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GEOGRAPHICAL SOCIETY IN FEDERATION OF
BOSNIA AND HERZEGOVINA

DEPARTMENT OF GEOGRAPHY
UNIVERSITY OF SARAJEVO — FACULTY OF SCIENCE

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# EDITORIAL

*In 2025, the University of Sarajevo, Faculty of Science, Department of Geography and Geographical Society of Federation of Bosnia and Herzegovina, continues to issue a scientific journal called "Geografski pregled". It was created in 1954 because of a growing need for scientific geographic research on the territory of Bosnia and Herzegovina. The creation of this journal is a major contribution to the development of geographic science in Bosnia and Herzegovina. The Journal is primarily intended for the presentation of scientific and professional achievements in all fields of geography.*

*This is the 52nd issue of the journal. The Journal will be exchanged in Bosnia and Herzegovina and abroad, primarily in Europe, but also overseas. The Faculty of Science and Department of Geography, which financially supports the issuance of "Geografski pregled", prescribed special Instructions for authors to publish their works. It is an integral part of this Journal. Guidelines are based on international standards and norms.*

*I thank the authors for coming with their works, reviewers for their maximum engagement, as well as members of the editorial board, and we invite everyone to further the cooperation with the aim of increasing the total contribution of geography to the overall science and development of our country.*

*Sarajevo, December 2025*

*Ranko Mirić - Editor in chief*

ARTICLES

# SURFACE URBAN HEAT ISLAND IN KRANJ

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*ABSTRACT*
***Surface urban heat island in Kranj***
*The article examines the shape, intensity, and seasonal regime of the surface urban heat island (SUHI) in Kranj. The analysis is based on data obtained through remote sensing from the Landsat 8 satellite. Seasonal variations in the urban heat island are presented, and the impact of land use on its intensity is also assessed. The study identifies areas in Kranj with higher levels of overheating and highlights the important mitigating effects of green spaces within the urban area and its surroundings.*

*KEY WORDS*
*Urban climate, surface urban heat island, heat load, Kranj*

## 1. Introduction

Today, 55% of the world's population lives in urban areas. Projections show that this share could rise to 68% by the middle of the 21st century. Today, the most urbanised continents are North America (82% of its population lived in urban areas in 2018), South America (81%), Europe (74%) and Oceania (68%). The share of the urban population in Asia and Africa is around 50% and 43% respectively. Tokyo is the world's largest city with 37 million inhabitants, followed by New Delhi with 29 million, Shanghai with 26 million, and Mexico City and Sao Paulo with around 22 million each. Today, Cairo, Mumbai, Beijing and Dhaka have almost 20 million inhabitants. By 2030, there are expected to be 43 megacities with more than 10 million inhabitants, mostly in developing regions. However, some of the fastest growing urban agglomerations are those with fewer than 1 million inhabitants. While one in eight people live in 33 megacities worldwide, almost half of the world's urban population resides in settlements with fewer than 500,000 inhabitants (UNDESA, 2024).

Urban environments are therefore the dominant ecosystem for the majority of the world's population. Urban ecosystems represent one of the extreme forms of the so-called builtanthropogenic ecosystem, characterised by dominant anthropogenic energy sources, altered land use and higher energy density compared to natural ecosystems (Douglas, 1983; Forman, 2014; Douglas, James, 2015; Errell et al., 2015; Oke et al., 2017).

One of the most prominent manifestations of urban ecosystems is the shaping of the urban climate, which occurs due to altered energy and mass balances (Douglas and James, 2015; Žiberna, 1996). Urban climate is manifested in altered local atmospheric circulation, precipitation distribution, relative humidity, water balance, and most prominently in the formation of an urban heat island (UHI), characterised by higher temperatures compared to those around cities. We can speak of the formation of a specific temperature field, which addresses not only the differences between the city and its surroundings, but also the differences between the different parts within cities.

Urban construction has increased the proportion of materials such as bricks, natural stone, concrete and asphalt. The changed surface characteristics in settlements have led to a change in the energy balance. Concrete has up to six times the thermal conductivity and almost twice the heat capacity (Oke, 1990) compared to wet soils, so it warms slowly during the day and cools slowly at night. It is this property that strongly influences the diurnal regime of air

temperature differences between the city and its surroundings. The city, with its built-up areas, acts as a thermo-accumulation furnace, absorbing short-wave radiation from the Sun during the day and then emitting long-wave radiation to the cooled surroundings. Temperature differences between the city and the surroundings therefore often occur at the time of minimum temperatures. Fezer (1994, 53-54) also discusses the annual regime of the intensity of urban heat island formation. While cities in subpolar areas experience the most intense urban heat island development during the winter months, in sub-Mediterranean cities it is most developed during the summer months. Research for the city of Maribor shows that the intensity of the urban heat island is highest in the summer months (Žiberna et.al., 2021). The intensity of the urban heat island is also influenced by the morphology of buildings: heat losses in narrow streets with tall buildings are lower at night (Oke, 1990).

The lower vegetation cover in urban areas also results in lower evapotranspiration and thus lower latent energy output, which raises the air temperature during the day and mitigates excessive cooling at night. All of the above has the effect of reducing the losses in the energy balance of the city compared to that of the surrounding area. One of the most visible consequences of this is the emergence of the 'urban heat island'. The energy balance is also altered by human activity in the city (heating, industry, transport), which adds energy to the atmosphere. It also introduces matter into the atmosphere, mainly in the form of pollutants and water vapour. Dust particles also modify the energy balance by reducing the direct and increasing the diffuse solar radiation. Regional climate with weather types, relief and anthropogenic factors are therefore the cause of local changes in the energy balance, changes in the water balance, changes in the composition of the air, changes in the air circulation and finally changes in the values of the climatic elements, leading to the formation of specific climatic conditions in the city, i.e. the "urban climate" (Žiberna, 1996).

In the future, especially in the summer months, we can expect more frequent periods of high heat loads in the event of anticyclonic weather. Adaptation will therefore be necessary also in smaller, densely built-up settlements. The EEA proposes three types of measures to adapt to increasing heat loads in settlements: grey (good quality insulation of buildings, use of external blinds or shutters on windows, passive cooling of buildings, urban design to allow for ventilation), green (preservation and expansion of green spaces in cities, introduction of green walls and green roofs) and soft (awareness raising, heat island mapping and monitoring) (EEA, 2012). The importance of studying heat islands even in

smaller settlements is therefore crucial to raise awareness, warn people of potential upcoming heat stresses and maintain a quality living environment. According to the European Environment Agency, heat waves caused an average of 192 deaths per million inhabitants in Europe between 1991 and 2015. Excluding Eastern Europe, where most deaths from natural disasters are caused by very low temperatures, heat waves are by far the most common cause of death among all natural disasters, exceeding deaths from other natural disasters by an order of magnitude or two. During the 2003 heatwave, 70 000 people died in Europe as a direct result of heat stress (Robine et al., 2008). The heatwave that swept through Russia in the summer of 2010 claimed 20 000 lives there due to high temperatures (Parsons, 2014; METOFFICE, 2024). High temperatures also cause psychological stress and increase interpersonal conflict and other forms of pathological behaviour (Hsiang et al., 2015). Studies have shown that in the USA, every 1°C increase in air temperature above 15°C reduces productivity by 1.7% (Hsiang and Deryugina, 2014).

It is an empirically confirmed fact that any clustered settlement with more than 1000 inhabitants already forms a distinctive heat island (Bonan, 2008). At the beginning of 2024, 56.8% of the population of Slovenia lived in 240 settlements with more than 1000 inhabitants (GIS.STAT.SI, 2024). Most of the population of Slovenia is therefore affected in one way or another by the warming of the air in settlements. Positive trends due to global warming are adding to the heat burden. In Slovenia, the 20th century trends in average air temperature rise were higher than the European average, at 0.34°C per decade (Žiberna, 2017). Summer months, with increasingly frequent heat waves, are also becoming a cause of high heat stress in smaller settlements, thus affecting the health and productivity of the population. The elderly and children, patients with cardiovascular and respiratory diseases, diabetics, patients with kidney disease, patients with mental disorders and the infirm are more at risk. Low socio-economic status, social isolation, poorer access to health services and generally poorer living conditions can further affect their vulnerability (Parsons, 2014).

The annual intensity regime of the urban heat island (UHI) and the surface urban heat island (SUHI) has been the subject of several studies to date. Bechtel et al. (2019) find that in some coastal cities in the USA (San Francisco, Los Angeles, San Diego), the surface urban heat island intensity is highest in spring and lowest in late summer, while in cities such as Fresno and Sacramento it is highest in September and October. Cities in semiarid areas (e.g. Phoenix) even experience lower temperatures in summer and autumn compared to their surroundings (urban cold island) due to irrigation. For London, Zhou et al. (2016) found that

UHI intensity peaks around the summer solstice, while the highest temperatures in the city are typically reached in late July and early August (Zhou et al., 2016). For European cities (Munich, Milan, Warsaw, Budapest), Pongracz et al. (2010) found that the highest UHI intensity during the day occurs during the summer months (June and July) and the lowest during the winter months (November to February). At night, the UHI intensity is steady between March and October, while it typically weakens during the cold half of the year. Nakamura et al. (2018) found that in Kumagaya, Japan, daytime UHI intensity is highest in the summer months, while nighttime UHI is most developed in spring, with nighttime UHI intensity being higher than daytime UHI intensity in all months.

## 2. Methodology

In this paper we consider the surface urban heat island, which represents differences in surface temperatures in Kranj. These can be detected by infrared (thermal radiation) sensors, which are converted into surface temperatures by algorithms taking into account the transparency of the atmosphere. Surface temperatures are closely correlated with the temperatures of the near-surface air layer, as the latter is heated mainly by the absorption of longwave radiation from the Earth's surface (Petkovšek and Hočevar, 1995). In our analysis, we used the remote sensing method of Landsat 8 images in channels 10 and 11 (both of which record radiation in the infrared part of the spectrum), which can be used to obtain land surface temperature (LST) data. The satellite orbits the Earth in 99 minutes and takes a picture of each particle of the Earth's surface every 16 days. If the weather over a given surface is perfectly clear, these images can be used to interpret surface temperatures. Landsat 8 records in the thermal channel at a resolution of 100 m x 100 m, but the data are later resampled to a spatial resolution of 30 m x 30 m (Jensen, 2014; EARTHEXPLORER, 2024).

Temperatures in both channels were averaged and atmospheric correction was also taken into account. For the purpose of our analysis, we used 22 satellite images for days with clear weather over Kranj. The images used cover the time window between 31st of March 2019 and 11th of August 2024. As land use in Kranj has not changed much during this period, especially in the context of the change in built-up areas, we consider the time period to be appropriate. The snapshots are evenly distributed across the climatic seasons (five snapshots each in climatological winter, spring, summer and autumn). Based on the urban surface heat island data, we have calculated the average surface temperatures by climate season.

The winter season includes December, January and February, the spring season includes March, April and May, the summer season includes June, July and August, and the autumn season includes September, October and November.

Surface temperature data were compared with land use, in particular the level of built-up areas. For this purpose, we used the 2018 Corrina Land Cover data (CORINA, 2018). To show the relationship between the level of built-up and the size, shape and intensity of the surface urban heat island, we also included in the analysis data on the proportion of impervious surface, which is basically in raster format with a pixel size of 10 m x 10 m. We have reclassified the fractions into five impervious surface fraction classes (0-10%, 11-30%, 31-50%, 51-80% and 81-100%). We have then calculated the mean seasonal surface temperatures for each of the Corina Land Cover categories and impervious surface fraction classes. Finally, the surface urban heat island intensity was calculated by taking the surface temperature in each season as the reference surface temperature in the pasture/grassland area, and then subtracting these from the average temperatures in the other land use categories in a given season. This is because, according to the World Meteorological Organisation (WMO), meteorological measurements in temperate latitudes are made on grassland, which as such represents the reference land use (WMO, 2008). We have also presented the results spatially.

## 3. Geographical characteristics of the area

According to the Statistical Office of the Republic of Slovenia, Kranj is the third largest settlement in Slovenia, with 37,802 inhabitants at the beginning of 2024. Kranj ranks 55th in terms of area (26.3 $km^2$) and 34th among Slovenia's 6,039 settlements in terms of population density (1,439.4 inhabitants per $km^2$). It is the centre of Gorenjska. The settlement was formed at the confluence of the Sava and Kokra rivers, at the transition from the Kranjsko-Sorsko polje to the hilly Gorenjske Dobrave. On the western side, the Škofja Loka hills and Šmarjetnagora approach Kranj. In the town area, the Kokra river at Primskovo reaches 27 metres relative depth and the Sava river 38 metres relative depth. In the Kranjsko-Sorško polje, both watercourses have formed river terraces. Kranj, on the other hand, spreads over four terraces of the Sava and two terraces of the Kokra. Both watercourses have in the past constituted a natural barrier to the expansion of Kranj. Until the 19th and 20th centuries, the relatively poor communication links between the two banks of the Kokra and the Sava were also a barrier (Pak and Slavec, 2005).

The lower-lying parts of Gorenjska have a pre-mountain variant of a temperate continental climate, characterised by an average temperature in the coldest month that does not fall below -3 °C and by roughly even wetting throughout the seasons (Ogrin et al., 2013).

The area was inhabited as early as the Neolithic period, as evidenced by archaeological finds in Drulovka, in the southern part of Kranj. Later settlements are evidenced by burial sites from the Hallstatt period. In antiquity, the Romans founded the settlement of Carnium, and settlement continued during the migration of peoples. Slavic settlements can be reliably mentioned from the 9th century onwards. Urban settlements can probably be spoken of from the 13th century, but certainly from the 15th century (Šifrer, 1968). An important phase in the development of the settlement was represented by the invasions of the Turks in the second half of the 15th century, the Hussars in the 16th century, the great fires of the 17th and 18th centuries, and the repeated outbreak of the plague between the 16th and 19th centuries. In economic terms, from the end of the Middle Ages onwards, it represents the development of crafts in Kranj (millers, butchers, furriers and leather processors, woodworkers, weavers). In the 16th century, the economic development was also marked by the development of the milling industry. In 1870, Kranj was also connected to Ljubljana by rail, but due to natural obstacles, the railway line ran outside the centre of the settlement, on the right bank of the Sava (Šifrer, 1968). Industrialisation in Kranj came relatively late, after World War I, before which there were only a few small factories in the old town centre. The development of industrial plants between the World War I and World War IIwas largely concentrated on the right bank of the Sava river along the railway line. Between 1920 and 1930, there were already 12 industrial plants in Kranj, 9 of which were textile plants (Šorn, 1960).

Deagrarisation initially led to the immigration of the population to Kranj, and later also to the surrounding settlements, which initially had a distinctly agrarian character (Stražišče, Gorenja Sava, Drulovka, Primskovo, Klanec, Huje, Čirče, Kalvarija) (Pak et al., 2005). After the Second World War, industry developed within Kranj, while urbanisation spread northwards and eastwards, along the left bank of the Kokra river. The construction of single-family houses intensified in the surrounding settlements of Stražišče, Orehek, Klanc, Primskovo and Planina. After 1991, the built-up area expanded in Savski Log, where the "Supernova" shopping centre was built. The Spar shopping centre was built on Klanc, and the Faculty of Organisational Sciences building and a sports hall were built on the north-western edge of the town.

New built-up areas were also created in the municipal and craft zone in Primskovo and along Delavska cesta in Stražišče. After 2000, the built-up area in Primskovo increased with the construction of large commercial and office buildings up to the bypass road in the east (Pak et al., 2005) (Figure 1).

*Figure 1: The area of Kranj.*
*Source: IPI, 2024.*

Table 1 and Figure 2 show the land use in 2018 according to Corina Land Cover (CORINA, 2018). Among the land use categories, the predominant land use is discontinuous urban fabric, which cover 33% of the land area. These are located in the area of the Old Town between the Sava and the Kokra, on the left bank of the Kokra in the area of Čirče, Planina, Huje and Primskovo, and in the northern part of Kranj in the area of Zlato Polje and Struževo. On the right bank of the Sava, they occur over large areas in Stražišče and Orehek. Built-up areas also include areas of industry and commerce, which cover 14,8 % of the area under

consideration, mainly along the Sava, in Primskovo and between Cesta Talcev and Ulica Rudija Šeliga. Built-up areas together cover 48.1% of the area under consideration. The agricultural areas are dominated by non-irrigated arable land (16,0 %) and small-holding agricultural land (12,4 %), which, except in the direction of Šmarjetna gora, fairly regularly fringe the built-up areas in Kranj. Forest areas approach the settlement from the west (Šmarjetna gora) in the largest complex, and from the south-east (Čirče) and east (Hrastovec) in smaller complexes.

*Table 1: Proportion of land use categories in the Kranj area.*

| CLC code | Land use | Share (%) |
|---|---|---|
| 112 | Discontinuous urban fabric | 33.3 |
| 121 | Industrial or commercial units | 14.8 |
| 122 | Road and rail networks and associated land | 0.4 |
| 211 | Non-irrigated arable land | 16.0 |
| 231 | Meadows, pastures | 6.2 |
| 242 | Complex cultivation patterns | 12.4 |
| 243 | Land principally occupied by agriculture, with natural vegetation | 3.8 |
| 312 | Coniferous forest | 6.0 |
| 313 | Mixed forest | 7.2 |
| | Sum | 100.0 |

*Source: CORINA, 2018.*

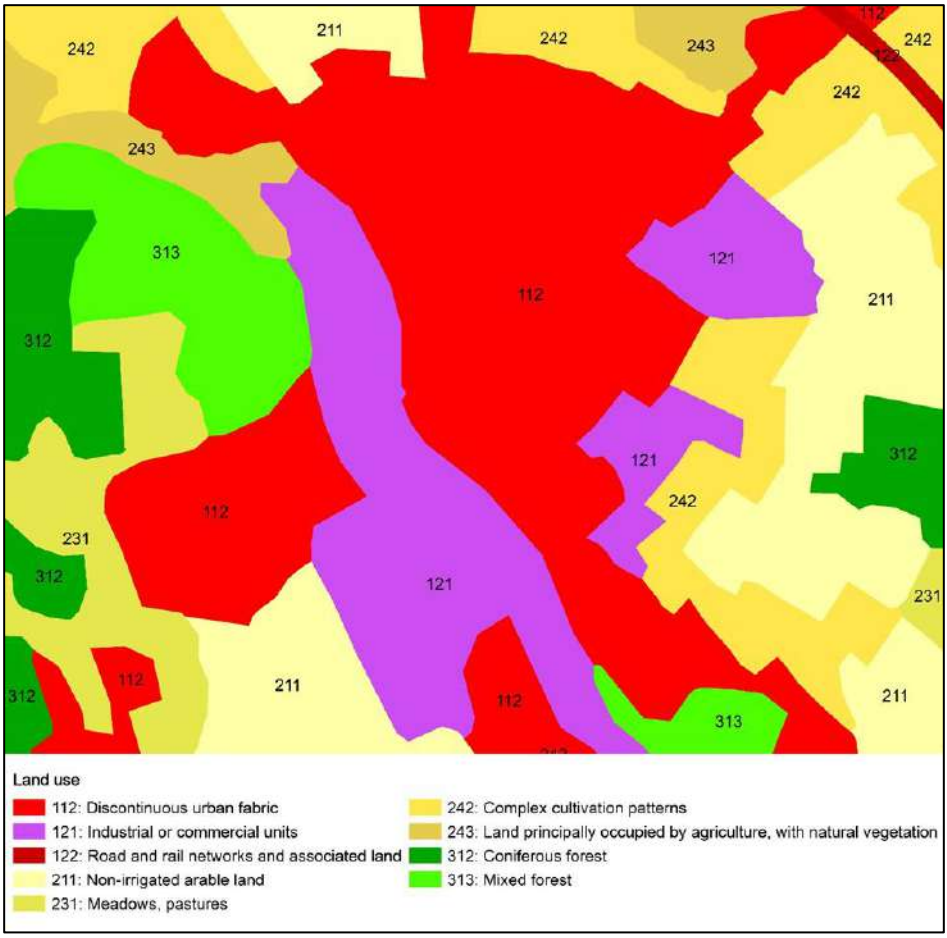


*Figure 2: Land use in the Kranj area.*
*Source: CORINA, 2018.*

In the study area of Kranj, areas with an impervious cover of up to 10% cover 58.1% of the area, areas with 11-30% cover 8.1%, areas with 31-50% cover 8.5%, areas with 51-80% cover 11.5% and areas with 80-100% cover 13.8% of the area (Figure 3).

