luka: Intangible Cultural Heritage of the Republic of Srpska]. InS. Đorđević Belić, D. Lajić Mihajlović, B. Sikimić . (Eds.*), Savremena srpska folkloristika XI: tematski zbornik radova* (pp. 241–257). Udruženje folklorista Srbije Beograd, Univerzitetska biblioteka „Svetozar Marković" Beograd, Centar za kulturu „Vuk Karadžić" Loznica, Naučno-obrazovni kulturni centar „Vuk Karadžić" Tršić.

Medar Tanjga, I., Pandurević J., & Panić Kašanski D. (2017). *Nematerijalno kulturno nasljeđe. Teorijski, metodološki i administrativni aspekti* [Intangible Cultural Heritage: Theoretical, Methodological, and Administrative Aspects]. Filološki fakultet Univerziteta u Banjoj Luci.

Medar-Tanjga, I.,, & Živak, N. (2020). Пространственное измерение культурного наследия в Республике Сербской [The spatial dimension of cultural heritage in the Republic of Srpska]. In П. Я. Бакланов (Ed.), *Сборник Международная научная конференция "Общественно-географическая структура и динамика современного евразийского пространства: вызовы и возможности для России и её регионов*" (pp. 210–219). Ассоциации российских географов-обществоведов (АРГО).

Medar-Tanjga, I., Živak, N., Ivkov-Džigurski, A., Rajčević, V., Mišlicki Tomić, T., & Čolić, V. (2022). Drina Transboundary Biosphere Reserve—Opportunities and Challenges of Sustainable Conservation. *Sustainability, 14*(24), 16733. https://doi.org/10.3390/su142416733

Milekić, V., & Jelić, D. (2017). *Narodne zdravice. Građa i komentari* [Folk Toasts. Materials and Comments]. Filološki fakultet Univerziteta u Banjoj Luci.

Nikolić, I. (2019). *Etnografska zbirka Arhiva SANU: pregled rukopisne građe* [The Ethnographic Collection of the Archive of the SASA: Overview of Manuscript Materials]. Filološki fakultet Univerziteta u Banjoj Luci.

Odluka o osnivanju Državne komisije za saradnju BiH sa Organizacijom Ujedinjenih nacija za obrazovanje, nauku i kulturu—UNESCO [The Decision on Establishing the State Commission for Cooperation with UNESCO], Službeni glasnik Bosne i Hercegovine br. 77 (2009); 35 (2016)

Organization for Security and Co-operation in Europe. (1995). *The Dayton Peace Agreement*. Organization for Security and Co-operation in Europe. https://www.osce.org/bih/126173

United Nations Educational, Scientific and Cultural Organization. (1945). *Constitution*. United Nations Ed ucational, Scientific and Cultural Organization. https://www.unesco.org/en/legal-affairs/constitution

United Nations Educational, Scientific and Cultural Organization. (1954). *Convention for the Protection of Cultural Property in the Event of Armed Conflict.* United Nations Educational, Scientific and Cultural Organization. https://unesdoc.unesco.org/ark:/48223/pf0000374590/PDF/374590eng.pdf.multi.page=8

United Nations Educational, Scientific and Cultural Organization. (1970). *Convention on the Means of Pro hibiting and Preventing the Illicit Import, Export, and Transfer of Ownership of Cultural Property*. Unite d Nations Educational, Scientific and Cultural Organization. https://unesdoc.unesco.org/ark:/48223/pf0000133378/PDF/133378qaao.pdf.multi

United Nations Educational, Scientific and Cultural Organization. (1972). *Convention Concerning the Prot ection of the World Cultural and Natural Heritage*. United Nations Educational, Scientific and Cultural Organization. https://unesdoc.unesco.org/ark:/48223/pf0000388545/PDF/388545eng.pdf.multi.page=5

United Nations Educational, Scientific and Cultural Organization. (2001). *Convention on the Protection of the Underwater Cultural Heritage*. United Nations Educational, Scientific and Cultural Organization. https://unesdoc.unesco.org/ark:/48223/pf0000126065/PDF/126065eng.pdf.multi

United Nations Educational, Scientific and Cultural Organization. (2003). *Convention for the Safeguarding of the Intangible Cultural Heritage*. United Nations Educational, Scientific and Cultural Organization. https://unesdoc.unesco.org/ark:/48223/pf0000383762/PDF/383762eng.pdf.multi.page=9

United Nations Educational, Scientific and Cultural Organization. (2005). *Convention on the Protection an d Promotion of the Diversity of Cultural Expressions*. United Nations Educational, Scientific and Cultur al Organization. https://unesdoc.unesco.org/ark:/48223/pf0000388847/PDF/388847eng.pdf.multi.pa ge=6

United Nations Educational, Scientific and Cultural Organization. (2007). *Mehmed-paša Sokolović Bridge in Višegrad*. United Nations Educational, Scientific and Cultural Organization. https://whc.unesco.org/ en/list/1260/

United Nations Educational, Scientific and Cultural Organization. (2016). *Stećci—Medieval Tombstones Graveyards*. United Nations Educational, Scientific and Cultural Organization. https://www.stecciwh.org/ locations/#single/0

United Nations Educational, Scientific and Cultural Organization. (2014). *Zmijanje embroidery*. United Nations Educational, Scientific and Cultural Organization. https://ich.unesco.org/en/RL/zmijanje-embroidery-00990

United Nations Educational, Scientific and Cultural Organization. (2018). *Picking of iva grass on Ozren mountain*. United Nations Educational, Scientific and Cultural Organization. https://ich.unesco.org/en/RL/picking-of-iva-grass-on-ozren-mountain-01289

United Nations Educational, Scientific and Cultural Organization. (2022). *Lipizzan horse breeding traditions*. United Nations Educational, Scientific and Cultural Organization. https://ich.unesco.org/en/RL/lipizzan-horse-breeding-traditions-01687

Vlada Republike Srpske, Ministarstvo prosvjete i kulture. (2024). Strategija razvoja kulture Republike Srpske za period 2023–2030. godine [Strategy for the Development of Culture of the Republic of Srpska for the period 2023–2030]. https://vladars.rs/sr-SP-Cyrl/Vlada/Ministarstva/mpk/PAO/Pages/ Zakoni_i_pravilnici_u_kulturi.aspx

Vlada Republike Srpske, Ministarstvo trgovine i turizma. (2021). Strategija razvoja turizma Republike Srpske za period 2021–2027. godine [Tourism Development Strategy of the Republic of Srpska for the period 2021–2027]. https://vladars.rs/sr-SP-Cyrl/Vlada/Ministarstva/MTT/Pages/default.aspx#collapsible21

Vlada Republike Srpske, Ministarstvo za prostorno uređenje, građevinarstvo i ekologiju Republike Srpske. (1996). Prostorni plan Republike Srpske 1996–2015, Etapni plan 1996–2001. [Spatial Plan of the Republic of Srpska 1996–2015, Phase Plan 1996–2001]

Vlada Republike Srpske, Ministarstvo za prostorno uređenje, građevinarstvo i ekologiju Republike Srpske. (2008). Prostorni plan Republike Srpske do 2015. godine [Spatial Plan of the Republic of Srpska until 2015]. https://www.vladars.net/sr-SP-Cyrl/Vlada/Documents/ProstorniPlan.pdf

Vlada Republike Srpske, Ministarstvo za prostorno uređenje, građevinarstvo i ekologiju Republike Srpske . (2015). Izmjene i dopune prostorng plana Republike Srpske do 2025. godine [Amendments and Su pplements to the Spatial Plan of the Republic of Srpska until 2025]. https://www.vladars.net/sr-SP-Cyrl/Vlada/Ministarstva/mgr/Documents/Nacrt%20draft%2025%2011%202013.pdf

Zakon o arhivskoj djelatnosti [Law on Archival Activity], Službeni glasnik Republike Srpske br. 35 (1999); 119 (2008)

Zakon o bibliotečko-informacionoj djelatnosti [Law on Library and Information Services], Službeni glasnik Republike Srpske br. 44 (2016)

Zakon o kulturnim dobrima [Law on Cultural Property], Službeni glasnik Republike Srpske br. 11 (1995); 103 (2008)

Zakon o kulturnim dobrima [Law on Cultural Property], Službeni glasnik Republike Srpske br. 38 (2022)

Zakon o muzejskoj djelatnosti [Law on Museum Activity], Službeni glasnik Republike Srpske br. 35 (1999); 57 (2012); 18 (2017)

Zakon o muzejskoj djelatnosti [Law on Museum Activity], Službeni glasnik Republike Srpske br. 112 (2021)

Zakon o uređenju prostora i građenju [Law on Spatial Planning and Construction of the Republic of Srpska], Službeni glasnik Republike Srpske br. 19(1996); 84(2002); 14,(2003); 40,(2013); 106,(2015); 3(2016); 84,(2019)

Zakon o zaštiti i korištenju kulturno-historijskog i prirodnog naslijeđa [Law on the Protection and Use of Cultural-Historical and Natural Heritage], Službeni list Socijalističke Republike Bosne i Hercegovine br. 20 (1985); 12 (1987); 3(1993); 13(1994)

Živak, N., & Medar-Tanjga, I. (2021). The Natural and Cultural Heritage of the Republic of Srpska – Institutional Jurisdiction, Legal Framework, Planning and Strategic Perspectives. In M. Grčić, L. Lazić, V. Stojanović, A. Ivkov-Džigurski, M. Bubalo Živković, D. Pavić, R. Gnjato, D. Filipović, A. Radivojević, A. Petrašević, D Vukoičić. (Eds.), *The 5th Serbian Congress of Geographers „Innovative approach and perspectives of the applied geography": Collection of Papers* (pp. 203–212). Faculty of Sciences, Department of geography, tourism and hotel management.

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SPATIAL DIFFERENCES IN THE FORMATION OF LOCAL INITIATIVES FOR THE PRESERVATION OF CULTURAL HERITAGE SITES IN RURAL AREAS AND SMALL TOWNS OF THE KALININGRAD REGION

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Abstract: Kaliningrad region is a unique region of the Russian Federation. For Russians, it is mainly known as the "gateway to Europe," and for Europeans, the territory of former Eastern Prussia is the most culturally close part of Russia. Nowadays, the region's rural eastern municipalities face typical challenges in the central part of Russia's processes, such as depopulation, decaying infrastructure, and job losses. This part of the region also suffered from becoming a borderland after 1991. Nevertheless, these territories have a diverse architectural heritage of the German period, which can be a resource for economic development, but this heritage has been actively destroyed in recent decades. Modern studies show that emerging tourist destinations can boost peripheral rural areas. And cultural heritage plays a key role in it. In the Kaliningrad region, Russians' complex relationship with the "alien" German heritage became more complicated because of the use of historical buildings. However, the interest in such heritage has grown in recent years, and restoration projects have increased. New owners of restored sites now interact with nearby villages and towns, providing new income sources for residents. This research examines the territorial differentiation of heritage restoration and reuse. It is based on interviews carried out in five rural municipalities and the database from the Ministry of Culture of the Russian Federation, supplemented by open sources. It analyzes spatial patterns, profiles local restoration actors, factors influencing differentiation (location, institutions, protected status of buildings), and similar features of successful practices in the field of functional use of historical buildings. Findings reveal the idea that restoration undergoes the following cycles: state participation rises during crises with the traditional forms of usage of historical buildings; during periods of economic growth, the diversity of residents and uses increases. Restoration geography depends mainly on the availability of financial support and training opportunities for potential residents, less on location (except peripheries). The presence of a protected status significantly reduces the attractiveness of the object's further use. The most successful examples are the area communities of restoration actors. Interacting with each other and forming a common policy makes the territory more attractive. Their actions can also help to increase the tourist flow and stimulate the restoration of new buildings in neighboring territories.

Keywords: cultural heritage sites; rural tourism; local initiatives; rural community development

1. Introduction

Any territory develops thanks to resources and factors that distinguish it from other territories. Often, territories develop under the influence of natural factors: oil reserves, differential rent,

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but accumulated potential plays a much more significant role: human capital, agglomeration effect, as well as cultural heritage—a layer of culture created by previous generations that characterizes the territory. Cultural heritage distinguishes a territory from others, makes it unique, helps to create of goods with higher added value, and attracts tourists and new residents. Thanks to this resource, many peripheral rural areas of the world are developing.

But often the opposite happens—the territory becomes impoverished, degrades, resources are depleted, and factors are not realized. This trend is especially noticeable in the peripheral rural areas of Russia, where depopulation and economic degradation reinforce each other, and cultural heritage is rapidly disappearing. Two problems are developing in parallel: 1) rural areas are degrading, unable to realize the potential accumulated over centuries, 2) the "potential" itself, the Russian cultural layer, is thinning and being destroyed. The further we go, the more acute the question becomes about the possibilities of preserving and using architectural monuments on the periphery, where fewer and fewer residents remain and economic activity is conducted less intensively. One of the solutions of this problem can be the development of "conscious" rural tourism. Studies of post-agrarian transformations in rural areas show that the emergence of new tourist destinations can become the basis for growing prosperity in peripheral rural areas (Drobnjaković et al., 2022; Terzić & Petrevska, 2021).

These trends are also manifested in the Kaliningrad region, which stands out with a number of unique features for Russia:

- compact territory and exclave position of the region relative to Russia,
- the cultural heritage of the region is foreign to the local population (mostly created by Germans), and
- high level of tourism development (especially on the Baltic Sea coast).

All this makes the Kaliningrad region an ideal case for studying the adaptation of architectural heritage for the needs of new rural areas, including the development of rural tourism. In the post-Soviet period, the historical real estate of the Kaliningrad region is actively changing the nature of its use. From the point of view of economic geography, this process can be characterized as a transformation of place functions, where a place is understood as a building, a single object that has both characteristics of economic and geographical position and specific characteristics (age, status, number of floors, architectural features, and "path dependence"—the influence of previous functions). The function of a place is the role that a territorial system performs within a higher-order system (Baburin et al., 2018). The number of places performing a certain function depends on the volume of demand for it from larger territorial systems and on the spatial capacity of the performed function. Place functions can be determined both economically (industrial areas, recreational areas) and culturally (for example, areas with a religious function). In this study, cultural heritage sites (CHS) are perceived as a category of spatial objects—places with a similar characteristic of "value" and a set of different external and internal characteristics. The transformation of the functions of these objects is a marker of large-scale socio-economic transformations that have occurred in the Kaliningrad region in the post-Soviet period.