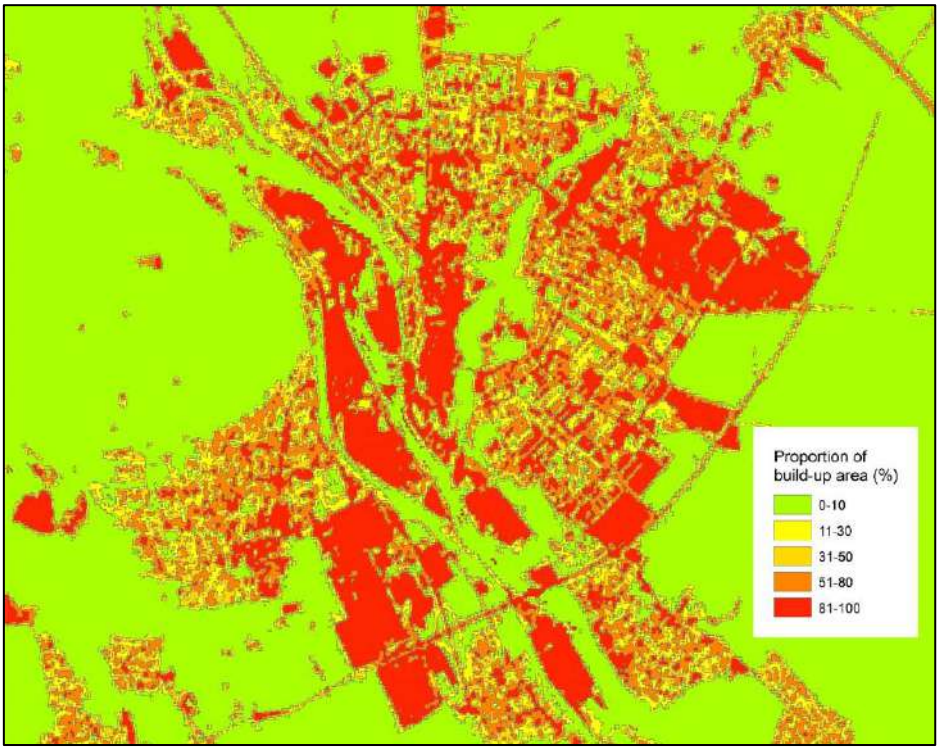


*Figure 3: Proportion of build-up area (%).*
*Source: COPERNICUS, 2018.*

## 4. Results and discussion

### 4.1 Shape, size and intensity of the surface urban heat island in Kranj

In the introductory part of the analysis, we look at the average values of surface temperatures in the area of Kranj. The surface urban heat island in Kranj shows a good correlation with the density of built-up areas. The 17 °C isotherm shows that there are three areas with higher temperatures: in the Old Town area in the triangle between the Sava and the Kokra (1), on the left bank of the Kokra up to the Cesta Jake Platiše and sometimes even up to the eastern bypass (2), and on the right bank of the Sava, mainly in the area of the production and service zone along the Ljubljanska cesta, in the area of the Iskra production facilities and in the Stražišče area (3).

Average surface temperatures are highest in the area of the Sava Trelleborg production site, at around 25.0 °C. Areas with higher surface temperatures include the Supernova shopping centre with associated car parks along Cesta 1. maja and Cesta Boštjana Hladnika (temperatures up to 21 °C), the shopping centre along Cesta Staneta Žagarja with parking lots, the shopping centre and cinema with associated parking lots south of Cesta Rudija Šeliga and the area of the Iskra production facilities between the Sava river and the railway line, in the area of the IBI Centre along Jelenčeva ulica and in the area of the retail and production activity along Šuceva ulica (all with temperatures up to 20 °C) (Figure 4).

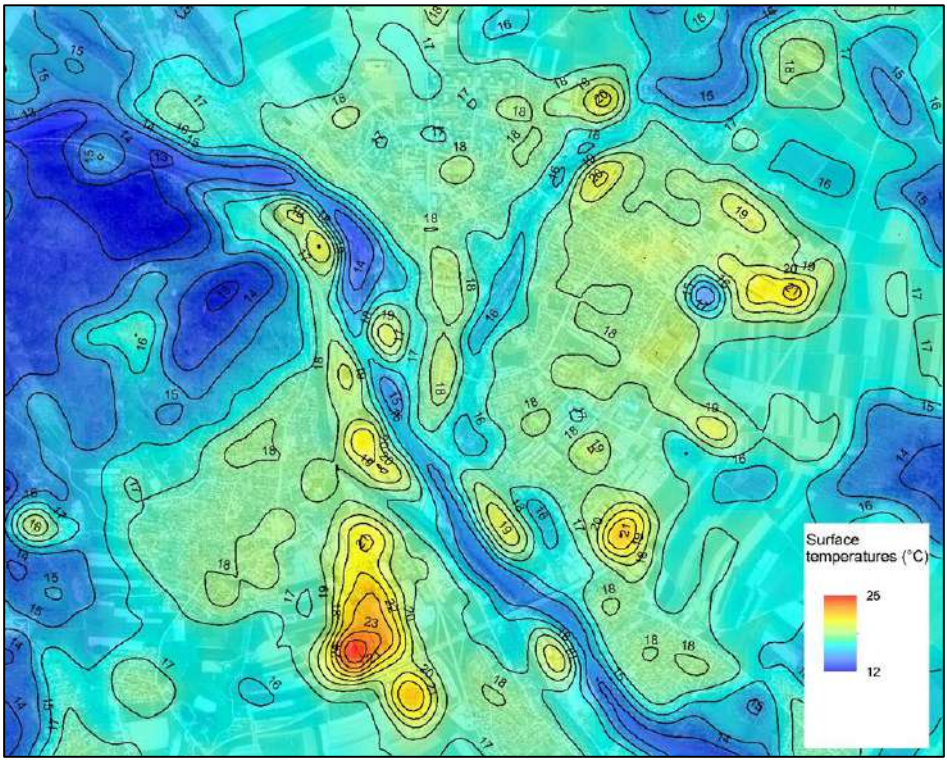


*Figure 4: Annual average temperatures of surface urban heat island in Kranj. Source: EARTHEXPLORER, 2024; Own calculations, 2025.*

Unfortunately, the Corine Land Cover land use typology does not include water areas, which, in addition to vegetated areas, significantly reduce surface temperatures and thus mitigate the negative effects of heat stress during the summer months. In this context, the mitigating effect of the Sava river is particularly important, where surface temperatures are in some places only around 14 °C. The mitigating effect of the Kokra river is also visible, but not as pronounced.

Land use has an impact on surface temperatures due to differences in the density of built-up areas: the highest average surface temperatures in Kranj are recorded in the area of industry and commerce (average temperatures 17.8 °C, maximum temperatures 25.0 °C) and in the area of discontinuous urban fabric (average temperatures 17.3 °C, maximum temperatures 20.4 °C). The lowest average surface temperatures occur in coniferous and mixed forests (14.3 °C) and predominantly agricultural areas (14.7 °C) (Figure 5).

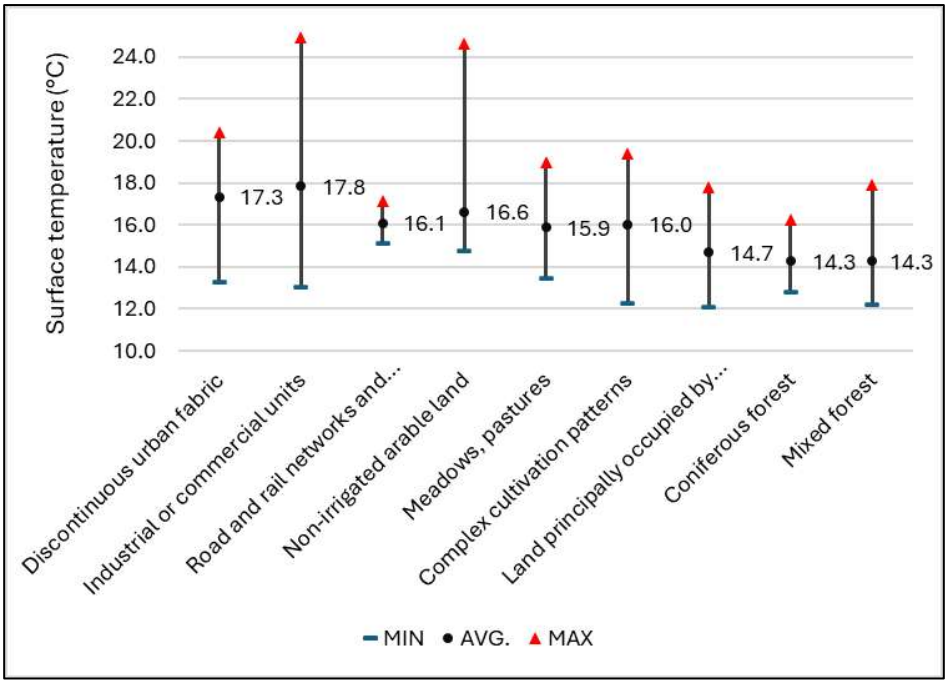


*Figure 5: Average, maximum and minimum surface temperatures by land use category in Kranj.*
*Source: EARTHEXPLORER, 2024; CORINA, 2018; Own calculations, 2025.*

All these categories are characterised by a higher proportion of vegetation, which, for the reasons mentioned in the introductory section, mitigate excessive surface warming. In this respect, the important mitigating effects of the forests on Šmarjetna Gora and the individual remaining forest areas to the east and north of Kranj should be highlighted. The area of industrial and commercial activities has the highest variation in average surface temperatures (11.9 °C).

An interesting situation occurs at the intersection of Cesta Staneta Žagarja and Cesta Jake Platiše in the north-eastern part of the city. This is the former printing house Gorenjski tisk, which went bankrupt in 2019. The halls are now used for activities that do not generate heat energy, and the eastern part is even cooled by air-conditioning. In this area, the surface temperatures are slightly lower than the surrounding area, so we can speak of a kind of island of lower temperatures.

Let's take a look at the intensity of the average surface urban heat island in Kranj. Here we show the deviations of the temperatures at individual pixels from the average temperatures in meadows and pastures. The highest intensity is found in the area of the production and service area on the right bank of the Sava river along the Ljubljanska cesta, where surface temperatures are about 9 °C higher than in the meadows and pastures. The high intensity of the urban surface heat island is also evident in the area of the shopping centres in the eastern part of the city (up to 6 °C), in the area of the Iskra production facilities on the right bank of the Sava river and in the area of the IBI Centre in the northern part of the city (up to 4 °C everywhere).

Surface temperatures are 3 °C lower in the forest area on Šmarjetna Gora and 2 °C lower in the Sava riverbed and forest area east of Kranj (Figure 6).

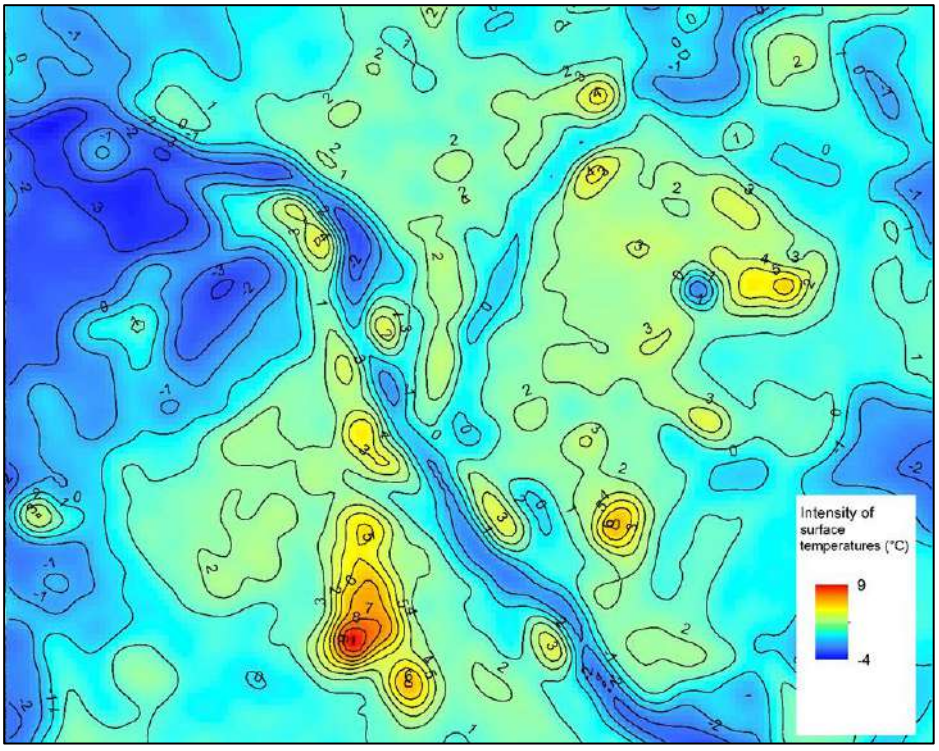


*Figure 6: Intensity of the average surface urban heat island in Kranj. The deviations of the surface temperatures from the average temperatures in meadows and pastures are shown.*
*Source: EARTHEXPLORER, 2024; Own calculations, 2025.*

The intensity of the average surface urban heat island in Kranj is highest in areas of industry and commerce, where average surface temperatures are 2.0 °C higher than in meadows and pastures. There is also a high intensity in discontinuous urban areas (1.5 °C). The lowest intensities are found in coniferous and mixed forests (-1.6 °C) and in predominantly agricultural areas with large areas of natural vegetation (-1.2 °C) (Figure 7).

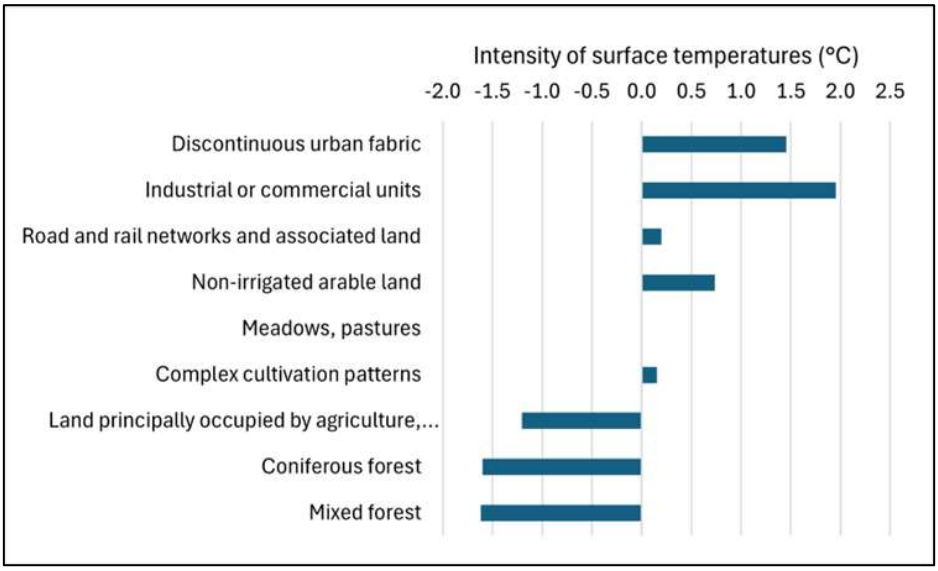


*Figure 7: Intensity of the average surface urban heat island in Kranj by land use category.*
*Source: EARTHEXPLORER, 2024; CORINA, 2018; Own calculations, 2025.*

Changes in surface temperatures also correlate well with changes in the proportion of the surface built-up. In areas with a built-up rate of up to 1%, average surface temperatures are 15.7 °C, increasing with the built-up rate to 17.5 °C in areas with built-up rates of 51%-80% and 18.2 °C in areas with built-up rates of 81%-100% (Figure 8). The latter are mainly located in the Old Town and in the manufacturing and service (commercial) areas on the outskirts of the city.

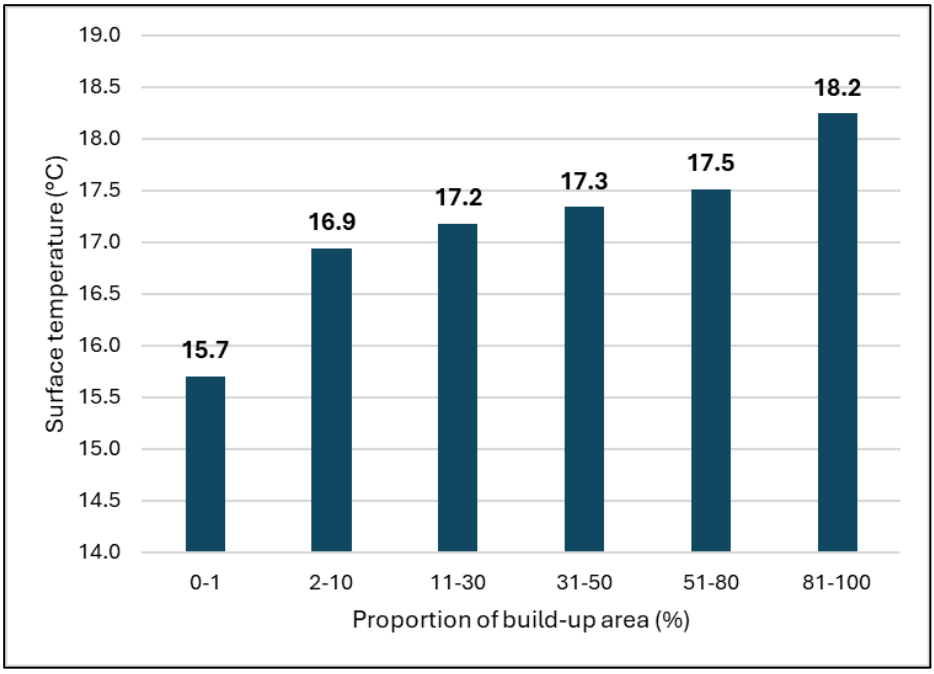


*Figure 8: Average surface temperatures as a percentage of built-up area in Kranj. Source: EARTHEXPLORER, 2024; COPERNICUS, 2018; Own calculations, 2025.*

### 4.2 Annual regime of the shape, size and intensity of the urban surface heat island in Kranj

The urban surface heat island varies in shape, area and intensity over the year. In Kranj, the urban surface heat island is smallest and least intense in winter. The temperature differences between the warmest and coldest pixels are only 7.3 °C. The snow cover obliterates the differences in the physical properties of the substrate, even though the snow cover is quickly removed from roads and parking areas by ploughing. The influence of the low solar elevation angle and the short daylight hours must also be taken into account (Žiberna, 2021; Žiberna et al., 2021). In the Ljubljana basin, a temperature inversion is common in winter and the associated phenomenon of low cloud cover or fog lowers the values of direct solar irradiance (Kastelec et al., 2007). During the winter months, due to the lower altitude angle of the Sun, the relief is of greater importance. The slopes receive relatively more solar irradiation than the flat areas, while at higher solar altitudes (in summer, and partly also in spring and autumn), the relief factors are

less important (Šegota and Filipčić, 1996). This can be seen in Figure 9, where it can be observed that in the pastures and meadows on the sloping southern slopes of Šmarjeta Gora, surface temperatures are comparable to, or even one tenth of a °C higher than, surface temperatures in the areas of industry and commerce.