This study examines the processes occurring with the architectural heritage of rural areas and small towns—all municipalities of the region are analyzed, except for the largest city in the region—Kaliningrad. Thus, cultural monuments with the best economic and geographical position are excluded from the object of study, and more attention is paid to other geographical

factors: the institutional factor, the natural factor, the "path dependence" of the use of CHS. The focus of this research relates it to a number of works devoted to the analysis of transformations of peripheral rural areas under the influence of rural tourism (Cano et al., 2013; García-Delgado et al., 2020). These studies focus on the sociological and historical aspects of transformations. This study operates more with the concept of "place" as a historical building.

The basis of this study is the author's database of CHS in the Kaliningrad region, which was created according to the data from the Ministry of Culture of the Russian Federation (2024). Such information as location, age, status, description, time of registration was supplemented by the authors with the information about the current state and use of monuments. It was collected both during field trips and with the help of online aggregators of attractions. The second database was a series of expert interviews with the people involved in the preservation and restoration of CHS. As the part of the field research, 15 interviews were conducted in five municipal districts. These interviews made it possible to describe correctly the ongoing transformations of place functions.

Local initiatives can be understood as a form of cooperation between local authorities and the population, which allow to solve socially important tasks with benefits for the local community. Scientific articles analyze various goals of this cooperation, but in our case, there are rather different forms of full or partial restoration, as well as conservation of CHS: rural estates, temples (Protestant, Catholic churches), and medieval castles.

In search of an answer to the question of why CHS are working actively with in the Kaliningrad region, one can turn to the concept of a specific "Kaliningrad" regional identity. Sometimes in search of its components of which Russian scientists come to contradictory conclusions (Starchenko et al., 2024; Vendina et al., 2021). Although the answer unlikely consists of one component, we can assert that the Kaliningrad region has maintained a positive migration balance for decades, despite a series of economic crises and serious changes in the cultural landscape after 1945 (Levchenkov, 2016). The German heritage and the architecture exotic for most Russians should be also included.

2. The specifics of the architectural heritage of the Kaliningrad region

For further analysis of transformations, it is necessary to characterize the architectural heritage features of the Kaliningrad region in details. The architectural heritage consists of 426 CHS listed in the register of the Ministry of Culture of the Russian Federation (2024; Kaliningrad is excluded). The earliest of them appeared in the 12th century. Religious buildings such as churches and chapels (112), residential houses (72), and defensive structures (52 objects) predominate numerically. This structure perfectly characterizes the historical place of East Prussia as a frontier, a zone of colonization and Christianization, a bastion protecting German states from the east. In current realities, both due to the changes in border configurations and the destruction of traditional lifestyles, defensive and religious structures often lose their functions. The question of their further use is quite acute.

Practically all recognized architectural heritage of the Kaliningrad region consists of pre-war monuments created in Eastern Prussia. The few exceptions are Second World War memorials and modernist monuments in Kaliningrad. As it is shown in Figure 1, the geography of heritage retains the pre-war configuration of the territory: on the periphery of Eastern Prussia along the border with Lithuania (and in the past of the Russian Empire), there

is the least development (density of CHS). At the same time, along the border with Poland, the density of monuments is higher: these are central, not border areas of the former Eastern Prussia, the southern part of which was transferred to Poland as a result of Second World War. The highest density of monuments is achieved in the west of the region: in Kaliningrad and on the Sambian Peninsula, where cities—military, commercial, and resort centers—have historically concentrated. But an area around the old centers of Prussia is also noticeable: Chernyakhovsk (former Insterburg) and Gusev (Gumbinnen).

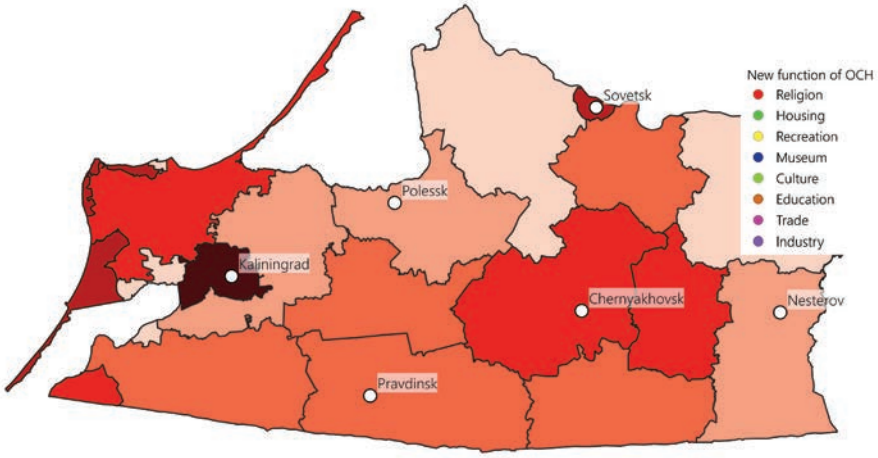

Figure 1. The density of architectural monuments included in the register of CHS in the Kaliningrad region by the authors.

The most significant feature of the architectural heritage is its foreignness to the local population. In 1945, the territory inhabited by Germans since the 12th–14th centuries was transferred to the USSR and populated by people from Belarus, Ukraine, and the Volga region. As a result, those who created the cultural heritage and those who used it after 1945 turned out to be not just different people, but people who, as a result of Second World War, were extremely hostile to each other. The attitude towards architectural heritage from the population and especially from the authorities has always been ambiguous. It can be judged by the dynamics of registering of cultural heritage monuments. Throughout the Soviet period, the heritage of the Kaliningrad region was practically not registered. There are both objective and subjective reasons for it: on the one hand, the lack of information complicated the process of studying future CHS, on the other hand, the value of "foreign" heritage was questionable, as the German past was tried not to be advertised. In the 1990s, as a result of the activities of different people such as local and art historians the situation was changed. Moreover, in the 2000s, when the number of registered CHS was declining throughout the country, in Kaliningrad, the number of CHS grew very intensively.

3. Dynamics of perception of the German heritage in the Kaliningrad region

Figure 2 presents a scheme of changing of the value of architectural heritage in the Kaliningrad region, which was based on interviews with heritage experts: activists, representatives of the tourism business, and local historians. Two types of value were conditionally distinguished: symbolic (the value of the object as a phenomenon showing a certain culture, history of the place, etc.) and utilitarian (the ability of the building to satisfy the population's demands for its use). The first type of value is largely determined by people's interest in history and culture, the second—by the level of rural economic development from the point of view of the demand for historical real estate and the condition of buildings (a destroyed building has a much lower utilitarian value than a preserved one) and the quality of the supply of historical buildings as well.