During the spring months, the surface urban heat island starts to intensify and also become more structured, as areas of discontinuous urban fabric surfaces and areas of industry and commerce become warmer than other areas. The temperature difference between the warmest and the coldest pixel increases to 18.9 °C within the study area. The urban surface heat island starts to intensify mainly in the areas of industry and commerce in the southern and western part of the city (average surface temperature 18.6 °C), and to a lesser extent in the of discontinuous urban fabric areas (17.9 °C), with the old town centre not standing out as a distinctive feature.

In summer, the urban surface heat island is at its most developed and the differences in surface temperatures between different parts of the city are still high, despite the overheating of lower built-up areas. The difference between the warmest and the coldest pixel is 17.0 °C. The highest surface temperatures are still found in the area of manufacturing activities along Ljubljanska cesta (Sava, Iskra) and in the shopping centres along Cesta Boštjana Hladnika. The highest average surface temperatures (30.4 °C) occur in the area of industry and commerce, while slightly lower average surface temperatures (29.7 °C) occur in the of discontinuous urban fabric areas, which also include the old town centre and areas on the left bank of the Kokra river.

During the autumn months, the urban surface heat island weakens and the temperature differences between different parts of the city decrease: the temperature difference between the warmest and coldest pixel drops to 12.0 °C, which is even lower than the temperature differences in spring. Surface temperatures are still highest in the area of the Sava and Iskra production plants along Ljubljanska cesta, in the shopping centres in the eastern part of the city and in the Old Town. Average surface temperatures are still highest in areas of industry and commerce (20.8 °C), and only 0.3 °C lower in discontinuous urban fabric areas. In general, autumn surface temperatures are higher than spring temperatures. In spring, the ground is still cool due to winter and snow cover, while in the autumn months, the surfaces are still overheated from summer.

The lowest temperatures occur in all seasons in forest areas and predominantly agricultural areas, and the influence of the Sava and Kokra rivers is of particular importance in the warm half, as they mitigate excessive overheating, at least in the belt along the beds of both rivers (Figure 9).

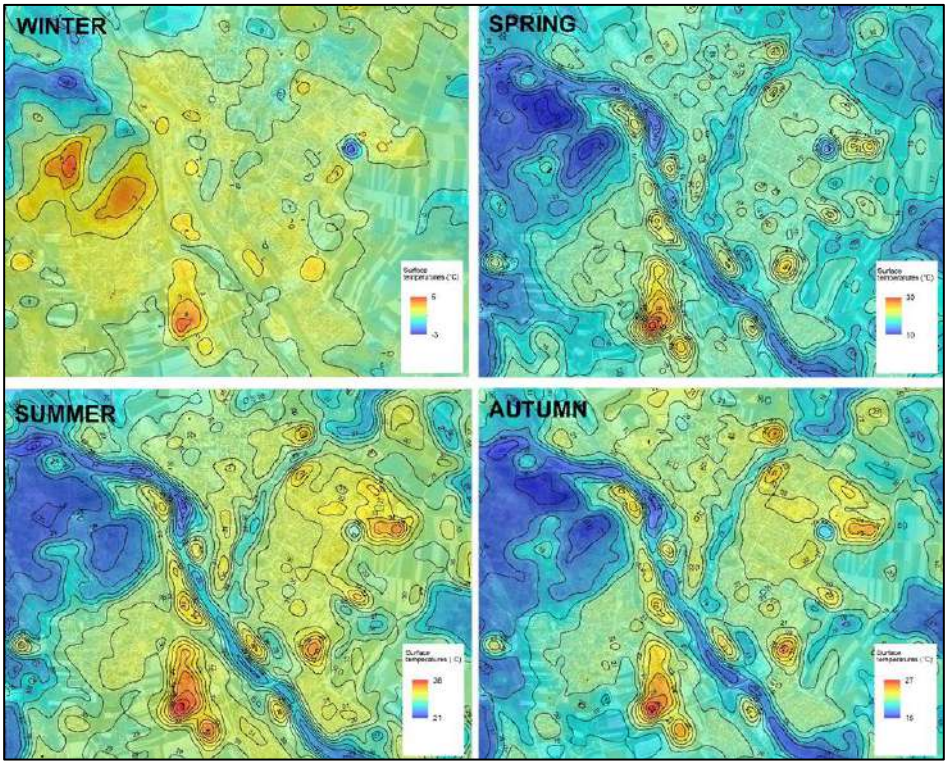


*Figure 9: Surface urban heat island in Kranj by season.*
*Source: EARTHEXPLORER, 2024; Own calculations, 2025.*

In terms of analysing the size, shape and intensity of the surface urban heat island in Kranj by season, it is perhaps even more illustrative to show the intensity of the surface urban heat island by plotting for each pixel the temperature deviations from the average temperatures in meadows and pastures. As the data are normalised we have used a single legend for all seasons in the spatial representation of the Surface Urban Heat Island Intensity (Figure 10). It can be observed that the temperature field is most homogeneous in winter, and most structured in summer and spring, with areas that we have already highlighted in

the discussion so far standing out in either a positive or negative direction. Figure 11, which shows the intensity of the surface urban heat island by land use category, also shows that:
1. In the warm half of the year, areas with industry and commercial activity and discontinuous urban fabric areas are the warmest, while areas of forests and predominantly agricultural land are the coolest.
2. The smallest differences in surface temperature between land use categories occur in winter (the reasons for this have already been discussed), while the largest differences occur in spring and summer).

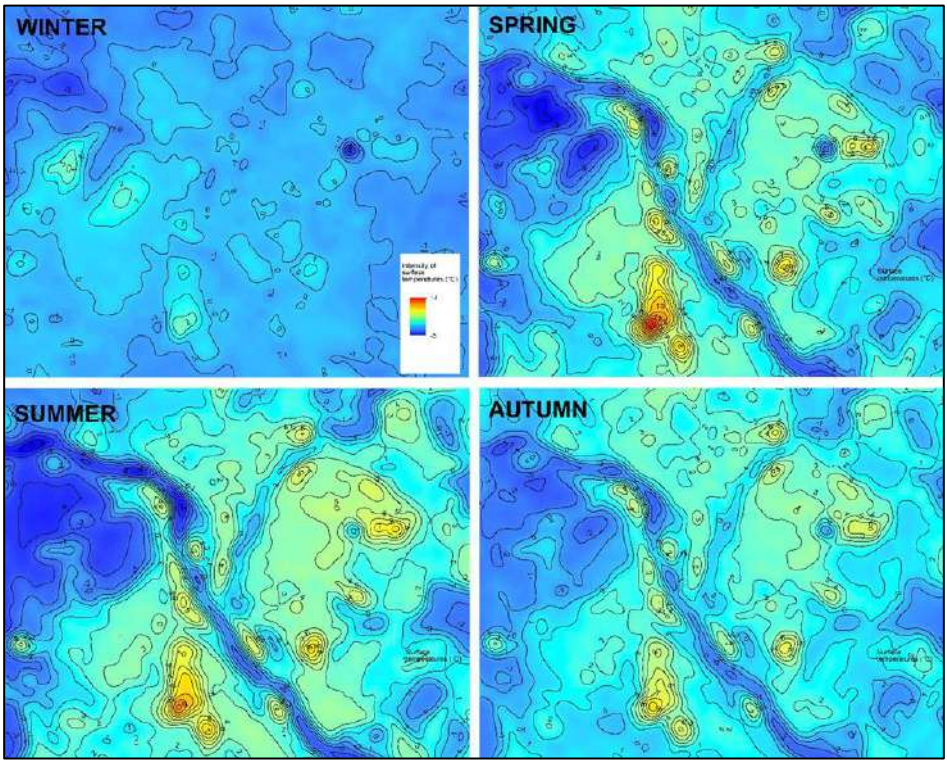


*Figure 10: Intensity of the surface urban heat island in Kranj by season.*
*Source: EARTHEXPLORER, 2024; CORINA, 2018; Own calculations, 2025.*

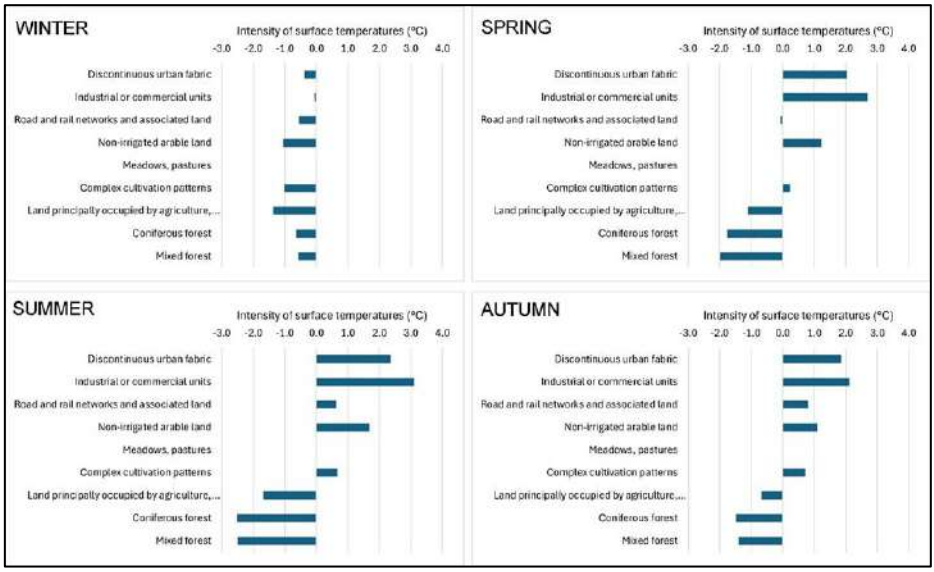


*Figure 11: Intensity of surface temperatures in Kranj by season and land use. Source: EARTHEXPLORER, 2024; CORINA, 2018; Own calculations, 2025.*

In the following, we analyse the seasonal regime of the surface urban heat island in relation to the proportion of built-up area. As the proportion of built-up area increases, surface temperatures increase in all seasons. Surface temperatures are by far the highest in all classes of surface coverage, while autumn surface temperatures are higher than those in spring. It is also noticeable that in spring the differences in surface temperatures between classes with different levels of coverage are higher than in autumn. In spring, the differences between the least built-up areas (0-1%) and the most built-up areas (80-100%) are 3.3 °C, and in autumn they are 2.6 °C. The largest differences are in summer, namely 3.6 °C. The smaller autumn differences in surface temperatures, which are a result of differences in the proportion of built-up area, are probably contributed to by the fact that less built-up areas are also overheated in the summer months, which affects the still relatively high temperatures in these areas in autumn. As evidence for this thesis, we should cite the fact that surface temperatures in the least built-up areas (0-1%) are 27.3 °C in summer, which is higher than surface temperatures in the most built-up areas (81-100%) in autumn (21.4 °C) (Figure 12).

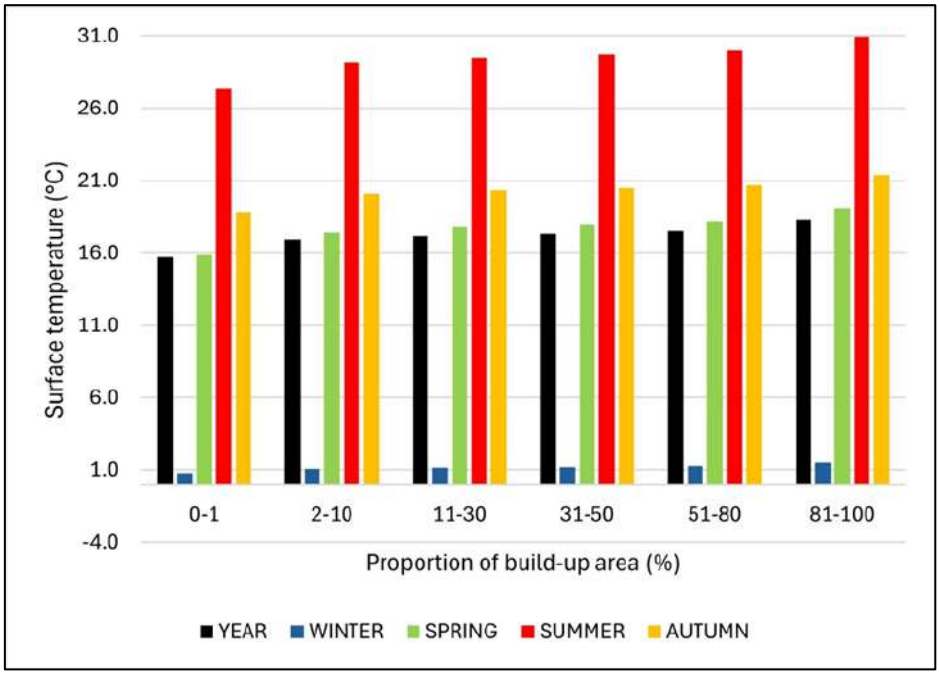


*Figure 12: Surface temperatures according to the proportion of built-up areas in Kranj by season.*
*Source: EARTHEXPLORER, 2024; COPERNICUS, 2018; Own calculations, 2025.*

## 5. Conclusion

Kranj is the third largest settlement in terms of population in Slovenia as of 2020 (PXWEB, 2025). As such, the settlement already forms a visible surface urban heat island. Surface temperatures are highest in the most densely built-up areas, especially in areas of industrial and commercial activity. We would highlight in particular the industrial part of Sava and Iskra in the south-western part, and the shopping centres in the eastern part of Kranj. Surface temperatures are highest in summer and higher in autumn than in spring, although the differences in surface temperatures between different parts of the city are higher in spring than in autumn. In winter, the urban surface heat island is the least structured. Under conditions of global warming, green and water areas in cities will have an increasingly important mitigating effect against the risk of overheating and the associated heat stresses to which vulnerable population groups (the elderly, the

sick, children, pregnant women, socially isolated groups) will be particularly exposed. Future urban development should not only preserve existing green and water areas in the city, but also expand them. This is the only way to maintain an adequate quality of the living environment in the face of increasingly intense heat loads.

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ARTICLES

# EDUCATIONAL BENEFITS OF INTEGRATING GIS INTO GEOGRAPHY TEACHING

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*ABSTRACT*
***Educational benefits of integrating GIS into geography teaching***
*This study explores the role of Geographic Information Systems (GIS) in modern geography education. GIS fosters the development of spatial literacy and critical thinking skills through interactive and visual learning methods. It connects students with real-world geographical contexts, encouraging active participation and interdisciplinary reasoning, which enhances comprehensive understanding of spatial relationships. GIS promotes inquiry-based learning by enabling question formulation, data analysis, and hypothesis development, thus shaping competent individuals capable of addressing global challenges. Despite its numerous benefits, barriers such as e.g. a lack of teacher training and limited resources hinder widespread adoption. Overcoming these obstacles is essential for the successful integration of GIS into the curriculum. Overall, GIS is a vital tool for advancing geography education and preparing students to actively participate in society, especially in a digitally oriented world.*

*KEY WORDS*
*geographical education, GIS, learning process, geoliteracy, skills development*

## 1. Introduction

The educational dimension of Geographic Information System (GIS) remains relatively limited, and its pedagogical potential is largely underutilized, particularly at the primary and secondary levels of education. The integration of GIS into teaching is based on interdisciplinary research encompassing geography, information technology, didactics and pedagogy (Mitchell et al., 2015). However, it is impossible to view the educational applicability of GIS in isolation from the broader processes of informatization and digitalization of education. The introduction of computers into classrooms has transformed the role of teachers and placed students at the center of the learning process, emphasizing independent knowledge acquisition (Retschitzki and Gurtner, 1997). Because of its multifunctionality, the computer has become one of the most versatile teaching tools within modern education. The use of GIS in the classroom promotes the development of students' cartographic skills and spatial thinking, although these outcomes are often difficult to quantify and measure accurately (Hickman, 2023). From a theoretical standpoint, four major perspectives explain the development of cartographic understanding during childhood: nativist, developmental-psychological, social and informational (Wiegand, 2006).

The information-processing approach provides the most suitable framework for understanding the impact of GIS on learning and skill acquisition. Digital maps enable students to explore spatial connections among geographic phenomena in a dynamic and interactive way. The pedagogical use of GIS reflects the transition from a behaviorist to a constructivist approach in education (Keiper, 1999). GIS-based methods, grounded in inquiry and problem-solving, promote experiential learning and offer a fresh perspective on teaching practice. By engaging students as active participants, GIS can transform them into 'cartographers', empowering them to represent and interpret the world from their own viewpoint.

GIS has also inspired discussions about comprehensive educational reform, particularly within the field of geography, though its applications have proven equally valuable in biology and other sciences (Demirci, 2008; Lenart, 2011). Its purpose in education is to stimulate spatial thinking and prepare students for active participation in addressing societal and environmental challenges. According to Kerski (2015), five global trends – geoawareness, geoenablement, geotechnologies, citizen science and geonarrative, have the potential to bring geography and GIS to the forefront of global education.

The European Union emphasizes that digital geotechnologies allow educators and researchers to better address the contemporary challenges facing Europe (Donert, 2014). Nevertheless, numerous questions remain to be explored before GIS can be fully and effectively integrated into geography education (Bowman, 2015).

Since geography teaching focuses on understanding why phenomena and objects are located where they are, GIS serves as a natural partner to the discipline, regional geography in particular (Sinton, 2016). Skilled teachers can integrate GIS methodologies into both inductive and deductive reasoning processes. Visualization of spatial data and the use of regional concepts remain essential for meaningful geographic education (Borghs and Johansson, 2010). GIS education involves two complementary approaches: teaching about GIS and teaching with GIS. The former focuses on GIS as a subject of study, primarily in geoinformatics and career-oriented training, while the latter uses GIS as a tool to enhance learning across disciplines. In the first two decades of 21st century, most leading universities worldwide had introduced GIS courses or specializations, and its presence has continued to expand into secondary schools and informal education programs (Baker et al., 2012).

Teaching about GIS emphasizes geoinformatic processes such as data processing, spatial analysis and planning, components identified by Koutsopoulos (2010) as the foundation of a conceptual framework for GIS education. Teaching with GIS, on the other hand, aims to create a pedagogically coherent model that integrates diverse spatial topics into a unified system. Much like the microscope, telescope, or computer systems in other sciences, GIS serves geography as a critical instrument for description and analysis. This approach strengthens rather than diminishes traditional educational goals, enhancing students' understanding of spatial relationships and the world around them (Jo et al., 2016).

Previous discussions on the integration of GIS technology into the educational system have generated numerous hypotheses about the potential benefits this approach may bring, particularly in the teaching of geography. Experiences from various countries have confirmed many of these positive assumptions (Milson et al., 2012), although there are also studies in this area has produced mixed results (Favier and Van Der Schee, 2014; Romadlon et al., 2021). Consequently, researchers and educators still face a long process of determining the full range of effects that the use of GIS may have in classrooms (Karolčik et al., 2016).

It is also necessary to identify the conditions under which positive outcomes can be achieved and negative ones minimized. This paper provides an overview of the advantages most frequently mentioned in existing academic literature, regardless of the extent of their empirical validation. These advantages span several dimensions (cognitive, didactic, practical and technical), each of which requires further research and assessment. According to current studies, GIS enhances the learning process, supports an inquiry-based approach to teaching, and helps students better understand geographical reality. It raises the level of geographic literacy, stimulates student interest and motivation, and promotes interactivity and critical thinking. Moreover, GIS helps develop skills relevant to future career paths, encourages teamwork, facilitates the planning and implementation of fieldwork and enables interdisciplinary learning. It also allows for easier updating of spatial content, fosters partnerships between schools and local communities and provides a number of technical advantages over traditional teaching methods. The majority of these claims are supported by clear scientific evidence from studies conducted over the past decades (Schulze, 2021).

## 2. Enhancing learning process

The claim that GIS enhances the learning process is often taken as a starting point in discussions about the role of geoinformation technologies in education. Without this assumption, there would be little reason to consider integrating GIS into the teaching process, since progress in achieving learning goals and outcomes is the very reason why innovative concepts like this are introduced in the first place (McClurg and Buss, 2007; Goldstein and Alibrandi, 2013). It is important to emphasize that the use of GIS technology does not replace or diminish the value of traditional cartographic skills. Rather, its educational role lies in broadening students' spatial understanding. According to Lateh and Muniandy (2010), GIS is far more than a convenient tool for organizing and using spatial data. It facilitates spatial reasoning and thus promotes higher levels of cognition. Lenart (2011) argues that GIS bridges students' cognitive needs with their lack of technical or theoretical knowledge, helping them perceive the 'big picture' and understand the interconnectedness of spatial phenomena (Kerski, 2012).

Jo and Hong (2020) claims that learning GIS helps enhance students' ability to generate and recognize some spatial concepts, those explicitly learned in relation

to the tools and functions of GIS software. Bevainis (2008) observes that GIS allows more time for observation, analysis and discussion of spatial issues.
For geography teachers, the most compelling argument for incorporating GIS into curricula lies in its potential to foster spatial thinking skills. As early as 1994, geography education standards i USA emphasized the integration of GIS at lower educational levels to strengthen geographic skills and spatial cognition. Three key dimensions of spatial thinking were identified: visualization, orientation and understanding of spatial relationships. Bednarz (2004) lists several types of spatial tasks frequently used in classrooms, such as recognizing spatial patterns, identifying shapes, memorizing spatial arrangements, linking locations, clustering and correlating phenomena and understanding spatial hierarchy and proximity, that can all be enhanced by GIS. Through the use of geoinformation technologies, students more easily construct their own cognitive maps, which they then employ in spatial and non-spatial decision-making. Golledge and Bell (1995) note that it is difficult to identify a GIS function that lacks a counterpart in the human cognitive system. The main pedagogical argument for GIS is that it allows students to learn geography through practical and visual spatial reasoning (Sinton, 2016). In this sense, GIS not only models, but also visually demonstrates cognitive strategies used in spatial analysis, serving as a powerful analytical tool for understanding spatial patterns (Ridha, 2020).

GIS proves especially effective in problem-based learning, where it supports the development of both individual and collaborative geographic skills. Artvinli (2010) emphasizes its role in improving visual-spatial comprehension, critical thinking and professional skills, while Zwartjes (2014) highlights its contribution to realism, engagement and relevance in the learning process. The full educational potential of GIS is realized when curricula are aligned with modern, technology-oriented teaching methods. Numerous international examples support this claim. In the 1990s, geography and environmental studies became more prominent in US curricula, creating favorable conditions for the adoption of GIS in education. The technology proved to be a highly effective tool for illustrating spatial and ecological concepts and supporting project-based learning (Palladino and Goodchild, 1993). Later experiences confirmed these assumptions, despite initial teacher skepticism regarding the ability of GIS to meet educational standards (Kerski, 2003).

In the UK, the geography curriculum emphasizes concepts such as place, space, scale, interdependence and diversity, and many geographers believe that GIS provides the most effective tools for teaching these topics. Sinton (2016) argues that integrating GIS into learning goals and pedagogical approaches creates

richer and more comprehensive educational experiences that reinforce spatial perspectives. However, for GIS to become more firmly embedded in educational systems, further empirical research is needed to demonstrate its actual impact on learning outcomes, as existing studies remain limited and yield mixed results (Viehrig, 2014).

The development of critical thinking represents one of the fundamental pillars of contemporary education as a whole. Among school subjects, geography stands out as a field where the contrast between the once-dominant traditional teaching principles and modern, cognitively oriented approachesis especially pronounced. GIS has been recognized as an effective method for fostering progress in this area (Baker and White, 2003; Kerski, 2012). Geoinformation applications have proven to be a particularly fertile ground for developing critical thinking within regional geography (Biebrach, 2007).

Consequently, they have become an additional argument for the educational revitalization of the regional concept, as discussed in previous chapters. Through GIS methodology, it has become increasingly evident that conducting studies focused on specific areas can make a substantial contribution to formulating or confirming general conclusions. While GIS technology is certainly not the only means of promoting critical thinking among students, it is one of the few that integrates all the key types of information necessary for forming well-reasoned, evidence-based opinions and making informed decisions. The creation of realistic spatial models in GIS provides an objective source of information, which must then be cognitively processed to generate meaningful and applicable knowledge.

## 3. Inquiry-based learning

One of the most frequently cited benefits of implementing GIS technology in geography education (and in education more broadly) is its contribution to developing inquiry-based learning. According to Bevainis (2008), fostering research skills represents one of the most effective ways of integrating GIS into geography teaching. Optimal learning conditions are achieved through projects of varying complexity, which promote deeper understanding and active student engagement. However, even in many highly developed countries, geography education remains insufficiently focused on student inquiry. GIS therefore emerges as a tool capable of significantly improving this aspect of instruction. With GIS, students can collect data, formulate geographic questions, test

hypotheses, analyze and evaluate information, as well as receive immediate feedback, allowing them to make informed decisions based on newly acquired knowledge. Biebrach (2007) highlights an example of teaching regional differences between northern and southern Italy, noting that GIS use created more opportunities for analysis and discussion compared to traditional approaches.

Furthermore, GIS facilitates problem-based learning, particularly when this methodology is embedded in the curriculum. It enhances spatial reasoning and problem-solving skills (Metoyer and Bednarz, 2017), while also encouraging both teachers and students to engage more deeply in inquiry, collaboration and the use of real-world data and tools. The inquiry-based approach is considered crucial for the successful integration of GIS in education, as it helps students develop scientific and analytical thinking, especially regarding dynamic changes in geographic space (Kerski, 2013). This model fundamentally transforms the traditional teacher-centered classroom, placing students at the core of the learning process and empowering them to actively guide it. Empirical research confirms that this approach enhances student motivation and performance on standardized tests (Crews, 2008; Goldstein, 2010; Kerski, 2011). Accordingly, most authors recommend that GIS be implemented primarily through student research projects, as this method most effectively realizes the educational potential of geospatial technologies.

Although it may not be immediately apparent to some, GIS and other geotechnological tools can be extremely valuable for planning and conducting both fieldwork and remote teaching (Robinson et al., 2015). This is supported by numerous documented examples, studies and articles (Fox-Gliessman and Kerski, 2005; Kerski, 2012; Pernica, 2017). In this context, GIS actually enables the conceptual and cognitive integration of the cartographic, analytical and field dimensions of a problem within a real-world space. Geographic fieldwork most often takes place in the immediate vicinity of the school, or within the local area, which requires the use of large-scale cartographic materials containing a high density of spatial details in real time. Without GIS technology, such materials are usually difficult to provide for student use, meaning that fieldwork is often conducted without adequate cartographic preparation and, consequently, without a comprehensive analytical approach. As a result, field-based geography lessons frequently fail to reach their full potential.

By using GIS as a teaching tool, which can integrate maps of various scales, satellite imagery, data collected directly in the field (via GPS or remote sensing),

relevant statistics and many other data sources, these challenges can be effectively addressed with a proper methodological approach.

## 4. Real-world perspective

Another key educational effect of GIS is its ability to bring learners closer to real-world geographic contexts, closely linked to the aforementioned benefits. In a large-scale study involving 1,520 schools across the United States, Kerski (2003) found that teachers identified GIS's greatest advantage as its capacity to make lessons more relevant to the real world, earning the highest average rating. For geographers and geospatially literate individuals, this is hardly surprising, since modeling geographic reality is the very foundation and purpose of GIS development. The geographic environment consists of complex interrelations that are difficult to grasp through direct observation alone. Even traditional maps cannot always provide a complete picture, as each contains limited information, while using multiple unintegrated maps increases cognitive load. GIS, in contrast, integrates spatial data from various sources, thus realizing the full educational potential of geography as a synthetic spatial science.

Vemić (2009) emphasizes the realism of virtual representation compared to traditional maps, as they provide three-dimensional representations of terrain, natural structures, colors and lighting. Such realism makes GIS-based depictions more engaging and comprehensible for learners (Koc and Burcu Topu, 2022). Additionally, GIS allows users to design and customize their own maps, further connecting them to geographic reality. The key component in this process is geovisualization, since human understanding of geographic space is primarily visual. The interactivity of GIS and other visualization tools further enhances spatial reasoning and reveals hidden relationships within space. In this way, GIS serves as a modern tool for implementing the long-standing educational principle of visual and experiential learning in geography. As Manakane et al. (2023) state, the integration of geospatial technology opens up opportunities for more engaging and effective contextualized learning in the digital era.

Promoting interdisciplinary learning is also considered important for developing a real-world perspective. Baloğlu Uğurlu (2008) emphasizes that GIS technology establishes coherence between different disciplines. This aspect is important because modern educational concepts assume that knowledge about the world around us is inherently unified and that all its components are interconnected, to varying degrees.

Consequently, complete separation of scientific fields is no longer acceptable in the educational process, leading to an increasing emphasis on interdisciplinary topics. The role of GIS in this context lies in integrating spatial knowledge and skills that can be applied across various disciplines, not just geography. Several examples have already been cited in this dissertation of successful GIS applications in teaching other subjects, such as mathematics, chemistry, IT, history, ecology, biology, etc. (Arlinghaus and Kerski, 2014).

It is well known that geography, as the science of space and the natural domain for GIS development, can significantly contribute to broader understanding in other academic disciplines within school curricula, a trend already recognized and supported in many countries. In this context, it is also important to highlight the significance of student projects, as they represent the most practical way to implement an interdisciplinary approach in schools.

Partnership between schools and the local community is a desirable relationship, primarily because schools are integral parts of their communities, and students should, through the educational process, develop a sense of belonging to them. This also involves becoming familiar with the issues that affect the local environment, many of which have a clear spatial dimension. The role of GIS in connecting schools and their students with their immediate surroundings can be understood in several ways. One of the most evident examples is the implementation of school-based GIS projects that involve cooperation with local administrations or other public service agencies (such as the police, fire departments, public utilities, or health services), which can provide data on specific phenomena within the community.

Fox-Gliessman and Kerski (2005) presented such an example in which high school students in a small Colorado town, using GIS and other geotechnological tools in collaboration with the local fire department, conducted a study on the effects of wildfires on nearby mountain terrain. Furthermore, GIS can also serve to strengthen ties between educational institutions and the business sector, ultimately creating numerous potential opportunities both for local economic development and for improving young people’s career guidance. Despite these possibilities, establishing partnerships between schools and the local community remains one of the least recognized potential benefits of this innovative approach (Kerski, 2003).

## 5. Geoliteracy

GIS has been widely recognized as a powerful tool for developing a broad range of skills, particularly geographic literacy (Comber et al., 2008). Çepni (2013) highlights the role of GIS in enhancing spatial perception. Spatial literacy is defined as a set of abilities related to acting and reasoning within spatial environments, such as the capacity to communicate through maps, perceive the world from an aerial perspective, recognize spatial patterns and understand geography as more than a list of toponyms on Earth. It also includes comprehension of spatial concepts such as scale, resolution and cartographic representation (Goodchild, 2006).

According to these definitions, a geographically literate individual possesses a mindset attuned to spatial reasoning – knowing where, when, how and why to think spatially. Such individuals can apply spatial reasoning informally, demonstrate deep understanding of spatial concepts (e.g. distance, direction, or scale), and critically evaluate spatial data for diverse applications (Golledge et al., 2007).

Tsou and Yanow (2010) argue that without emphasizing spatial literacy, geography teachers cannot fully prepare students for life and work in the 21st century. Geoinformation science and technology play a crucial role in this process, as they support the development of geographical, quantitative and informational skills. Geoinformatic literacy is thus considered a component of general digital literacy – a vital element of modern society. Stansfield (2002) identifies its three main elements: geographic, cartographic and informational literacy. Although geography and cartography are distinct disciplines, they overlap significantly, forming the foundation of geoinformatic competence. Through the integration of GIS in education, geoinformatic literacy has expanded beyond academic and expert circles. It is now accessible to students, professionals across disciplines and even the general public. Svatonova and Mrazkova (2010) emphasize that geoinformatic literacy is not limited to the technical use of tools and procedures. It also involves generating new knowledge, insights and decision-making materials. Kerski (2014) introduces the concept of geo-literacy, grounded in three pillars: geographic content, geographic tools and geographic perspective. The last pillar refers to understanding the world from a spatial viewpoint, fostering curiosity and critical thinking, all of which are effectively enhanced through GIS.

## 6. Developing skills for future professional career

In many countries, the incorporation of GIS into the educational process is viewed as an effective way to help students acquire skills relevant to their future career paths. Differences among countires and regions in this respect stem from varying degrees of recognition of the need for advanced geoinformation technologies, something that usually correlates with the general level of socio-economic development. Broadly speaking, professions that involve GIS and other modern geospatial modeling tools are expanding, which in turn creates a growing demand for a skilled workforce. Introducing GIS at lower levels of education allows students to gain early exposure and develop certain technological knowledge and skills that may later prove highly useful in career choice and employment opportunities.

It is therefore assumed that such an approach to teaching can motivate more students to pursue highly valued, in-demand professions in science and engineering (Johansson, 2003). A proper treatment of spatial issues seems more necessary today than ever before, given that problems of a geospatial nature (geoecological, resource-based, demographic, urban, infrastructural, developmental, or political) have never been as pronounced as they are now (Hong, 2016). Consequently, guiding younger generations toward addressing such issues through the use of geoinformation technologies can be regarded as a necessity, one that could yield benefits for society as a whole, both locally and globally.

Bednarz (2004) identifies the career dimension as one of the three key justifications for integrating GIS technology into education, confirming that many arguments for its inclusion in primary and secondary schools are based on the development of professional skills. She refers to the US National Geography Standards Committee, which emphasized this aspect when advocating for the introduction of GIS in schools, expressing concern about the capacity of the American workforce to remain competitive in a rapidly changing global market. In this sense, GIS is presented as a decision-support system that enables action based on spatial data and, importantly, fosters the implementation of critical thinking skills essential for shaping a more intelligent workforce. The professional value of GIS is further illustrated by the growing number of GIS-related programs at universities, certification courses, online training and virtual GIS campuses. Considering all of this, introducing GIS at all levels of education is justified not only for economic reasons, but also as a way to ease the often turbulent transition of young people from school to the workplace.

Among the countries that have recognized the significance of GIS in motivating students to pursue professions related to solving geospatial problems is the United Kingdom. Biebrach (2007) notes that the pilot geography curriculum in England and Wales at the beginning of the 21st century included GIS as one of nine thematic areas, specifying that students would be introduced to its use across a wide range of professions.

The same author recorded opinions from many British geography teachers who believed that GIS helps students see geography as a discipline with real career potential. Moreover, feedback from students was largely positive, as many expressed satisfaction upon realizing that GIS and geography can be useful in so many different fields. Still, this raises an important question: do educators merely prepare students to become efficient workers in an information-driven economy? Should the purpose of GIS education be reduced to adapting new generations to the needs of the market and the labor economy? These rhetorical questions remind us to remain cautious when emphasizing the professional aspects of GIS-related work – education must not, and should not be oriented solely toward market demands.

In many professions, teamwork skills are also very important. The argument that GIS fosters teamwork is rooted in numerous practical examples from various fields. Successful GIS projects are typically the result of synergistic collaboration among multiple team-connected individuals, each of whom has a clearly defined, specific role. Certain experiences indicate that the use of GIS technology can be implemented in a similar way with student populations. This perspective is supported by authors such as Bevainis (2008), who argues that, in general, information technologies enhance opportunities for communication and collaboration among students. Komlenović and Manić (2008) emphasize that GIS in geography education, among other things, contributes to students' mutual communication through modern technologies and digital maps. This teaching method is also credited with strengthening social skills by encouraging students to cooperate with one another (Baloglu Ugurlu, 2008). Although this type of educational benefit can be achieved through various instructional approaches, teamwork in the classroom is most effectively practised through student projects, which is where the use of modern geotechnology in schools is most often focused. In such projects, students are directly dependent on one another as they jointly strive to master geoinformatics skills and find solutions to assigned problems. A team-based approach is recommended even for other uses of GIS in the classroom, as it helps partially mitigate technical and cognitive challenges associated with using GIS software.

## 7. Student motivation

Increased student motivation and engagement represent one of the most visible educational benefits of using GIS in geography instruction. Younger generations, already immersed in digital technologies, tend to prefer interactive, technology-based learning over traditional methods. Teachers who have implemented GIS in their classrooms often report that students find this approach more engaging and enjoyable, leading to greater conceptual understanding (Bevainis, 2008). Many studies confirm the positive motivational effects of GIS (Al Kamali, 2007; Jekel et al., 2008; Tuna, 2009). However, Artvinli (2010) warns that overly complex software or tasks beyond the students' capabilities can lead to decreased interest, underscoring the importance of selecting age-appropriate tools and methods.

West (2003) note that students show higher levels of focus and intrinsic motivation when participating in GIS-based learning. Nevertheless, further empirical research is needed to determine whether this motivation stems from GIS itself or from the novelty of using digital technologies. Despite these uncertainties, it is reasonable to assume that higher motivation leads to improved learning outcomes. If empirical evidence confirms that GIS not only enhances, but sustains motivation throughout the learning process, it would strongly support its educational value in geography. Although the complexity of GIS software can be challenging, the availability of simplified educational versions provides teachers with sufficient flexibility to adapt it effectively.

Another aspect that still requires thorough investigation is the fact that an increase in motivation does not necessarily translate into a direct improvement in the acquisition of geographical knowledge. For instance, even if students are engaged with a computer screen, their attention may not always be directed toward the intended learning objectives. Therefore, the relationship between students' motivation stimulated by GIS technology and their ultimate learning outcomes remains an area that is not yet fully understood. Consequently, this and similar questions deserve greater attention in future research. Despite these observations, it is reasonable to assume that increased motivation can enhance the likelihood of achieving more positive learning outcomes. In this sense, students develop a genuine need for knowledge, an element that is not only crucial at the beginning of the learning process, but also needs to be sustained throughout it. If empirical evidence confirms that GIS increases or at least maintains students' motivation during all phases of learning, this would represent a strong indicator of its positive impact on geography education as a whole.

On the other hand, student motivation may decline if GIS software is perceived as overly complex. An inappropriate choice of software for educational purposes could reduce students' interest in geographical content. However, given the wide variety of GIS software packages available today, teachers have sufficient flexibility to find suitable solutions, meaning that software complexity should not represent a major barrier to the integration of GIS technology in teaching and learning, particularly from the motivational perspective (Biebrach, 2007). Ultimately, it can be concluded that the motivational element plays a significant role in determining learning outcomes. Nevertheless, the exact nature of this relationship, especially concerning the educational use of GIS technology in geography teaching, remains insufficiently explored.