After Second World War, the Kaliningrad region became the part of the RSFSR and was populated by people from different parts of the USSR. Many migrants came from the western regions devastated by the war, as well as from the Volga region (for example, Chuvashia and Mordovia). Former military personnel who fought on this land and saw it with their own eyes served as guides and agitators. Due to the change in population, the attitude towards cultural heritage has always been ambiguous: it was considered foreign and therefore had no value. Moreover, in the first decades, the practice of deliberate destruction of buildings by new residents was widespread: there were rumors about the return of these lands to the friendly GDR, and people didn't want to give them back. A big problem for any researchers was the complete lack of information about the monuments: all archives of Königsberg were taken to Germany, and therefore it was impossible to carry out restoration or even learn about the original owner, type of use, date of construction. The local population also could not know anything about the places where they lived (even German names of settlements were known only to a few enthusiasts). And the few Germans who did not leave hid their origin and rarely contacted researchers. Until the 1980s, the symbolic value of most objects (except some remains of old Königsberg) was hardly perceived.

As a result of Second World War, the region's economy was undermined, many historical buildings were destroyed and damaged. It could not help affecting their utilitarian value. The complete change of population led to the fact that many buildings were not in demand and were destroyed. Their functions were changed to others that stimulated their rapid destruction (especially religious objects). Nevertheless, the utilitarian value of many buildings (especially in the case of industrial and residential) was quite high. It began to decline only towards the end of the Soviet era due to the rare and poor-quality repairs of buildings.

The situation began to change during Perestroika and dramatically transformed with the opening of borders and the collapse of the USSR: a stream of "nostalgic tourists" rushed to the Kaliningrad region—Germans who left in their early years came to look at the houses where they spent in their childhood. They actively interacted with local residents, told about old settlements, houses and villages; some of them began to help with money in restoring buildings, others searched for archival information and sent it to Russia. In interaction with them, the first wave of Kaliningrad activists appeared, believing that it was necessary to "restore the Eastern Prussia" in all its glory. They were both Kaliningrad residents and residents of villages who, due to privatization, became owners of old houses. As a result, the earliest heritage restoration projects began to form. Some of them were supported by

charitable foundations from various European countries. Experience in working with foundations, the ability to compose, and win grants are the key conditions for the current successful development of the Kaliningrad region. Besides, various confessional communities such as the Russian Orthodox Church and Protestant and Catholic communities participated in the restoration of religious objects. The symbolic value of heritage has grown significantly.

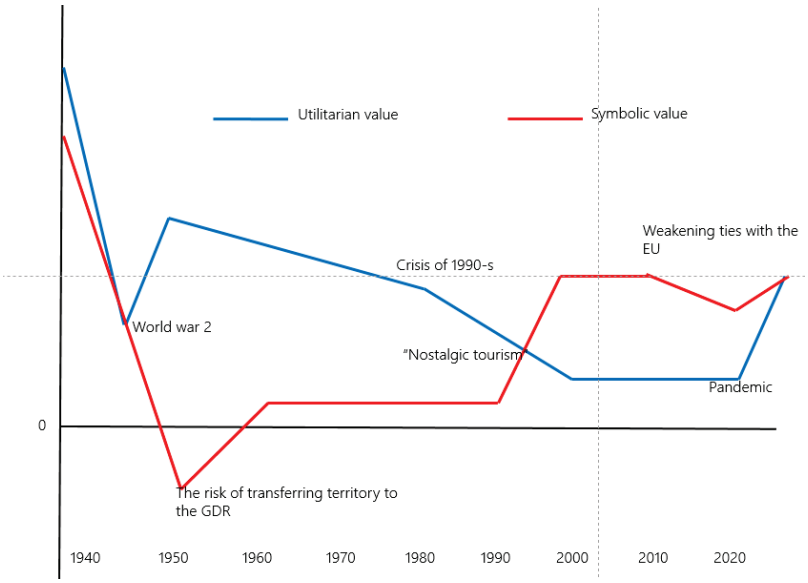

Figure 2. The dynamics of the value of architectural heritage in the Kaliningrad region by the authors.

At the same time, poverty, social stratification, degradation of social infrastructure, and mass departure of rural residents to cities caused even more active destruction of architectural objects in rural areas. The utilitarian value of objects decreased due to declining demand for them, they were actively destroyed, dismantled for bricks. Neither activists nor foreign foundations could fix this, and therefore by the end of the 2000s, the intensity of activists' activities began to decrease.

Activists also began to lose support from local authorities due to the political duality of the architectural heritage of the Kaliningrad region, because for many people German heritage remained alien, the question of its preservation and protection was not as unambiguous as in native Russian regions. By the mid-2000s, religious revival also ended, new projects of converting churches into temples disappeared. The end of this stage can be considered as the transfer of all churches and castles from state ownership to the Russian Orthodox Church in 2011. It put an end to the possibility of restoring castle structures and deprived activists of their motivation for further work (Bakhtin, 2014). After 2014, the work of most foreign foundations in Russia was also terminated, which limited the possibilities for restoring cultural objects.

Open borders changed the lifestyle of Kaliningrad residents: weekend excursion trips to European Union (EU) countries, especially to Poland, became fashionable among them. A large tourist market was formed, many companies earned money on rural tourism in its

various forms. At the same time, in the Kaliningrad region, there were neither interesting projects nor a desire to create them: they only drove people to the coast and mainly tourists from "Big Russia", not Kaliningrad residents. In 2013, it was based on the union of an organizer of hikes to Lake Vishtynetsky and a participant of an EU grant for forming rural tourism projects in the Polessky district. The first tour operator creating programs in the east of the Kaliningrad region called Hobbitour was created. It was this company that supported some of the early projects in the field of rural tourism (for example, the German Waldwinkel school or the Vyshtynetsky Ecological and Historical Museum). Nevertheless, until 2020, it was the only one company in this segment.

Everything changed in 2020 when due to the closure of borders. Kaliningrad residents, accustomed to trips, began to explore the territory of the region out of boredom. Immediately after it, a construction boom began in the region: people started renting churches and castles belonging to the Russian Orthodox church. They also bought old estates, houses in rural areas, and even horse barns. The number of currently implemented notable projects in rural areas was more than 30, which was a very significant number for such a small region. Unlike the 1990s, when the symbolic value of objects grew while their utilitarian value decreased, the current situation was characterized by an increase in the utilitarian value of objects, because they could pay off within the framework of rural tourism development. At the same time, the symbolic value of objects couldn't but grow by 2020, a second wave of heritage activists was forming, the key center of which is the volunteer movement "Ruin Keepers". Vasily Plitin, the founder of the movement, describes out the difference between activists of the 2020s and activists of the 1990s: heritage protection was now not nostalgia for a past that cannot be returned, but a process of adapting and carefully using heritage for the benefit of people living in the region.

However, such a wave of interest in heritage and rural tourism raises doubts about the future prospects of this process: any political and economic change can lead to the curtailment of many projects due to their excessive number. Nevertheless, the positive aspects are more significant: investments are coming to rural areas, jobs are being created in construction and service sectors in the depressed east of the region, and finally, Kaliningrad residents are learning about unique objects located within an hour's drive by car.