## 8. Student interaction

Focusing on student interactivity represents a fundamental conceptual innovation introduced by GIS methodology when compared to traditional teaching approaches, a point particularly relevant for educational systems such as that of Bosnia and Herzegovina. Through the use of GIS, students become actively engaged in the process of discovering new geographical information rather than serving as passive recipients of monotonous content (Aladağ, 2014). The application of GIS in education reflects a pedagogical shift from a behaviorist to a constructivist approach to learning. Owing to its compatibility with inquiry-based and problem-solving methods, GIS brings a new perspective to classroom instruction.

Johansson (2003) also highlights this shift in focus from behaviorism to constructivism in teaching. By using GIS, students are given the opportunity to construct their own knowledge, which carries much greater long-term value than knowledge acquired passively. Student interactivity manifests through active engagement within peer groups, where learners collectively process geospatial data and interpret the obtained information. This approach transforms the roles of both students and teachers. Students assume a far more active role in the learning process, as purposeful peer-to-peer communication fosters the joint discovery, analysis and evaluation of geographical content.

The introduction of GIS technology into the classroom also significantly impacts teachers. They are no longer the sole source of information and knowledge; instead, their role shifts toward continuous pedagogical development aimed at fostering a motivational learning environment and facilitating the acquisition of

new knowledge and skills. In other words, teachers now enable students to access original sources of information directly (Çepni, 2013). Learning no longer depends primarily on the teacher's interpretation of instructional material, as is the case with traditional, lecture-based teaching. Students are encouraged to seek information online and from other available sources, as well as to generate new knowledge through GIS-based analytical and synthetic methods. Thanks to GIS and digital technology in general, students are no longer confined to outdated textbooks and printed maps.

Although this approach relieves teachers from the burden of transmitting large amounts of factual information, their new role can, in many ways, be even more demanding. Teachers must now guide students through a relatively complex learning process in which numerous technical, pedagogical, methodological and organizational challenges may arise. Steering the learning process often presents greater challenges than leading it directly. Nevertheless, if the anticipated improvements in learning outcomes are achieved, it can be concluded that this transformation of the teacher's role fully justifies its purpose.

## 9. Technical advantages

The technical advantages of GIS methodology, and of virtual geovisualizations in general, over traditional didactic methods in geography education are numerous (Drešković and Avdić, 2017). These have been distinguished as a separate category of benefits within the new methodological approach, primarily because of the need to emphasize that the world is currently in an era of rapid technological advancement, one that plays a critically important role in the continued development of science and education, including the field of geography. The opportunities made possible by the expansion of geoinformation technologies have opened entirely new horizons for exploring geographic space, as well as spatial phenomena and processes.

Berlyant (2011) identifies five main educational values of virtual geovisualizations. The first relates to the creation of an almost perfect illusion of field observations and direct access to geographic objects. The second involves developing habits of visual perception and evaluation of geographic reality across different scales, from small areas of the Earth's surface to the planetary level. The third advantage lies in the significantly facilitated ability to perform cartometric operations (such as determining elevations, distances, areas and angles). The fourth value refers to the opportunity for active and independent

learning. The final value emphasizes the high level of interactivity and feedback between the learner and the geovisualization (Vemić, 2009).

Freeman (2003) argues that GIS technology should be introduced as early as the primary level of education, precisely because of its technical advantages and the potential to familiarize students with the basic functions of GIS that can support the acquisition of specific knowledge and skills. These include understanding raster and vector maps, plotting symbols and routes on digital maps, measuring distances, and comparing and interpreting different digital representations of the Earth's surface. According to the same author, the use of GIS at the secondary level enables students to distinguish between raster and vector maps, master the skills of entering geospatial data into digital maps from various sources, and conduct complex research by linking qualitative and quantitative data to point, line, or polygonal features within a GIS environment. At the highest educational levels, students can also acquire skills necessary for performing advanced tasks such as selecting and using different raster and vector formats, creating various geodatabases, images and other cartographic materials, analyzing data and presenting them through appropriate cartographic means, and designing procedures that allow the use of maps by other users (Komlenović and Manić, 2008).

The updating of spatial content in geography education is a particularly important issue that educators should pay close attention to. Among all scientific disciplines, geography's subject matter is characterized by the greatest degree of temporal dynamism. As a result, spatial data, information and facts can become outdated rather quickly amid the rapid transformations of today's globalized world. This applies primarily to the social elements of space, such as population, settlements, economic activities and political conditions, but the natural environment is also changing increasingly fast due to human influence, as most clearly seen in the case of climate change. Consequently, traditional educational materials such as textbooks, maps and atlases have a progressively shorter period of relevance, and updating them in line with real-world spatial and temporal changes has become highly impractical. However, from this perspective, GIS stands out as an optimal solution, since updating data in digital format is far simpler than revising, publishing, printing and distributing textbooks or atlases.

With this technology, teachers and students can access various online databases, many of which are regularly updated, and they also have the opportunity to create and update data themselves. Such an approach makes geography teaching more

dynamic, creative, and less dependent on standardized materials and traditional instructional aids.

## 10. Conclusion

This paper underscores the transformative potential of Geographic Information Systems (GIS) in enhancing geography education. Integrating GIS into the classroom not only deepens students' understanding of spatial phenomena, but also promotes critical thinking and inquiry-based learning. As evidenced throughout the study, GIS facilitates interactive learning experiences that transcend traditional map-reading and memorization, thereby cultivating vital spatial skills. One of the key advantages of GIS is its ability to bring learners closer to real-world geographic contexts. Virtual representations, 3D models and user-designed maps make geographic environments more tangible and engaging, enhancing comprehension and fosters a stronger connection between theoretical knowledge and practical understanding. Additionally, GIS enables interdisciplinary learning by linking concepts from various fields, thus emphasizing the interconnectedness of spatial phenomena.

Furthermore, GIS actively supports inquiry-based and problem-solving learning models. Students are empowered to formulate research questions, analyze spatial data, test hypotheses and evaluate their findings, thereby developing essential analytical and scientific skills. This approach promotes deeper engagement with the discipline, ultimately preparing students for future careers in a data-driven world. Despite its numerous benefits, integrating GIS into education also presents challenges. Research studies conducted in Bosnia and Herzegovina and Croatia indicates that there are significant differences in teachers' attitudes toward the use of geoinformation technologies (Avdić et al., 2020; Šiljeg et al., 2022). Teachers may face obstacles such as insufficient technical training, limited access to hardware and software and curriculum constraints that hinder comprehensive implementation. Moreover, some educators might be unfamiliar with how to effectively incorporate geospatial technology into their pedagogical strategies (Misarova et al. 2024).

Overcoming these barriers requires targeted professional development and curriculum reform to embed GIS seamlessly into teaching practices (McKenzie et al., 2022). Overall, the adoption of GIS in geography education aligns with contemporary educational trends emphasizing digital literacy, spatial thinking and real-world problem solving.

According to Humble (2023), the potential of GIS in primary and secondary education lies in its accessibility, its capacity to foster transdisciplinary connections, and its ability to extend learning experiences beyond the traditional classroom setting.

As technology continues to advance, educators' role in fostering geospatial competencies becomes increasingly vital. By addressing existing challenges and leveraging the full potential of GIS, educational institutions can better prepare students to understand and navigate complex spatial environments, ultimately fostering a more informed, engaged and geographically literate society.

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ARTICLES

# OPERATIONAL INSIGHTS RELATED TO MAPPING AND ANALYSING RURAL PLACE (DIS)AMENITIES

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ABSTRACT
***Operational insights related to mapping and analysing rural place (dis)amenities***
*This study employs collaborative mapping to identify the amenities and disamenities associated with living and working in the Slovenian rural areas, with a focus on the Košana Valley and the Upper Pivka as a case study. We conceptualize an amenity as a spatial quality or characteristic that enhances the attractiveness of a location for rural habitation and work, determined not solely by quantitative measures but also shaped by individual perceptions and mental representations. The survey on (dis)amenities was conducted over three consecutive years with a single target group comprising 109 geography students. In total, 670 amenities (classified in 10 categories) and 521 disamenities (classified in 11 categories), were geolocated, described, assigned a value and documented photographically. A systematically designed methodological approach—encompassing the preparation of ArcGIS Online data base, pre-fieldwork preparation, fieldwork execution, and post-processing with both exploratory and explanatory analyses —enabled the application of advanced and more complex cluster spatial analyses. Key outcomes are interpreted in terms of: (1) practical relevance for use by local authorities, decision-makers, land use planners, and the general public), (2) didactic potential of collective*

*mapping; and (3) methodological implications for the analysis and visualization of collective mapping data.*

*KEYWORDS*
*amenity, disamenity, collective mapping, Košana Valley, Upper Pivka, Slovenia*

## 1. Introduction

The term "collaborative mapping" is very broad and used for various purposes in many scientific disciplines, therefore one does not use it to describe a specific method but rather a group of approaches to community spatial data collection. Often, the term collaborative mapping is defined as a multi-stakeholder collaboration, where participants express their spatial ideas, feelings, and knowledge through cartographic visualization to achieve a specific research or decision-making goal (Denwood et al., 2022).

Systematic efforts to gain and expand collective spatial understanding through community mapping began in the 1990s. This period was marked by the confluence of several factors: an increase in research efforts in the field of "sense of place" and concepts of spatial attachment, an increasing need for location-specific spatial data for more effective environmental monitoring and spatial planning, and the development of public participation geographic information systems (PPGIS) that enable more accessible public participation in decision-making processes (Brown et al., 2020; Bobovnik and Potočnik Slavič, 2021).

The implementation of collaborative mapping is justified by four key premises, which indicate the applied nature of this process.
• The first is the advocacy of the idea of effective governance through the inclusion of the public in decision-making processes, which also contains the principles of citizen and post-modern science.
• The second premise highlights the critical spatial knowledge of participants, which is often subversive, as a key element of collaborative mapping.
• The third is the recognition that the spatial knowledge of participants is valuable and useful.
• The fourth premise is the already mentioned development of appropriate, affordable and user-friendly geographic information technologies (McCall, 2021).

With the growing number and variety of participatory mapping applications and technologies, the types of spatial attributes collectively mapped expanded by including place values (Brown and Reed, 2011), land use preferences, special places (representing the favourite places of individuals within the given study area; survey participants are invited to explain why these places have special meaning to them), experiences, activities, amenities, behaviours, perceived environmental impact, highway/trail qualities, environmental threats/risks, etc.; Brown et al. 2020; Bobovnik and Potočnik Slavič, 2021).

Over the last decades, the conceptualisation and definition of amenity has been emerging. Some define amenity as the ability of a space to satisfy human psychological needs, which is often summarized in a simplified way in the phrase "a space suitable for raising children" (Moss and Glorioso, 2014; McDonagh, Nienaber, Woods, 2015) or as "a space that enables a good life or a high quality of life" (Coppack, 1985, cv. Hanson, Guiliano, 2004, 95). Mostly research focuses on natural, while rare recent research focuses on social and cultural amenities (e.g. traditional lifestyle practices, health, social perceptions of landscape, place values, landscape values, ecosystem services, etc.; Brown and Reed, 2012; Brown et al., 2020). The majority of research focuses on people living in a city and their view on the amenities that guide their choice of a place to spend their free time, recreation, purchase of a secondary residence, etc. There are interesting results of research on the quality of the living environment and the quality of life in Slovenian cities (Tiran, 2015; Drozg, 1994), and on the longitudinal research of the so-called topophilia and topophobia in Ljubljana (Krevs, 2004, 2024), etc. On the other hand, there is an increasing number of studies that emphasize that amenities stimulate the local development (especially in rural areas; amenity-based local/rural development; Power, 2005; Bobovnik and Potočnik Slavič, 2021). Hanson and Guiliano (2004) conclude that amenities play an important role in the development of urban areas, contributing decisively to suburbanization, to the increase in the dispersed settlement of non-agricultural populations in rural areas, and to the growth and development of small towns that are in the area of influence of larger urban centres. Rural areas that are rich in amenities (in terms of number and their “quality”) often face reduced employment opportunities in agriculture, and therefore amenities can represent a development alternative (e.g. the development of services, creative professions, etc.) and promote local development or the well-being of the population (Bobovnik and Potočnik Slavič, 2021).

In our research, we were interested in the spatial distribution of amenities and disamenities in a a demographically and economically dynamic rural area with good transport connections. We apply the concept of amenity:
• in a narrow sense, amenity as the quality/-ies (characteristics) of a rural place that makes it appealing for people to reside and work in (Bobovnik and Potočnik Slavič, 2021; Power, 2005), not only in terms of quantitative aspects but also related to individuals' perceptions;
• amenity is not only an absolute quality of a place, but is also a mental construct that includes both subjective and objective representations;
• in a broader sense, amenity is understood as a conceptual (Hanson, Guiliano, 2004), dynamic, cause-and-effect and complementary connection between the town/city and the rural areas, which is based on the qualitative characteristics of the place and the community (Moss, Glarioso, 2014, 119, 387).

This paper identifies and discusses the spatial distribution and spatial patterns of (dis)amenities in a surveyed rural locality (shallow karst of Upper Pivka and Košana Valley in Slovenia, in the Dinaric-Karst macroregion) based on collective mapping endeavours of certain target group (i. e. geography students) over three consecutive years (2023, 2024, 2025). After introduction, the methods section focuses on case study area and methodological approach. Key findings on spatial patterns of (dis)amenities are discussed in the third section, together with implications for local authorities. Critical observations of methodological approach and findings are elaborated in conclusions.

## 2. Methods

### 2.1. Key geographic features of the case study area

The collaborative mapping of (dis)amenities elements was conducted in Košana Valley (in Slovene: Košanska dolina) and Upper Pivka (in Slovene: Zgornja Pivka), situated at the junction of the Dinaric Karst (Dinaric Karst foothills and plains) and the Mediterranean (flysch hills, hills and valleys) macroregions (Žiberna et al., 2004). On the north-west side, the area is partially bordered by the uplifted Vremščica and Slavinjski Ravnik, the northern lowland part continues into Lower Pivka, and the north-east and east are again bordered by the uplifted Javorniki Hills. In the south, the area opens towards the rest of the Upper Pivka to Šembije, and in the south-west it is bordered by the flysch Brkini Hills. Upper Pivka is a roughly level landscape, divided into a river basin along the Pivka River and its tributaries, and a karst plain, which is dissected by various

karst basins and domed peaks (Stepišnik et al., 2017). Part of the case study area belongs to the Seasonal Lakes of Pivka Nature Park. Totally, on an area of 123.30 km$^2$, the settlements of Čepno, Dolnja Košana, Gornja Košana, Kal, Klenik, Narin, Neverke, Nova Sušica, Parje, Petelinje, Pivka, Prestranek, Selce, Slavina, Slovenska vas, Stara Sušica, Šmihel, Trnje and Velika Pristava were surveyed (Figure 1). The settlements, with a total population of 5,884 in 2025, are part of the Primorsko-Notranjska statistical region and of the two municipalities (Pivka and Postojna). The population aging index reaches 150.06, i.e. below-average age of the Slovenian population (152.8; SURS, 2025).

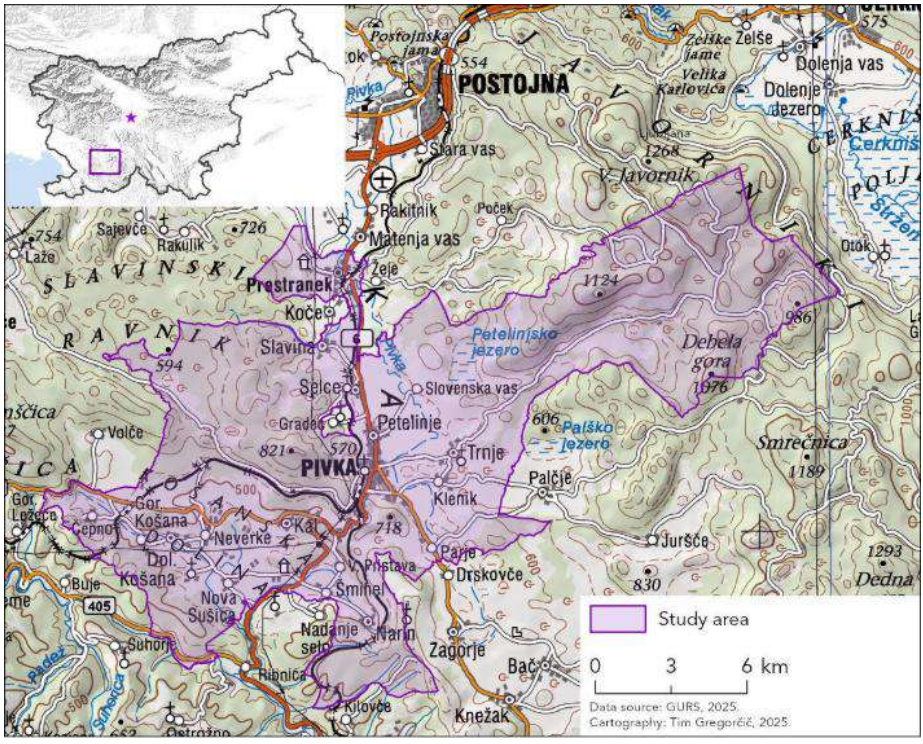


*Figure 1: Case study area.*

In the agrarian period (before World War II), the population was engaged in agriculture (mainly sheep farming and fruit growing), forestry and transporting (mostly by horses). After World War II, the food processing (poultry farming – Pivka Delamaris) and wood processing (Javor Pivka) industries developed mainly; due to its strategic location and tradition, there was also a military

territory in Pivka (Dolgan, 2006), and the transport industry was also significantly represented. In the post-industrial era, a third of jobs are still provided by the food processing industry, while in the last twenty years the number of jobs in the industrial-small business zone has increased (mainly the metal processing industry, which provides almost half of the jobs), while the wood processing industry has largely collapsed and is now reflected in a modest number of small companies and solo entrepreneurs. Service sector (public services, transport and logistics activities, tourism and museum activities) have gained a greater role. The case study area is an example of demographically and economically dynamic rural area with good transport connections, characterised with low population density of 48 inhabitants per $km^2$ (compared to the national average at 104,8 inh./$km^2$; SURS, 2025), predominant role of forest in land use (78.22 $km^2$ or 64.44% of the surveyed territory), and lower level of centrality services in the settlements (Gornja Košana is local rural centre, only Pivka has more public services and population of 2021 (SURS, 2025), and is recognized as a small town; whilst other settlements do not have central functions).

## 2.2. Methodological approach to longitudinal collective mapping

There are various methodological approaches to implementing collaborative mapping, which can be roughly divided into digital, physical and combined. Participatory GIS (PGIS), Public Participation GIS (PPGIS), and volunteered geographic information (VGI) are classified as digital, while sketch mapping and mental mapping are among physical and combined (Denwood et al., 2022; Verplanke et al., 2016). Our approach towards surveying the (dis)amenities of selected rural locality was based on PPGIS framework and was composed of four main building blocks (Figure 2).

a. Development of the technical framework of the online GIS environment in the ArcGIS Online.

Initially, all geography students (3rd year v Bachelor study; later on addressed as »collaborators«) included in collaborative mapping were provided with a working ArcGIS Online License. This step was necessary to ensure traceability of field entries, but it is not obligatory, since it is also possible to develop a tool that allows anonymous data entry without a working license. Thereupon, we created the so-called Group, to which all collaborators were invited. Then, an Online map was added to the Group, which contained three layers (two point feature layers for mapping (dis)amenities, and a Settlement layer; GURS, 2025). Both point feature layers contained a column in the attribution table where the

collaborator could explain his/her choice and allowed the attachment of visual material taken in the field. To make monitoring of entries on the Online map more effective, we also assigned appropriate symbology to the layers. To operate data entry in the field, we enabled work with the Field Maps web application. We prepared the students for the fieldwork in terms of content and technology.

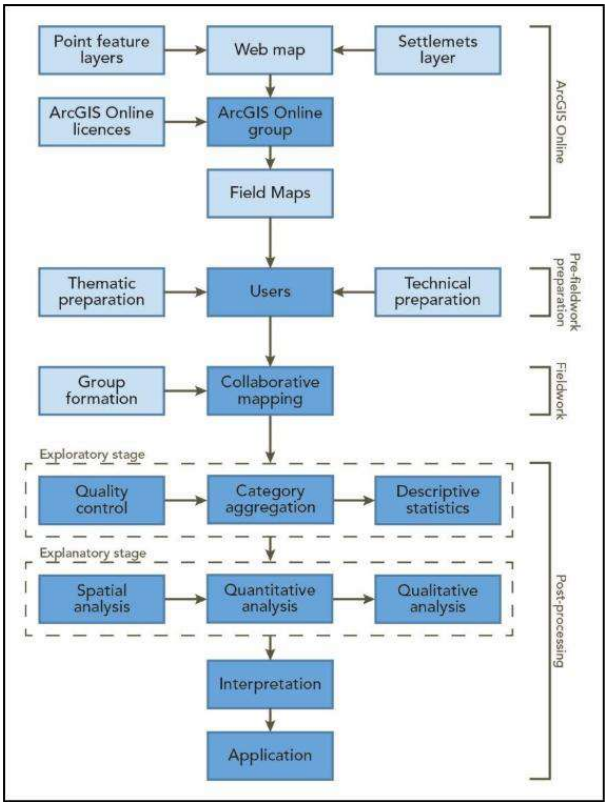


*Figure 2: Building blocks of methodological approach.*

b. Pre-fieldwork preparation.

Pre-fieldwork preparation consisted of two parts: the technical and content preparation. During the technical preparation:

• the concept of online geographic information systems was introduced to collaborators;

• then, the basic functions of the Field Maps application were presented and its functioning was individually checked; individual technical problems were subsequently resolved;
• additionally, the collaborators were informed about the potential problems they may encounter during the fieldwork and how they could be resolved (e.g. interrupted data connection); this ensured that the collaborators were familiar with the objectives of the survey and understood how they could contribute high-quality field data entries.

The content preparation included:
• insights into the geographical characteristics of the Košana Valley and Upper Pivka (including comparative maps, data, photos);
• identification of key development fault lines (e.g. introduction of the railway system in the second half of the 19th Century, setting-up the first wood-processing unit after World War II, decay of former Yugoslavia in 1991, EU investments supporting the upgrading of industrial business zone, etc.);
• analysis of the characteristics dissolved landscape;
• definition of (dis)amenity elements (including the conceptualisation, examples with photos; further elaborated below).

c. Longitudinal fieldwork.

The fieldwork in the case study area took place over three consecutive years (2023, 2024, and 2025). The collaborative mapping was conducted in one day. Altogether, 109 collaborators participated (34 in 2023, 50 in 2024, and 25 in 2025). The collaborators were divided into groups (of 2 to 3 persons) which independently carried out mapping in the sub-areas assigned. Data was entered onto the Online map using smart mobile devices. Each entry included the location of the (dis)amenity, its characteristic, description, and a photo. Real-time updating of the Online map by multiple users at the same time not only enabled collaborative mapping, but also joint monitoring of entries and recognition of spatial and content patterns in the field (Phantuwongraj et al., 2021; Wang et al., 2025).

d. Conceptualising and reframing categories of (dis)amenities

Within the pre-fieldwork content preparation with potential collaborators, we set-up random groups of four participants. During brainstorming activity, they were asked to list elements which they find attractive (amenities) and non-attractive (disamenities) in the landscape. Collaborators were previously shown

several pictures from the surveyed area, but they were encouraged to imaginatively find different examples from various landscapes. The groups presented their findings and provided arguments, later on we participatively created a joined set of elements, which were afterwards grouped into categories.

• A set of six elements (accessibility, green and forested areas, natural and cultural heritage, low population density, provision of services in the settlement, well-maintained built-up and natural environment) indicating amenities was confirmed.
• Following the same procedure, also a set of six elements (traffic congestion, derelict areas, poorly maintained buildings and the environment, new buildings, inadequate infrastructure and services, population density) indicating disamenities was confirmed as well.
• When monitoring (dis)amenities, we also added the element "other", which allowed us to add elements that we did not pay attention to in pre-fieldwork preparation (Table 1).

Herewith, the collaborators provided held values which identify what is personally important to the individual (Brown et al., 2020). When collaborators provided their entries into Online Map,they contributed assigned values:the later express what is important about the objects of surveyed area (Brown et al., 2020). When an individual collaborator is asked to identify the location of an element on a map, his/her entry is cognitively associated with individually perceived held value and assigned value (what appears important to the individual in the physical landscape).

We experienced significant variability in mapped entries, therefore during the quality control we identified several new elements which were provided within the field mapping. This resulted in altogether 31 elements of amenities, and 19 elements of disamenities. Consequently, we had to rearrange elements and create aggregated categories: in the two-phase process we introduced 10 categories of amenities (Table 1), and 11 categories of disamenities respectively. The final number of categories was deliberately smaller since we wanted to provide intelligible maps.

e. Post-processing and analysis of the fieldwork results.

After the completion of fieldwork, and following the methodological framework of Fagerholm et al. (2021), several exploratory and explanatory methods for PPGIS data analysis were applied. During the exploratory stage, the quality of

the entries was examined in detail. Entries that did not meet the quality criteria—such as missing detailed descriptions, lack of thematic relevance, mismatches between descriptions and photographs, or insufficient photo quality—were excluded from further analysis. In total, 58 amenity points (7.97 %) and 4 disamenity points (0.76 %) were removed. Subsequently, basic descriptive statistics were calculated.

Within the explanatory stage, several spatial, quantitative, and qualitative analyses were conducted for amenities and disamenities separately. Visual and overlay analyses were performed using ArcGIS Pro. The study area was tessellated using a hexagonal grid with a polygon size of 0.4 km². Point counts were calculated using the Spatial Join tool, and the resulting hexagons were visualised according to the number of intersecting points. In addition, the polygon layer was overlaid with the point layer and visualised according to (dis)amenity categories.

The second analysis involved calculating selected indices across spatial clusters. Clusters were generated using the Density-Based Clustering tool in ArcGIS Pro. The self-adjusting HDBSCAN method was applied, with the minimum number of features per cluster set to 20. This resulted in 10 amenity clusters and 8 disamenity clusters. For each cluster, the dominant and second most dominant categories were identified, and seven quantitative indices proposed by Brown and Reed (2012) were calculated (see Table 2 for index descriptions).

The third analysis examined the spatial relationship between the presence of amenities and disamenities within the aforementioned hexagons, using bivariate symbology. Based on the resulting maps, an evidence-based interpretation was developed, followed by recommendations for local municipalities.

*Table 1: Defining categories of amenities and disamenities.*

| Category of amenity | Description | Numerus | Share (%) | Category of disamenity | Description | Numerus | Share (%) |
|---|---|---|---|---|---|---|---|
| **Infrastructure** | infrastructure for pedestrians, public infrastructure, signage infrastructure, sports and recreational infrastructure, well-maintained road infrastructure | 219 | 32.69 | **Built environment** | dilapidated building, abandoned building, unfinished building (for several years), dilapidating monument, non-maintained bus stop, salonite roofing unkept | 165 | 31.67 |
| **Cultural heritage** | church and other religious object, monument, architectural heritage, local identity | 89 | 13.28 | **Dumping site** | unkept dumping site of construction materials, old machinery, mixed waste, branches, tires, etc. | 96 | 18.43 |
| **Services and local economy** | shop, bar, restaurant, self-service machine, on-farm selling point, individual selling point | 74 | 11.04 | **Surroundings** | non-maintained garden, non-maintained playground, non-maintained rest area | 66 | 12.67 |
| **Built environment** | well-maintained building, yard, fence | 73 | 10.90 | **Road infrastructu-re** | Inadequate-ly paved road, potholes on the road, sand and stones on the road | 46 | 8.83 |
| **Public service** | bus stop, train stop, waste collection and separation | 64 | 9.55 | **Traffic hazard** | no sidewalk, dangerous intersection, dangerous traffic section | 40 | 7.68 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Green area** | park, forest, bigger green plot in the settlement, green infrastructure, scenic view | 49 | 7.31 | **Agriculture** | liquid manure leakage, stench, overgrowth of agricultural land | 34 | 6.53 |
| **Agricultural landscape** | cultivated agricultural land (field, meadow, pasture, orchard) | 45 | 6.72 | **Signage infrastructu-re** | billboard not in order, outdated information, signage not located in the appropriate place | 18 | 3.45 |
| **Public institution** | primary school (central or subsidiary), kindergarten, (eco)museum, senior home, community centre | 30 | 4.48 | **Power line** | existing power line as a disturbing element in the landscape | 13 | 2.50 |
| **Renewable energy source** | solar panels, firewood | 24 | 3.58 | **Stream** | non-maintained stream bed (vegetation, erosion, waste) | 11 | 2.11 |
| **Other** | information on EU investment, revitalised derelict area, etc. | 3 | 0.45 | **Noise, heavy traffic** | noise, heavy traffic | 9 | 1.73 |
| **Total** | | 670 | 100.00 | **Other** | graffiti, functionally derelict area, pressure from economic activity, poor signal, invasive plant | 23 | 4.41 |
| | | | | Total | | 521 | 100.00 |

*Table 2: Quantitative metrics used for the cluster analyses.*

| Definition | Calculation | Usefulness | Limitations |
|---|---|---|---|
| Value Sum Absolute (P0) - the total count of all points located within a cluster | $P0 = \sum p_i$ where $p_i$ = number of points mapped within cluster $i$ | Indicates the most valued cluster by comparing value sums across clusters | Larger spatial units may have higher point counts simply by virtue of the larger spatial unit |
| Value Sum Percent (P1) - the percent of mapped points in a cluster relative to the total number of mapped points across all clusters | $P1 = \frac{\sum p_i}{P}$ where: $p_i$ = number of points mapped within the cluster $i$ $P$ = total number of points | Reveals the clusters with the highest proportions of all mapped points | |
| Dominant category - the category with largest count of point locations within the cluster | $D = max\left(\sum v_i\right)$ where: $v_i$ = number of mapped points for a given category $v$ in a given cluster $i$ | Shows the dominant category within a cluster | A cluster can have multiple categories close in total count and a focus solely on the dominant category would mask small differences. |
| Value frequency index (F)— the relative frequency of points within a cluster compared to the average frequency of points across all other clusters | $F = \frac{\sum p_i}{\frac{1}{n-1}\sum_{j=1}^{n-1} \overline{X_j}}$ Where: $p_i$ = number of points mapped within cluster $i$ $n$ = total number of clusters excluding $\overline{X_j}$= mean number of points per unit $j$ | Shows whether a given cluster has greater relative frequency of points (F>1.0) or smaller frequency of points (F<1.0) than the average number of mapped points across all other clusters. | |
| Value dominance index (D1)—an index that quantifies the dominance relationship between the dominant landscape value within the landscape unit and the next most common value | $D1 = \frac{max(\sum v_i) - max(\sum v_i)^{(2)}}{max(\sum v_i)}$ | Shows whether the dominant category is distinct or only slightly more common than other categories in a cluster | Only examines the difference in the top two categories in a cluster. |
| Category diversity index (D2) - is the standard Shannon diversity index used in ecological studies calculated for the different categories located within a cluster | $D2 = -\sum_{i=1}^{v} p_i \ln p_i$ Where: $p_i$ = the proportional abundance of the $i$th category $(n_i/N)$ $n_i$= the number of points in the $i$th category $N$= the total number of all mapped points | High diversity scores could indicate multiple, competing categories for the same cluster | Does not fully indicate the potential for conflict because some categories may be complementary rather than competitive |

| | | | |
|---|---|---|---|
| | $ln$= natural logarithm<br>$v$= the number of categories<br>The calculated index was normalised to a scale ranging between 0.00 and 1.00 where higher index values indicate higher category diversity within the cluster. | | |

## 3. Results and discussion

### 3.1 Spatial distribution of amenities

Altogether, our collaborators provided 670 completed entries which reflected their assigned values, i. e. amenities in Košana Valley and Upper Pivka. Nearly one third of all entries was ascribed to infrastructure (Figure 3): this is partly a consequence of our broad definition of the "infrastructure" category, which included public infrastructure, pedestrian infrastructure, sports and recreational infrastructure, signage infrastructure and well-maintained road infrastructure. We also decided to create a broad category because the setting-up and management of such infrastructure is predominantly the domain of the municipality. Collaborators identified amenities from the perspective of someone who is a pedestrian (which is why they were probably more attentive to pedestrian infrastructure and road infrastructure maintenance). Since almost all of them were in this area for the first time, they also paid great attention to good signage infrastructure.

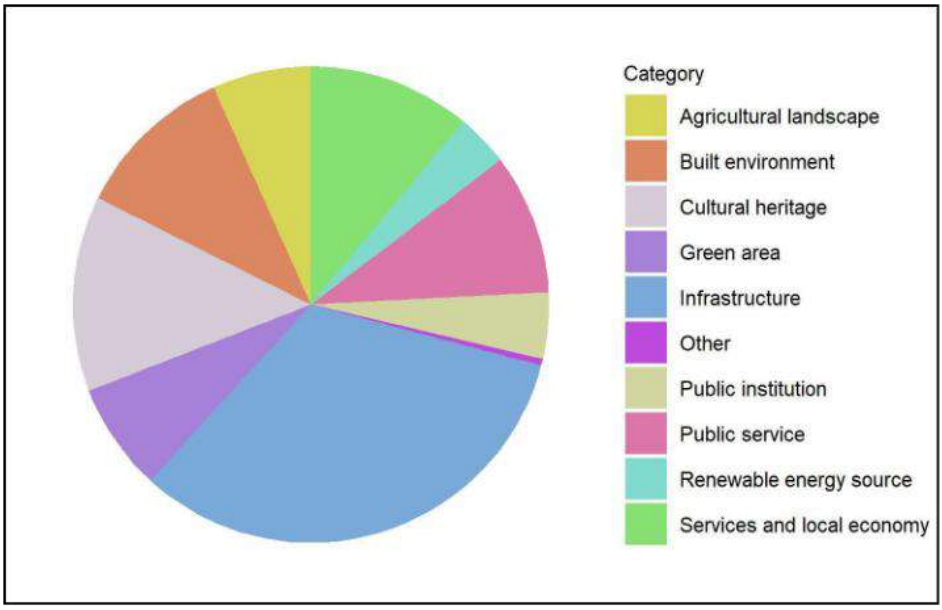


*Figure 3: Assigned amenities in surveyed area.*
*Source: Field work, 2023 —2025.*

A good eighth of the entries was identified as attractive cultural heritage, with well-maintained monuments, churches and other religious buildings, as well as locally specific architectural elements (e.g. stone well, in Slovenian: šterna). Every tenth entry addressed services (e.g. shop, bar, restaurant, self-serving machine) and direct home sales (sale of apples and products made from them, sale of honey), which indicates an active agricultural landscape and diversification of farm income. Collaborators also paid attention to well-maintained individual or group buildings, courtyards and hedges. Other categories (public services, green areas, public institutions, etc.) were marked less often, which is also a consequence of the fact that we carried out fieldwork mostly in settlements without central functions or that public services and public institutions are mostly concentrated in Pivka as a sub-regional center (Figure 4). The lineral spatial pattern prevails in the distribution of amenities, which indicates that our collaborators were walking and using public roads. Applied hexagonal grid enables to identify several agglomerations of amenities: the later are mostly located in the centre of the settlement.

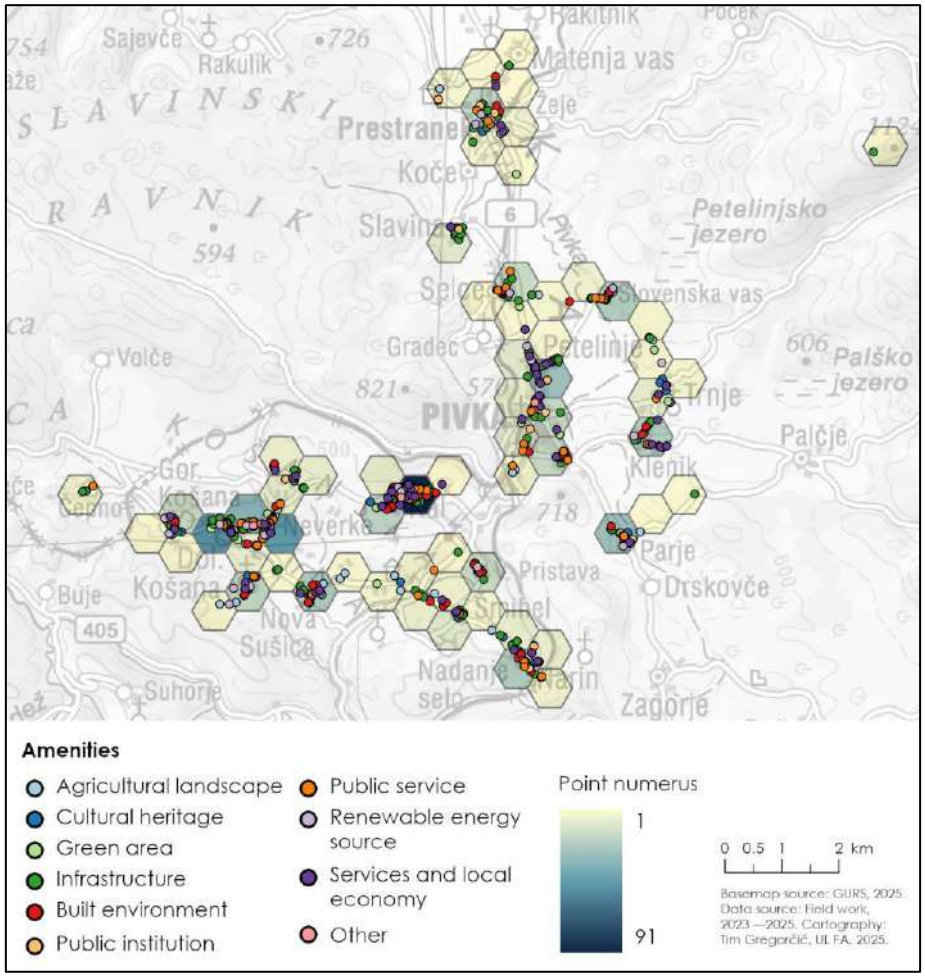


*Figure 4: Spatial distribution of amenities in Upper Pivka and Košana Valley.*

### 3.2 Spatial distribution of disamenities

In total, 521 completed entries reflected collaborators´ assigned values, i. e. disamenities in Košana Valley and Upper Pivka. Nearly one third of all entries was ascribed to built environment (Figure 5): this category included dilapidated, abandoned and unfinished building (for several years), dilapidated monument, unkept bus station, and tiled roof. The fact is that insufficient maintenance of

built environment and surroundings (13% of entries) were both very tangible elements of disamenity.