4. The specifics of the use of CHS

Let's consider the specifics of transformations in the functions of historical real estate depending on their key characteristics: age, primary function, geographical location, and protection status. Let's start with an analysis of the age structure (Figure 3). The territory of the Eastern Prussia began to be developed by the crusaders in the 12th–13th centuries. At this time, the earliest castle-fortresses and churches were founded, which due to their height and strong walls were also often used as defensive structures. These structures formed the primary framework of the cultural heritage of the Kaliningrad region. Due to changes in borders and the development of fortification, some of these objects lost their functions even before 1945. They are still in a ruined state. Among the 14th-century structures, there is the highest percentage of abandoned buildings. For a number of reasons a new function cannot be found immediately for churches and peripheral castles. The main ones are peripheral location and large areas of objects. Most investors are unable to restore them. It is also

necessary to take into account the role of the Russian Orthodox Church, because most of the objects are under its management and cannot be sold to other private individuals. As a result, they cannot be restored under the current policy of the Church. Finally, it must be also taken into consideration that in the Soviet period, most of these buildings were used in the most harmful areas for CHS: as granaries, production facilities, and prisons. It affected their condition, resulting in much larger investments needed for their restoration.

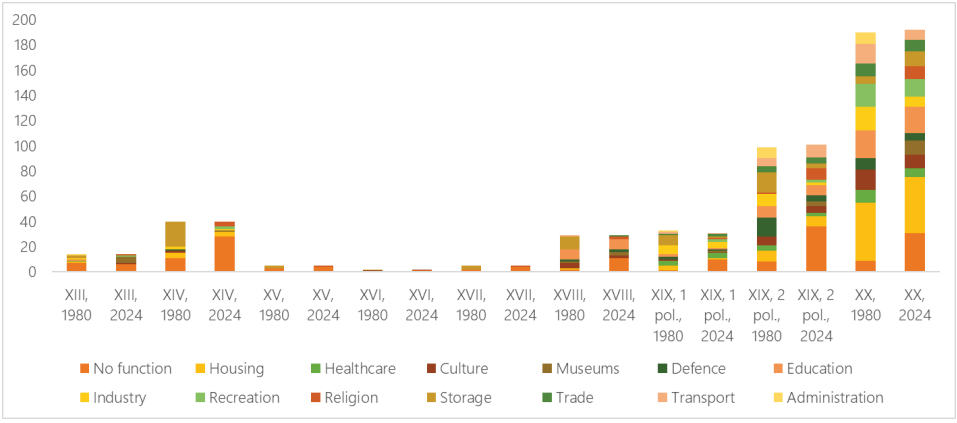

Figure 3. Transformation of CHS' functions depending on the period of construction by the authors.

The 15th–17th centuries are characterized by a small number of monuments. It is not easy to analyse them quantitatively. The largest number of monuments dates back to the 19th and early 20th centuries. It was during that time that most of the civil architecture of the region had been built. The 20th century stands out with the smallest share of abandoned objects: this is primarily explained by lower investments in the use and restoration of these buildings. Most often they are provided with water supply, electricity, and other communications, and are in better condition. It should also be taken into account that buildings of that period are more often located near the coast and large cities. Urbanization and emerging tourism made their position more adapted for modern use.

After 1945, most historical buildings in the region received new functions. The geographical location of buildings and their structural features played a role in the choice: water towers and military objects most often retained their function, while other types (for example, churches) completely changed their function. The chosen function led to the destruction of the building to varying degrees. This peculiar "path dependence effect" still affects the modern use of CHS. As a whole in 1980 (Figure 4), the share of abandoned buildings in the region was small (less than 10%). Almost all abandoned buildings are churches and defensive structures built before the mid-19th century had become morally obsolete. Many objects were used in accordance with their original function as housing, educational, defensive, transport, and economic objects. The most heterogeneous were groups with the original function of management and security, trade, and religion. The first two groups were mainly concentrated in cities, where buildings more often changed their functions and acquired new ones under the influence of many intracity processes. Religious buildings were most often used in agriculture as warehouses,

granaries, and workshops, but urban churches were used as cultural institutions. It is necessary to note separately the critically low number of museums (only one outside Kaliningrad). Such low values are determined by the specific attitude to German heritage and the lack of reliable historical information about the territory of the Eastern Prussia.

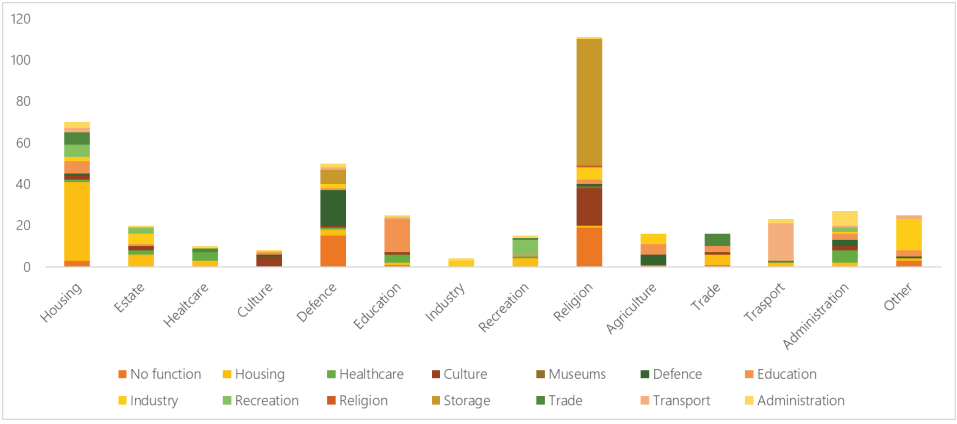

Figure 4. The functions of using CHS in 1980 according to the initial use by the authors.

Comparing the current situation with 1980, it can be noticed that different types of monuments reacted differently to the transformations that occurred in the region. Unexpectedly, the most affected type of monuments were religious buildings. More than 50% of them currently have no function. This situation is explained by a significant degree of depreciation of their resource as a result of economic activity, on the one hand, and the fact that these objects are most evenly distributed throughout the region and on the periphery cannot acquire new functions due to the general degradation of rural areas. At the same time, more than 30 religious buildings restored their original function. They account for more than 30% of all restored buildings in the region. A significant increase in the number of abandoned buildings fell on shrinking state sectors such as agriculture, production, and defense. The crisis of the 1990s and the reduction in the role of the state in the economy led to a decrease in demand and degradation of historical buildings.

The number of abandoned buildings in the region steadily grew from 1980 to 2019. However, since 2020, an opposite trend has been observed. The number of restored CHS exceeded the number of annually abandoned ones. In 2024, the number of abandoned buildings returned to the level of 2010, although it continues to exceed significantly the level of 1990. At the same time, the process has significant spatial differentiation (Figure 5). Three groups of districts can be distinguished:

- those in which from 2015 to 2024 the number of abandoned CHS continued to grow (the Bagrationovsky, Nemansky, Svetlogorsky districts),
- the growth in the number of abandoned CHS was replaced by stagnation (the Baltiysky, Gvardeysky, Pravdinsky, Chernyakhovsky, Gusevsky, Nesterovsky districts), and
- the growth in the number of abandoned CHS was replaced by a decrease (the Zelenogradsky, Guryevsky, Polessky districts).