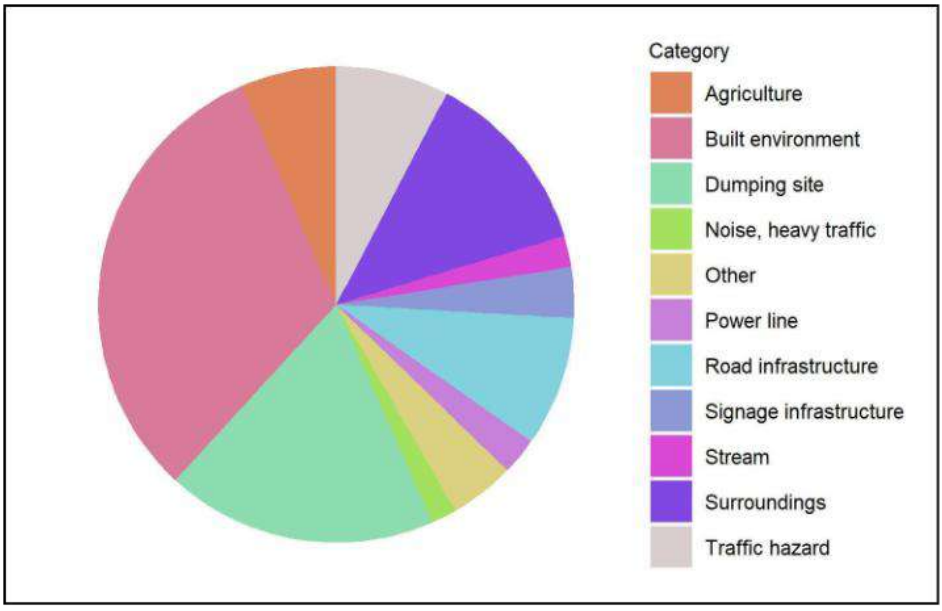


*Figure 5: Assigned disamenities in surveyed area.*
*Source: Field work, 2023 —2025.*

It is interesting that collaborators dichotomously marked: a well-maintained built environment (73 entries) and non-maintained built environment (165 entries). They paid particular attention to illegal dumping sites (almost 20%; including construction materials, old machinery, mixed waste, branches, tires). Again, a comparison with organized waste disposal (assigned as amenity; 5% of entries) makes sense. From the perspective of a pedestrian, the collaborators identified disordered road infrastructure (9%) and points with bigger traffic hazard (8%; no sidewalk, dangerous intersection, dangerous traffic section) as disamenity. Some interesting patterns emerge in the spatial distribution of disamenities: the linear pattern is less obvious than in the case of amenities, there are fewer hexagonal centers with a high density of entries (collaborators identified 150 entries less), and more dispersion is also observed (especially regarding the dumping sites, but also in the case of the non-maintained built environment; Figure 6).

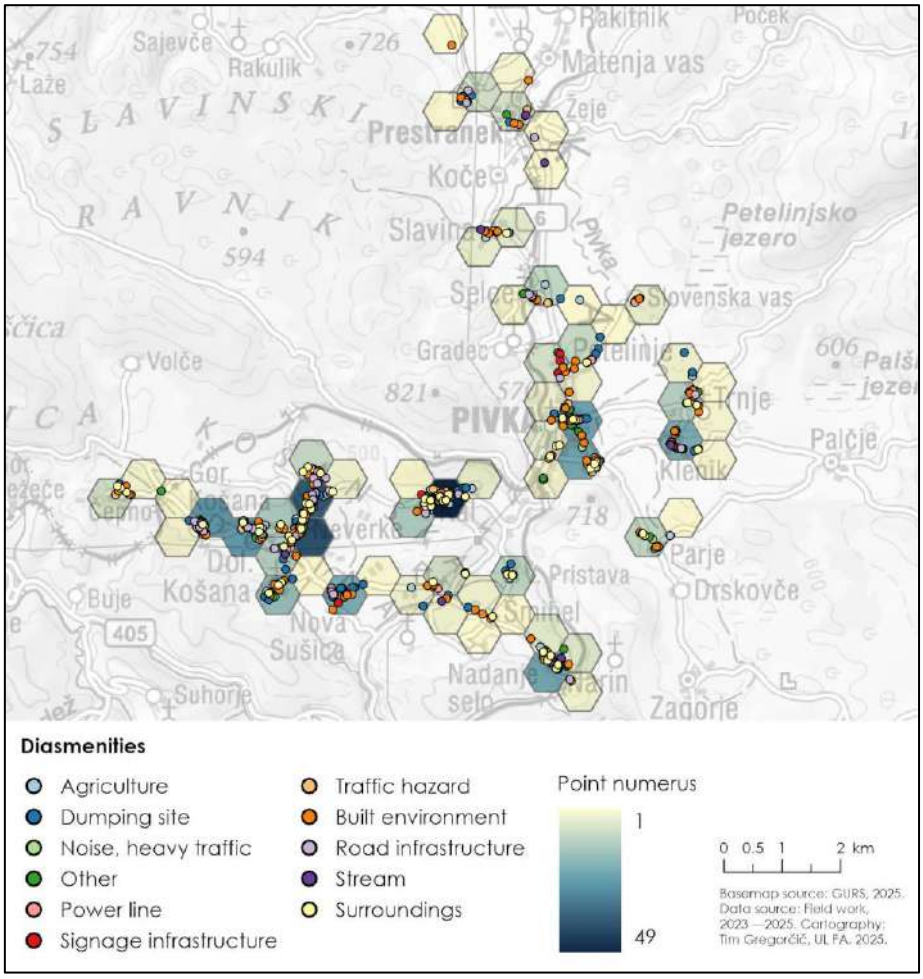


*Figure 6: Spatial distribution of disamenities in Upper Pivka and Košana Valley.*

### 3.3. Cluster analysis

In addition to descriptive statistics, we conducted a cluster analysis, following the quantitative metrics outlined in Table 2 (Brown and Reed, 2012). Regarding the spatial distribution of clustered amenities (Figure 7), five out of ten clusters correspond to settlement centres (IDs 1, 2, 3, 8, and 10, representing Parje, Prestranek, Kal, Nova Sušica, and Dolnja Košana, respectively). The remaining

clusters encompass at least two settlements, indicating stronger interconnectivity within these areas.

The calculated metrics are presented in Table 3. The highest proportion of amenities (21.08%) was recorded in Cluster 3, representing the centre of Kal. In contrast, Cluster 8 (Nova Sušica) contained the lowest proportion of amenities (4.32%). This was the only cluster where the dominant amenity category was "agricultural landscape"; in all other clusters, "infrastructure" was identified as the dominant category.Considering the second most dominant amenity category, a more diverse range emerged, with "cultural heritage", "public institutions", and "built environment" being the most common. The value frequency index (F) indicated that Clusters 3, 4, 7, and 9 had a higher frequency of amenities compared with the average across all other clusters (F > 1.00). Based on the value dominance index (D1), although "infrastructure" was the dominant category in most cases, it was not markedly distinct. The highest D1 value was 0.62 in Cluster 7, meaning that the number of amenities in the second most dominant category was equal to 62% of the number in the dominant category. The highest diversity of amenities was observed in Cluster 9 (Dolnja Košana and Neverke), with a category diversity index (D2) of 1.59 (D2 normalised = 1.00), and the lowest in Cluster 7 (D2=1.59; D2 normalised=0).

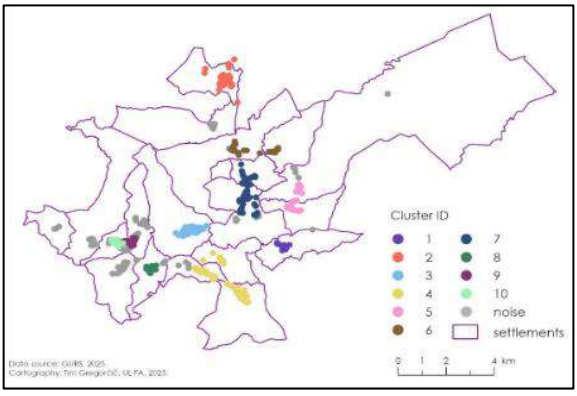


*Figure 7: Clusters of amenities (left) and disamenities (right).*

Four out of eight disamenity clusters correspond to settlement centres (IDs 3, 5, 6, and 8, representing Kal, Nova Sušica, Gornja Košana, and Dolnja Košana, respectively). Two of the remaining clusters encompass two settlements, and the other two encompass three settlements (Figure 8).

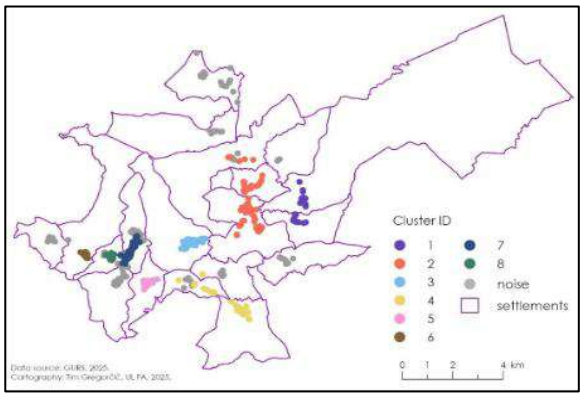


*Figure 8: Clusters of disamenities.*

The calculated metrics are presented in Table 3. The highest proportion of disamenities (22.22%) was recorded in Cluster 7, representing Dolnja Košana and Neverke. In contrast, Cluster 5 (Nova Sušica) contained the lowest proportion of disamenities (5.56%), as was also the case for amenities. The cluster located in Nova Sušica was again the only one with a different dominant disamenity category, namely "dumping site", whereas in all other clusters the dominant category was "built environment". "Dumping site" also appeared most frequently as the second most dominant category. Overall, the diversity of second most dominant categories was greater than that of the dominant categories.

The frequency index (F) indicated that Clusters 2, 3, and 7 had a higher frequency of disamenities compared with the average across all other clusters ($F > 1.00$). The maximum D1 value (0.56) was observed in Clusters 4 and 7, indicating that the dominant disamenity categories were even less distinct from the second most dominant category compared with the amenity case. The highest diversity of disamenities was found in Cluster 3 (Selce, Pivka, and Petelinje), with a category diversity index (D2) of 1.59 (D2 normalised = 1.00), and the lowest in Cluster 5 (Nova Sušica) with D2 = 1.28 (D2 normalised = 0). When comparing absolute D1 values between amenities and disamenities, the highest diversity (maximum value) and greatest homogeneity (minimum value) were both observed for disamenities.

| Amenities | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| **Cluster ID** | **P0** | **P1** | **Dominant category** | **Dominant category numerus** | **Second dominant category** | **Second dominant category numerus** | **F** | **D1** | **D2** | **Normalised D2** |
| 1 | 29 | 5.23 | Infrastructure | 8 | Green area | 5 | 0.50 | 0.38 | 1.89 | 0.80 |
| 2 | 35 | 6.31 | Infrastructure | 12 | Public institution | 5 | 0.61 | 0.58 | 1.96 | 0.97 |
| 3 | 117 | 21.08 | Infrastructure | 31 | Cultural heritage | 23 | 2.40 | 0.26 | 1.92 | 0.86 |
| 4 | 78 | 14.05 | Infrastructure | 26 | Built environment | 13 | 1.47 | 0.50 | 1.84 | 0.64 |
| 5 | 32 | 5.77 | Infrastructure | 10 | Cultural heritage | 6 | 0.55 | 0.40 | 1.82 | 0.62 |
| 6 | 45 | 8.11 | Infrastructure | 15 | Built environment | 7 | 0.79 | 0.53 | 1.84 | 0.65 |
| 7 | 77 | 13.87 | Infrastructure | 37 | Services and local economy | 14 | 1.45 | 0.62 | 1.59 | 0.00 |
| 8 | 24 | 4.32 | Agricultural landscape | 5 | Cultural heritage | 5 | 0.41 | 0.00 | 1.91 | 0.83 |
| 9 | 68 | 12.25 | Infrastructure | 23 | Public service | 10 | 1.26 | 0.57 | 1.97 | 1.00 |
| 10 | 50 | 9.01 | Infrastructure | 21 | Public institution | 10 | 0.89 | 0.52 | 1.59 | 0.01 |
| | | | | | | | | | | |
| **Disamenities** | | | | | | | | | | |
| 1 | 41 | 10.35 | Built environment | 13 | Dumping site | 11 | 0.81 | 0.15 | 1.89 | 0.89 |
| 2 | 81 | 20.45 | Built environment | 26 | Dumping site | 14 | 1.80 | 0.46 | 1.95 | 0.97 |
| 3 | 67 | 16.92 | Built environment | 17 | Surroundings | 14 | 1.43 | 0.18 | 1.97 | 1.00 |
| 4 | 45 | 11.36 | Built environment | 16 | Surroundings | 7 | 0.90 | 0.56 | 1.95 | 0.97 |
| 5 | 22 | 5.56 | Dumping site | 10 | Built environment | 7 | 0.41 | 0.30 | 1.28 | 0.00 |
| 6 | 27 | 6.82 | Built environment | 7 | Agriculture | 5 | 0.51 | 0.29 | 1.78 | 0.73 |
| 7 | 88 | 22.22 | Built environment | 34 | Dumping site | 15 | 2.00 | 0.56 | 1.85 | 0.83 |
| 8 | 25 | 6.31 | Built environment | 9 | Road infrastructure | 6 | 0.47 | 0.33 | 1.76 | 0.69 |

*Table 3: Results of the quantitative and qualitative cluster analyses.*

### 3.4. Spatial relation between amenities and disameitnites

Figure 9 compares the distribution of amenities and disamenities per hexagonal polygon. Intense green indicates a high number of amenities and few disamenities, while intense blue indicates many disamenities and few amenities. Dark purple represents polygons with high counts of both amenities and disamenities. Lighter shades of these three colours indicate varying proportions between the two classes. Overall, the northern part of the study area, towards Prestranek, contains many greenish cells, indicating an amenity-rich environment with few disamenities, and is therefore potentially attractive for residents. The settlements of Pivka, Kal, Neverke, Nova Sušica, and Dolnja Košana exhibit more dark purple cells, suggesting they are rich in both amenities and disamenities. In such areas, improving liveability would primarily require reducing disamenities, potentially with relatively modest resource investment, which could substantially enhance the quality of the living environment. Peripheral areas are mostly pale green or pale blue, reflecting a low density of either amenities or disamenities.

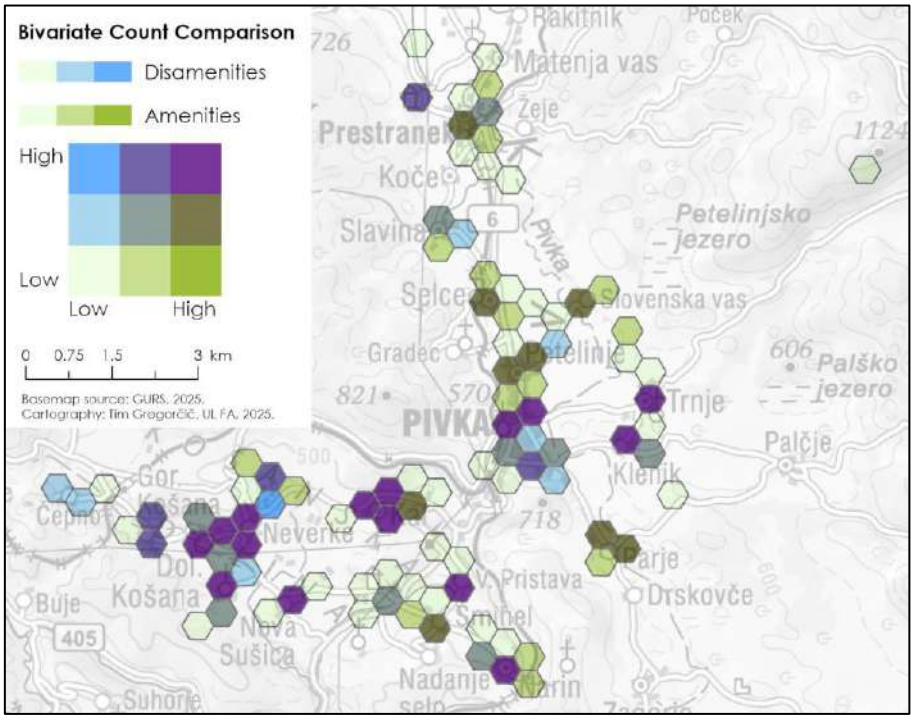


*Figure 9: Bivariate comparison of amenities and disamenities in the study area.*

### 3.4. Implications for local authorities

Fieldwork inputs show that our collaborators evaluated the maintenance of various infrastructures (for pedestrians, sports and recreation, public, signage, etc.) very positively. This is a very encouraging message for local stakeholders and the local population. On the other hand, the recognized and documented disamenities could encourage the setting-up of activities, raising awareness of the local population, or also measures (prevention, as well as sanctions).

Observations from visitors (i.e. our collaborators), who were not emotionally attached to the space and place and are often more objective, offer us insight into thinking about "how others see us, how they see us from the outside."

The collaborators pointed out numerous smaller or larger illegal dumping sites of various materials that are scattered throughout the surveyed area. Since we identified these locations through collaborative mapping and also added appropriate photographs, this type of data layer can be useful for the local municipality in identifying such points and taking action (e.g., establishing a new waste collection site, encouraging residents to use regular waste disposal services at the waste collection center, possibly even punishing offenders). Since we also published a short article in the local newspaper about the distribution of (dis)amenities (June 2024), it might be necessary to address the presidents of local/village communities to inform themselves and organize themselves in this regard.

A very large number of entries were associated with the dilapidated houses and other buildings in the surveyed settlements - we did not identify any spatial cluster in this disamenity category, since dilapidated buildings appear in all settlements. Also, with the help of collaborative mapping, the municipality has a data layer with which it can gradually prepare thematic municipal tenders for renovation, talk to the presidents of local communities and owners and, in the function of advisors, present them with various financial sources with which the owners could renovate the buildings. For this purpose, thematic meetings or workshops could also be organized, sometimes also with representatives of the Institute for the Protection of Cultural Heritage, who provide expert guidelines for renovations. It is very interesting that collaborators have very positively evaluated the recent renovations of the buildings, which included elements of the local architectural heritage.

The accurate and content rich material gathered with the longitudinal collective mapping in Košana Valley and Upper Pivka, and the introduction of online tool brought another added value: we created and interesting interactive browser, which is able to assist both the Municipality of Pivka and individual local/village communities and settlements in discussing and planning the future investments.

## 4. Conclusion

Key findings about collective mapping of (dis)amenities are derived from three consecutive years of fieldwork with geography students. They relate to our interpretation of the (1) practical usefulness (for local authorities, decision-makers, public and land use planners), (2) didactic value of collective mapping and (3) methodological approaches to collective mapping results´ analyses and visualizations.

Mapping (dis)amenities and providing this information to the officials (whether elected or appointed) is very useful if used in the early land use planning process. The truth is that there is a little evidence to suggest these PPGIS informed decision-making. Participatory mapping has largely failed to exert significant influence for a variety of reasons, including the lack of specific agency directives or incentives to engage broader publics, lack of experience with participatory processes, a concern of unknown legal implications for appealing planning decisions, and mistrust of the "lay" knowledge generated in the process (Brown et al., 2020). We contacted the Municipality of Pivka and they were interested in using this data layer for their needs, and also to be familiar with the needs of locality.