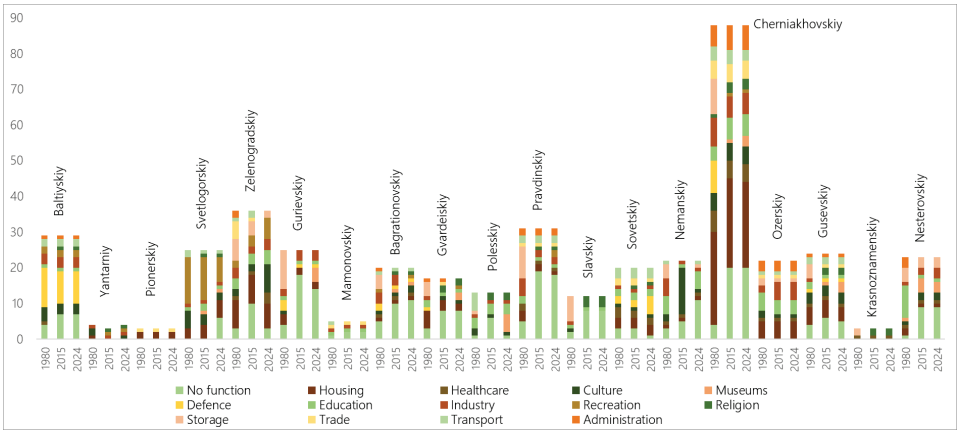

Figure 5. Transformation of CHS functions by districts of the Kaliningrad region by the authors.

In general, a center-periphery pattern is noticeable: Zelenogradsky and Guryevsky districts, adjacent to Kaliningrad, are developing much more successfully than the peripheral Nemansky or Chernyakhovsky. However, significant deviations from such a distribution are noticeable. They are mainly explained by institutional factors: successful examples of Polessky and Nesterovsky districts, the degradation of Svetlogorsky district are primarily explained by the quality of management and staff training. Among the towns (Figure 8), over 44 years, the most successful were Zelenogradsk (one of the most creative resort cities in Russia) and Gusev (the second most important administrative center of the Eastern Prussia). In the development of these two towns additional resources were invested.

Finally, the protection status plays a large role in the preservation of the monument. Within the framework of the Russian system of cultural monument protection, there is a hierarchy of statuses: the most valuable objects have the status of federal monuments, less significant ones the regional one. In addition, the region can approve lists of monuments of local significance. There are quite few monuments of federal significance. The state pays them more attention. For the allocation of monuments of local significance, an active local community interested in it is often important. Regional monuments in most regions of Russia are abandoned most often. There is neither support from the federal government nor participation of the local community. Over 44 years of observations, the number of abandoned monuments of regional significance increased three times (from 27 to 83), local—also three times (from 15 to 48). As for 2024, all federal monuments have a function or are being reconstructed. In the structure of monuments of the Kaliningrad region, federal CHS occupy a smaller share. Most of them are located in the residential quarters of Chernyakhovsk, forming a single ensemble. Most of the problematic objects (churches, castles, rural estates) have the status of regional monuments.

5. The processes of destruction and restoration of CHS

Let's examine in details the dynamics of loss (Figure 6) and change (Figure 7) of functions in historical buildings. We can identify four periods:

- Late Soviet (1980–1989). As a result of long-term exploitation and lack of quality repairs, buildings fall into disrepair. This is especially true for rural heritage, where CHS are used most inefficiently. Over 10 years, 20 buildings lost their function, while three changed their function.
- Post-Soviet (1990–1994). There is a sharp transformation of the economy and society. In five years, 45 buildings lose their functions. Most of this is due to the destruction of collective farms in rural areas. At the same time, there is a religious revival: 14 objects become temples of different confessions. The first museums also appear, while the history of the Eastern Prussia ceases to be such a taboo topic.
- Russian (1995–2019). This period is characterized by a peculiar balance of restoration and destruction: the number of destroyed objects steadily slightly exceeds the number of restored ones. Geographically, the region is divided into two parts: east and west. The eastern part is depopulating and degrading to a greater extent, while the western one is gradually developing due to tourism and migration inflow. Gradually, due to tourism development, among the restored objects, the share of churches decreases, and the share of museums increases, but the share of historic hotels remains insignificant.
- New (2020–present). The closure of borders due to the pandemic, and then the sharp increase in the cost of outbound tourism due to sanctions, led to the development of domestic tourism, including rural tourism. Kaliningrad residents, accustomed to weekend tourism, began to look for vacation spots within the region. This sharply increased the attractiveness of historical real estate for business. As a result, a race began for CHS in relatively good condition. The greatest interest is in country estates and rural churches. The former are being bought (Lugowen, Gryoza Hutor), the latter are being rented from the Russian Orthodox Church (Allenburg Church, Gerdauen Church). Castles are too expensive for most actors, and therefore are not yet used. However, they also attract interest from large federal-scale investors: projects have already been launched to restore four castles in different parts of the region. In the last five years, more objects have been restored than in the previous 20 ones. At the same time, transformations have affected the entire territory of the region: in the last five years, not a single CHS has been abandoned. It is also unusual that among the restored objects there are no churches, but a significant share is occupied by recreation and trade facilities.

At the same time, the territories that had built rural tourism support structures even before 2020 are benefiting the most from the current situation. The leaders are the Polessk, Nesterov, and Pravdinsk districts (Figure 8).

The Pravdinsk district, in turn, has become popular among visiting businessmen. The governor of the region paid attention to the township of Zheleznodorozhny, and many Kaliningrad residents appreciated the uniqueness of this territory. Some of them began to buy real estates in the area to serve the growing tourist flow. However, the participation of the local population in these projects is minimized.

In the Polessk district (the most successful among the three), the basis for rural tourism was created as a part of the international grant "Sparks of Hope for Russian Villages". It taught local residents how to run their own businesses in rural tourism. After the grant ended, a group of its participants united in the "Resource Center for Rural Tourism". They advertise each other's products and stimulate further tourism development in the district.

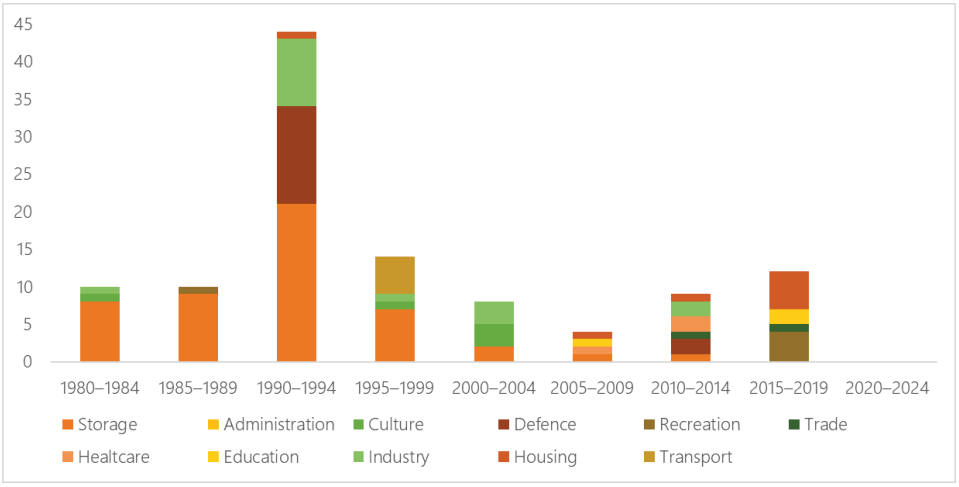

Figure 6. Dynamics of loss of functions by buildings based on their last function by authors.

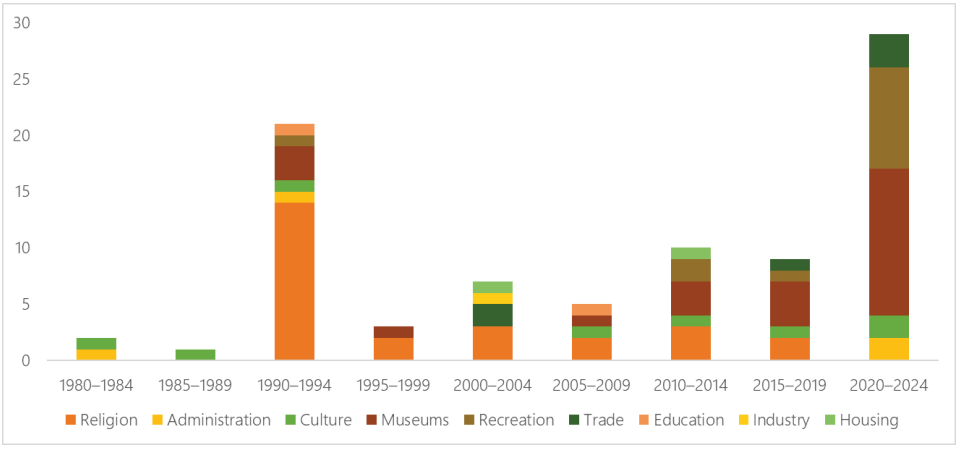

Figure 7. Dynamics of the restoration of CHS objects, taking into account the use of the results of the restoration by the authors.

Finally, the third significant district is Nesterov. The most active zone of tourism development has become its southern part called the Romintenskaya Pushcha [Rominten Forest]. There, with the efforts of two people and one private museum, they managed to unite local residents around the idea of developing rural tourism. They help them to implement their plans. In addition, the private museum acts as a coordinator of local residents' activities, advertises them, and forms a brand for a fairly large area situated on the Vyshtynets Upland.

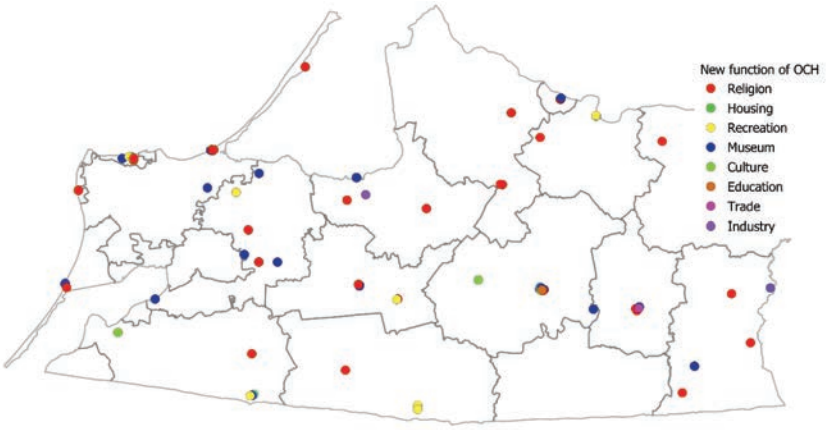

Figure 8. Geography of restored CHS facilities in rural areas of the Kaliningrad region by the authors.

Comparing these three districts, we can come to several conclusions:

- For the development of tourism in rural areas, an external impulse is needed: the interest of a high-ranking person, a grant programme, or the appearance of a talented coordinator.
- The involvement of local residents turns out to be higher with a softer, "horizontal" approach to tourism development, when rural residents are not offered the role of observers, but the one of creators.
- To be able to implement their projects, rural residents need skills and resources. That is why the Polessk district turns out to be the most productive. They not only communicated with local residents, identifying the most active among them, but also provided financial support, taught them the most productive ways to implement their projects.

6. The portraits of the actors of restoration of CHS

The question about the actors involved in the restoration of CHS has a particular interest. Who are these people? Where did they come from? What makes them undertake the challenging commitments of leasing a half-destroyed rural church without a dome or a wing of a Teutonic Order castle in a remote village? In July 2023, we conducted 13 in-depth interviews with restoration actors, most of whom were "pioneers" in the municipalities that now attract tourist groups from outside the region. We supplemented these biographical interviews with the participant observation of the lives of the sites restored by our respondents and identified some common features in the socio-psychological "profiles" of our interlocutors (Table 1).

The most common trait among all respondents is their tendency to transform the original functions of the CHS. Thus, the wing of a Teutonic castle may become a workshop for making props, and a city mill building starts to transform into a hotel. When choosing a new function, the renters of cultural sites are guided by a subjective, sometimes fantastical perception of the site (one of the phrases we often heard was: "I saw it and realized that it was my dream"). At the same time, the new owners of the CHS often try to play up the historical past of their site, opening small museums, collecting old German photographs, tiles from excavations, and other thematic items. Some sort of sacred knowledge about the pre-war function of the sites becomes a matter of personal pride.

Table 1. Comparison of similar features of actors in the restoration of CHS by the authors

A characteristic feature	Number of eligible respondents/ total number of respondents
Rethinking the functions of objects	12/13
Grant management skills	11/13
Participation in the life of the local community	10/13
Kaliningrad as the place of birth or temporary residence	9/13
Age from 35–40 years	9/13
European grant programmes	6/13
The beginning of the restoration in the 1990s (early 2000s)	5/13

Another widely spread feature is the ability to work skillfully with all available support measures: regional, federal, and foreign grants (until the latter were available). The high rate of restoration of sites relies on these individuals' education, understanding of support mechanisms, and "soft skills" that help them to create sustainable social networks between municipalities, exchange best practices, and promote each other's projects. Last summer, we witnessed one of our respondents, with whom we were conducting an interview, negotiating a joint event with someone from another municipality, where we only planned to arrive a day later. Many projects from the 1990s (early 2000s) are connected with European (German, Dutch, etc.) grant programmes or private individuals who often gave the green light for restoration on a barter condition ("We help you re-roof the rural estate, and you organize a children's camp").

It's interesting to know, that in the Kaliningrad region many actors of local initiatives are more loyal to the local community and are more willing to establish connections (in particular, hiring local residents) than their counterparts in other regions of Russia. In the Voskresensky district of the Nizhny Novgorod region, we observed a clear division between local residents and the "new rurals"—migrants from cities (Krutov et al., 2024). This opposition caused misunderstandings even at a household level ("they milk the cow at the wrong time"); perhaps the absence of this divide between incoming activists and rural residents in the Kaliningrad region is related to a smaller distance and a shared past among the inhabitants of this "region of migrants".

Another fairly common feature is the path of actors to the restoration site through Kaliningrad as a place of birth, study, or temporary residence. It is not surprising for those who, having arrived in the Kaliningrad region from outside, first chose the regional center (the most convenient place to live) and then began to explore the attractions in peripheral areas. However, we also encountered cases where residents of small rural settlements, having spent several years in Kaliningrad, did not stay there or return, but moved to other rural settlements. In some cases, respondents explained their atypical move by the uniqueness of the area or the presence of an old German site for sale. Nevertheless, the internal ethnography of the process of choosing a restoration site is still not entirely clear.

For example, one of our respondents, a renter of a wing of the 13th-century Waldau Castle, explained her desire to take on this challenging site as a "midlife crisis" and a search for the meaning of life when the goals postulated by society ("family-career-children") have already been achieved, but there is still a need to move forward. Our interlocutor believes that her example of working with the castle, which "pushes you to learn new professions", is nothing more than a way to avoid internal conflict and help the next generations understand what needs to be done. Similar motivation appeared more than once in our interviews: Table 1 shows a skew in the age of respondents toward mature and older working-age adults.

However, a new wave of interest in preserving CHS that began in 2020, largely thanks to the movement "Ruin Keepers", paints another portrait of the actors. These are residents of Kaliningrad of all ages who come to rural areas alone, with friends, or with families for volunteer clean-ups at ruined churches to improve the territory and conserve the sites in the spirit of European "ruin aesthetics". This option for maintaining CHS does not require as serious investments as restoring unique sites but allows to form of a broader social network and the preserve typical sites as unusual walking areas in villages, creating a kind of "open-air historical parks".

7. Conclusion

The functions of places are transformed under the influence of changes in higher-order territorial systems. The more radical the transformations within the system, the sharper the changes in functions become, and the greater the risk of a complete loss of functions. Peripheral areas, characterized by low human capital and low labor productivity, adapt the worst. Over the last 80 years, the Kaliningrad region has experienced a significant number of sharp transformations: the complete change of population in 1945–1947, the collapse of the planned economy in 1991, rural depopulation, changes in the configuration of borders, and their closure due to the pandemic. As a result, the rural areas have lost not only many functions but also the resources needed for further development. These resources now need to be somehow attracted from outside, which is possible either through long-term economic growth of the entire region or due to reduced competition for these resources. The latter is what happened in the region in the 2020s when almost all tourist locations outside the region were closed. This created a demand for recreation and led to the restoration of CHS on the region's periphery. Meanwhile, human resources and financial means are attracted either from Kaliningrad or other parts of the country: local communities are not so often involved in the restoration activities of CHS. This creates additional risks for the development of new functions of the place (as they are somewhat antagonistic to the locations of deployment). The most successful cases of CHS restoration are earlier stories from the Polessky and Nesterovsky districts, where territorial development actors primarily worked with local residents and gave them the opportunity to realize their own dreams and needs using the resources available in the area. It is precisely these systems that have more prospects for further development and evolutionary adaptation. However, at the moment in Russia, they are more the exception than the rule.

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References

Baburin, V. L., Gladkevich, G. I., Danshin, A. I., Savoskul, M. S., & Safronov, S. G. (2018). Territorial Conflicts and Function of the Place (Case Study of the Borovsk District of the Kaluga Region). *Vestnik Moskovskogo universiteta. Seriya 5, Geografiya*, *6*, 72–82. https://vestnik5.geogr.msu.ru/jour/article/view/483

Bakhtin, A. P. (2014). The Condition of Cultural Heritage Sites in the Kaliningrad Region. *Slovo.ru: Baltisky akcent, 1*, 91–104. https://cyberleninka.ru/article/n/situatsiya-s-pamyatnikami-kulturnogo-naslediya-v-kaliningradskoy-oblasti

Cano, M., Garzón, E., & Sánchez-Soto, P. J. (2013). Historic preservation, GIS, & rural development: The case of Almería Province, Spain. *Applied Geography, 42*, 34–47. https://doi.org/10.1016/j.apgeog.2013.04.014

Drobnjaković, M., Panić, M., Stanojević, G., Doljak, D., & Kokotović Kanazir, V. (2022). Detection of the Seasonally Activated Rural Areas. *Sustainability, 14*(3), Article 1604. https://doi.org/10.3390/su14031604

García-Delgado, F. J., Martínez-Puche, A., & Lois-González, R. C. (2020). Heritage, Tourism and Local Development in Peripheral Rural Spaces: Mértola (Baixo Alentejo, Portugal). *Sustainability, 12*(21), Article 9157. https://doi.org/10.3390/su12219157

Krutov, O. D., Grelya, N. K., Veprickij, A. A., Kuksin, Ya. K., Nazarenko, G. A., Prusihin, O. E., Shirokova, P. A., Kruze, Yu. L., & Alekseev, A. I. (2024). New rural residents and forms of their territorial organization in the Voskresensky district of the Nizhny Novgorod region. *Lomonosov Geography Journal, 2*, 66–79. https://doi.org/10.55959/MSU0579-9414.5.79.2.6

Levchenkov, A. V. (2016). Changes in the cultural landscape of the Kaliningrad region's periphery in the 19th/20th centuries. *Baltijskij region, 8*(1), 132–159. https://doi.org/10.5922/2074-9848-2016-1-8

Ministry of Culture of the Russian Federation. (2024). *Unified State Register of CHS (Historical and Cultural Monuments) of the Peoples of the Russian Federation* [Data set]. https://opendata.mkrf.ru/opendata/7705851331-egrkn/

Starchenko, R. A., Serin, P. A., & Donezhuk, M. Y. (2024). *Regional Identity And Migration Orientations Of Residents Of The Kaliningrad Region*. https://ncmu.hse.ru/en/news/940831006.html

Terzić, A., & Petrevska, B. (2021). Transformation to Seasonal Villages: Second-Home Tourism as Initiator of Rural Diversification. In R. P. Marques, A. I. Melo, M. M. Natário, & R. Biscaia (Eds.), *The Impact of Tourist Activities on Low-Density Territories. Evaluation Frameworks, Lessons, and Policy Recommendations* (pp. 125–148). Springer. https://doi.org/10.1007/978-3-030-65524-2_6

Vendina, O. I., Gritsenko, A. A., Zotova, M. V., & Zinovyev, A. S. (2021). Identity of Kaliningraders: Influence of Social Beliefs on the Choice of Self-Identification. *Bulletin of the Russian Academy of Sciences. Geographical Series, 85*(4), 565–578. https://doi.org/10.31857/S2587556621040117

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