Despite the fact that our collaborators were quite homogenous group (geography students, aged between 22-24 years), one could observe some variabilities in mapped entries among collaborators even when mapping the same geographic location. The number and type of entries varied according to the familiarity with the geographical area, collaborator´s personal interest or motivation, weather, and the pre-fieldwork preparation. We are aware of the fact that applying different and more heterogenous group of collaborators might bring different aspects of (dis)amenities in the surveyed area.

Mapping of (dis)amenities provided insight into the attitudinal predisposition of an individual or a group. For example: several entries evaluated agricultural landscape as attractive – the locations and photos confirmed that collaborators

indicated active agricultural cultivation (fields, meadows, orchards, pastures) as amenity. On the other side, the smell of manure was evaluated as non-attractive, even though it is inevitable in agricultural landscape with free range cattle breeding. And again, the patches of agricultural land that were overgrown with shrubs, were perceived as a disamenity. The conceptualization of structured and closed categories made work of collaborators and post-processing analysis easier. We are aware that introduction of more open and qualitative categories would bring more information, but would ask for different analytical approaches.

Our methodological approach enables collaborators to use point and polygon geographic features. Mapped entries reveal collective clustering around communities where people live (i.e. the centre of the settlement), whilst sparsely populated areas document fewer entries. Therefore, we were able to identify sub-geographic areas having less compared to areas with more entries. Additionally, mapped entries typically occur in spatial clusters that are related to the particular physical or built landscape feature (The Seasonal Lakes of Pivka Nature Park, railway track, main road). The methods employed in the post-processing stage, along with their results, highlight the importance of integrating advanced spatial, quantitative, and qualitative analytical techniques to uncover complex spatial patterns in mental representations.

We invested a reasonable amount of time into the conceptualization of elements and (aggregated) categories of (dis)amenities, but it showed up that the later have to be operationally defined (Brown et al., 2020) and communicated in such a way that their meaning is simple and intuitive. Our typology was previously tested in Alpine microregion of Slovenia (Bobovnik and Potočnik Slavič, 2021) and could be replicated in different geographic environment – being confirmed with this survey in Dinaric-Karst microregion of Slovenia. Herewith, it provides an opportunity to compare relative importance of different (dis)amenities since it bears elements of external validity.

Aesthetic, recreation and economic amenities are most frequently mapped (Brown et al. 2020; Bobovnik and Potočnik Slavič, 2021); biological, life sustaining, and historical/cultural entries occupy mid-range in value rankings. Non-specified (dis)amenities ask for more loose approach: collaborators should have the opportunity to map this type of (dis)amenity with his/her own definition.

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ARTICLES

# GENDER DISPARITY IN LITERACY AMONG THE POPULATION OF BOSNIA AND HERZEGOVINA

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*ABSTRACT*
***Gender disparity in literacy among the population of Bosnia and Herzegovina***
*The study examines gender disparities in literacy among the male and female population of Bosnia and Herzegovina. The study utilizes data from the national population censuses of 1953, 1961, 1971, 1981, 1991 and 2013. Illiteracy rates, computer literacy, and Sopher's disparity index were calculated to quantify differences in literacy rates between males and females. Variations in literacy rates across municipalities and cities of Bosnia and Herzegovina were also analysed. within the municipalities/cities of Bosnia and Herzegovina. The research incorporates geographic information systems (GIS) to process and analyse population literacy data. The resulting geospatial data were subjected to analytical-synthetic processing using the R programming language and subsequently visualized cartographically. Several thematic maps were generated to illustrate temporal and spatial changes in literacy levels, providing a comprehensive overview of literacy dynamics and gender disparities across the country.*

*KEY WORDS*
*Educational structure, literacy, Sophers disparity index, programming language R, Geographic Information System, Bosnia and Herzegovina*

# 1. Introduction

## 1.1. Basic educational characteristics

Enculturation is a formal process by which a society, through schools, universities and other educational institutions, transmits its cultural heritage and its overall knowledge, values and skills to the next generation (Mešanović and Hadžimustafić, 2023). Education is simply an aspect of socialization and involves acquiring knowledge and learning skills, and it also affects the formation of beliefs and moral values (Ilišin et al., 2003).

Educational structure is a term that refers to the representation of educated or schooled persons in a certain area (Galeković-Krušlin, 2019). It includes the structure of the population according to literacy, schooling and other educational characteristics. Literacy and schooling are one of the basic indicators of the educational level of the population, especially of its employed part, and are an essential prerequisite for the successful economic development of the country (Šolević, 2020).

Literacy is the lowest level of education (Nejašmić, 2005). It has become one of the most important means for achieving various personal goals and for performing various roles: at school, at the workplace, in the family and in society, both locally and globally. The level of literacy affects several aspects of human life: the acquisition of education, the possibility of employment, success in the workplace, self-realization and the success of activities in the community (Dijanošić, 2012).

A large amount of information from everyday life, such as instructions for using technical devices or medical prescriptions, can only be understood with a sufficient level of literacy. Individuals also need to be literate in order to understand official announcements or read important information (e.g., travel restrictions during the global COVID-19 pandemic, paying taxes, etc.).In addition, literacy is necessary for filling out certain forms (e.g., applying for a job), signing contracts (e.g., before vaccination) or for political participation (e.g., voting in elections).Some of them may require a high level of reading and writing skills. Moreover, private and business communication takes place more and more through social networks, such as Facebook, X, YouTube or Messenger, which requires people to read and understand different forms of online texts. Literacy skills are also a prerequisite for everyday activities that can bring

personal fulfillment and increase life satisfaction (e.g., e-mail, blogs, chats) (Miyamoto et al., 2024).

### 1.2. Study area

The research area is Bosnia and Herzegovina, which is located in Southeast Europe, that is, on the Balkan Peninsula. According to the 2013 census, there are 3,531,159 inhabitants, who live in 142 municipalities and cities (Figure 1). Administratively and politically, it is divided into: Federation of Bosnia and Herzegovina, Republika Srpska and Brčko District of Bosnia and Herzegovina. Bosnia and Herzegovina borders Croatia to the north, west and south, while Serbia and Montenegro are located to the east (Avdić et al., 2022).

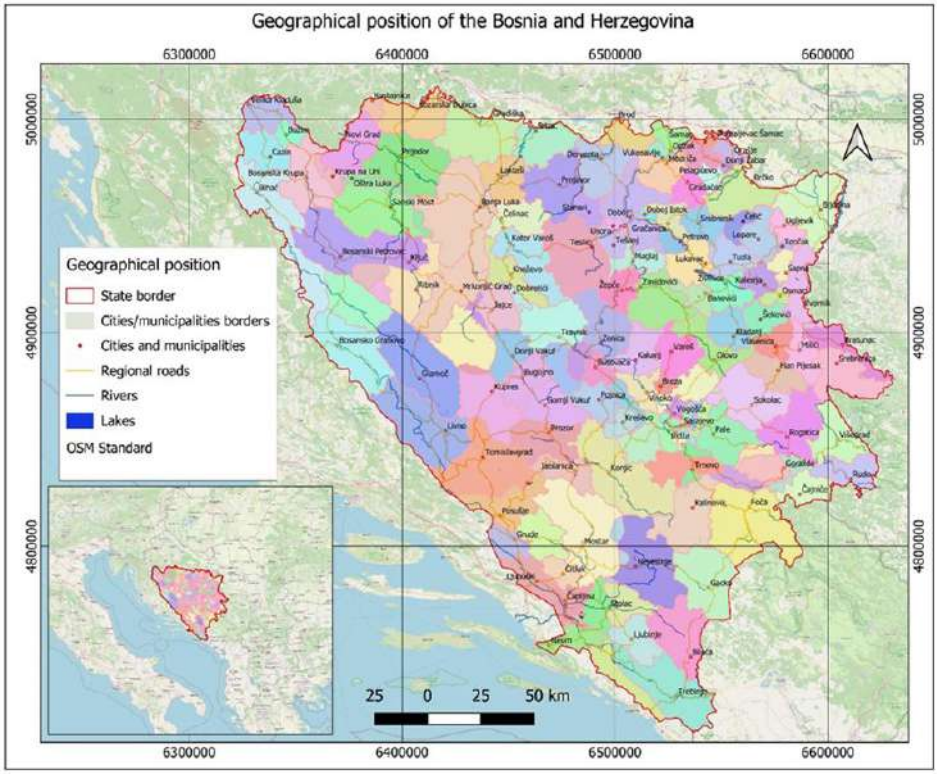


*Figure 1: Geographical position of Bosnia and Herzegovina.*

### 1.3. The aim of the research

The aim of the research in this paper is a comprehensive analysis of the literacy of the population in Bosnia and Herzegovina. The literacy of the population was influenced by various factors in society, and each of them has a positive or negative effect in a certain way.

### 1.4. The Historical Development of Literacy and the School System in Bosnia and Herzegovina

The first forms of literacy or the development of education in Bosnia and Herzegovina can be traced through the inscriptions on the medieval tombstones of members of the Bosnian, Orthodox and Catholic churches, from the 11th to the 15th century. On the territory of Bosnia and Herzegovina, there are 2,612 sites with 59,593 »stećak« tombstones, and their script is a variant of the South Slavic Cyrillic alphabet (Bešlagić, 2004). On a certain number of tombstones, the inscriptions are written in Glagolitic script and Latin letters as well (Bogićević, 1975).

In medieval Bosnia, culture and literacy was limited to a circle around monasteries, churches and court offices and included clergy, rulers, noble families and merchants.

In the Ottoman period, education was on a confessional basis, and there were Muslim, Orthodox, Catholic and Jewish schools. The upbringing and education of the Muslim population took place in mosques and religious schools, and the following subjects were studied: Arabic, Turkish and Persian languages, theology, logic, history, geography, arithmetic, geometry, etc. The most famous religious schools were founded in Sarajevo, Tuzla, Travnik and Mostar (Monography, 2016).

Organized institutional education of the Orthodox population in Bosnia appeared only at the beginning of the 19th century. Until then, literacy took place in churches, monasteries, primary schools under the care of church municipalities, and also through self-taught literacy (Bogićević, 1975). The first such school in Bosnia and Herzegovina started operating in Livno in 1820. Towards the end of the Ottoman rule, there were 56 schools, 75 teachers and 3,523 students in Serbian-Orthodox schools. Among the Orthodox schools during this period, it is important to highlight the women's school of Staka Skenderova, which has been operating in Sarajevo since 1856 (Papić, 1972).

Except for Sarajevo, some of the oldest schools are also in Mostar, Brčko, Banja Luka, Žitomislić, Travnik, Trebinje and Foča. The schools were supported by church parishes, with occasional assistance from Vojvodina and Serbia, most often in the form of textbooks, supplies, and school reading materials (Encyclopedia of Yugoslavia, 1983).

The first Catholic school in Bosnia and Herzegovina was opened by the Franciscans who came to medieval Bosnia at the end of the 13th century. The earliest centers of literacy were monasteries, and the oldest monastery and religious schools are mentioned as early as 1655 in Kreševo, Rama, Fojnica, Modriča, Srebrenica, Tuzla and Visoko, Gornja Tolisa in 1823, and later in Herzegovina (Humac and Široki Brijeg). At the end of the Ottoman administration, elementary schools for Catholic children were founded by nuns of the order of St. Vinko, who arrived in Bosnia in 1871. These nuns opened schools throughout the territory of the country at the time, teaching male and female children religious and secular subjects. They opened the first school in Sarajevo (1871), Mostar (1872), Dolac near Travnik (1872), Banja Luka (1872) and Livno (1874) (Šušnjara, 2014; Encyclopedia of Yugoslavia, 1983).

Sephardic Jews came to Bosnia and Herzegovina in the 16th century, and they are originally from the Iberian Peninsula. The Jews, coming from Spain, brought with them two languages and two scripts: the Hebrew language (Ivrit; Heb. 'ibrīt: Hebrew) and the Spanish language (Ladino). With the arrival of Austro-Hungarian rule in Bosnia and Herzegovina in 1878, Ashkenazi Jews also settled there, who in 1902 built an Ashkenazi temple, their cemetery, etc. Jewish children acquired education and knowledge in »Meldar«, which was a lower elementary school, and »Talmud Torah«, which was a higher religious school, and in »Yeshiva«, a higher Talmudic school that trained rabbis, which was founded in 1768 by the famous rabbi David Pardo. The most famous work of Jewish cultural heritage is the Sarajevo Haggadah. This unique work is distinguished by the beauty of the original decorations and illustrations and surpasses all illustrated Haggadahs of the world so far. The manuscript of the Sarajevo Haggadah was created in Spain in the second half of the 14th century. The Sarajevo Haggadah is a reflection of the great culture of the Sephardic community, which has its deep historical basis and a strong connection in tradition (Zarić, 2010). Today it is kept in the National Museum in Sarajevo.

Austro-Hungarian administration over Bosnia and Herzegovina began in 1878. This Monarchy, in addition to religious schools, also organizes state - interconfessional schools (Papić, 1972).

The first decree on the organization of state primary schools was passed in 1879 and it provided for three types of schools: general public schools, private schools and confessional schools. Schools were male and female, and sometimes mixed (Šušnjara, 2014). In addition to primary schools, commercial schools and state schools-gymnasiums are also being opened.

With the formation of the Kingdom of Serbs, Croats and Slovenes, that is, the Kingdom of Yugoslavia, there were no significant changes in the education system of Bosnia and Herzegovina. Corrections were made in the curricula and programs in the group of national subjects, with an emphasis placed on the history and geography of Serbs, Croats, and Slovenes, and for school reading, works from Serbian, Croatian, or Slovenian literature were prescribed.

The general social and cultural transformation and economic development after the Second World War required comprehensive primary education for children, youth and the elderly, as well as the development of a network of secondary and vocational schools, as well as higher education. This contributed to the development of the population's awareness of the importance of education, especially among women, who were neglected in earlier times.

The weak cultural and educational heritage and the consequences of the Second World War are the basic conditions that influenced the state of illiteracy and the policy of literacy in the territory of Bosnia and Herzegovina after 1945. The high percentage of the illiterate population represented one of the biggest problems of the overall socio-economic development, and a population literacy program was started.

Literacy in Bosnia and Herzegovina, but also in Yugoslavia, was carried out through illiteracy courses that were organized in villages, factories and institutions throughout the country, especially in educationally backward regions. The courses were designed by the state educational authorities, that is, the public education departments of the federal ministry and the republican ministries of education (Bondžić, 2010).

Gender differences with regard to academic performance remain one of the more challenging issues in educational research (Jelas et al., 2014). Although girls and women were neglected in the earlier period in terms of literacy and education in general, significant changes have occurred in recent times. Girls have a substantial advantage over boys in terms of reading performance throughout all OECD countries (Van Hek et al., 2019).

According to the conducted reading literacy research from PISA 2018, girls in Bosnia and Herzegovina also achieved better results than boys in reading (Džumhur et al., 2022).

## 2. Material and methods

Research on the territory of Bosnia and Herzegovina was carried out on the basis of available historical sources and data, as well as own research. Most of the research on the development of literacy and education is devoted to the period from 1953-2013. year, because this is made possible by the official population censuses conducted in different inter-census intervals.

During the time of Socialist Yugoslavia and Bosnia and Herzegovina as one of the republics of the joint state, a total of 6 censuses were conducted: 1948, 1953, 1961, 1971, 1981 and 1991. The first population census after independence was conducted in October 2013.

There are minor or major methodological differences in the population censuses. According to the 1948 census, no data were provided on the educational structure of the population. For the year 1953, no data were published on the educational structure of the population for the level of municipalities, but only for the characteristic of literacy, that is, illiteracy of the population older than 10 years for the level of the republic. The population censuses from 1961, 1971, 1981, 1991 and 2013 included the illiterate population by municipalities and cities aged 10 and over and their age structure. In addition, in the 2013 census, data on the number of computer-literate population aged 10 and over, by gender and age groups, were given for the first time. Persons could declare that they know how to perform one or more activities on a computer (word processing, creating tables, use e-mail and use the Internet) or declare that they do not know how to perform any of the offered activities.

According to the census methodology in the former Yugoslavia and Bosnia and Herzegovina, every person who declared that they could write and read a text-letter from everyday life was considered a literate person, regardless of the script they wrote in or the language they spoke (Wertheimer-Baletić, 1999). The word illiterate means an ordinary person who can neither read nor write. The group of people who are said to be literate includes people who can read and write. The word semi-literate is most often used for a person who can only read and not write. Even today, literacy, in the broadest sense, is considered to be the ability

to read and write. However, other forms of literacy have developed over time, and today we distinguish between: basic, elementary literacy, functional literacy, information literacy, digital literacy, media literacy, visual and social literacy (Bradić-Martinović, 2022).

During the research, general scientific methods, quantitative and qualitative methods were applied. Collected data from the population census in Bosnia and Herzegovina from 1953-2013. were stratically processed in the programming language R and the rates of illiteracy of the population, computer literacy and Sopher's index of disparity, which is obtained from the percentages of male and female literacy, were calculated. The data is also presented cartographically with the application of geographic information systems.

Namely, the disparity index developed by David V. Sopher (1974) was calculated using the following formula (Sakshi and Bano, 2023):

$$D = \text{Log}\ (X2 / X1) + \text{Log}\ [(Q - X1) / (Q – X2)]$$

where $X2 \geq X1$ (X2should have a higher value than X1) and $Q = 100$.
In the formula, X2 implies the male literacy rate and X1takes into account the female literacy rate.

In the case of perfect equality (i.e., no disparity) the value of D will be 0. With the rising value of D, the disparity rises. For example, a score of 0 means zero disparity, and as we go towards a higher value, the disparity keeps on increasing. Sopher’s disparity index is useful for measuring the relative disparity (Sakshi and Bano, 2023). Also, the values of the Sopher male-female literacy disparity index are divided into five categories, namely: very low disparity, low disparity, moderate disparity, high disparity, very high disparity.

## 3. Results and Discussion

Literacy is related to the age structure, so there are differences between preschool and early literacy and the literacy of young people and adults. It is necessary for further education and, in addition, a minimum assumption of inclusion in the modern work process and a better quality of life. A higher rate of illiteracy is characteristic of mostly underdeveloped countries, including Bosnia and Herzegovina.

Table 1 illustrates data on the illiterate population of Bosnia and Herzegovina according to censuses from the period 1953-2013 year.

*Table 1: Total and illiterate population of Bosnia and Herzegovina aged 10 and over by gender in the period 1953-2013.*

| Year | Total population | Population aged 10 and over | | Illiterates in (%) | | |
|---|---|---|---|---|---|---|
| | | In total | Illiterate | Everything | Male | Female |
| 1953 | 2,847,790 | 2,122,629 | 853,007 | 40.2 | 21.8 | 57.1 |
| 1961 | 3,277,935 | 2,375,803 | 772,679 | 32.5 | 16.0 | 47.8 |
| 1971 | 3,746,111 | 2,897,941 | 671,925 | 23.2 | 10.5 | 35.1 |
| 1981 | 4,124,256 | 3,383,159 | 491,044 | 14.5 | 5.5 | 23.3 |
| 1991 | 4,377,033 | 3,697,232 | 367,733 | 9.9 | 3.4 | 16.4 |
| 2013 | 3,531,159 | 3,180,115 | 89,794 | 2.8 | 0.8 | 4.8 |

*Source: Population censuses in 1953, 1961, 1971, 1981, 1991 and 2013.*

By analyzing the data in table 1, we can see that the number of illiterate population in Bosnia and Herzegovina in the period from 1953-2013. years gradually reduced. Thus, the share of illiterates decreased from 40.2% in 1953 to 2.8% in 2013. The share of illiterate male population decreased from 21.8% in 1953 to 0.8% in 2013, and the female population decreased from 57.1% in 1953 to 4.8% in 2013 (Figure 2).

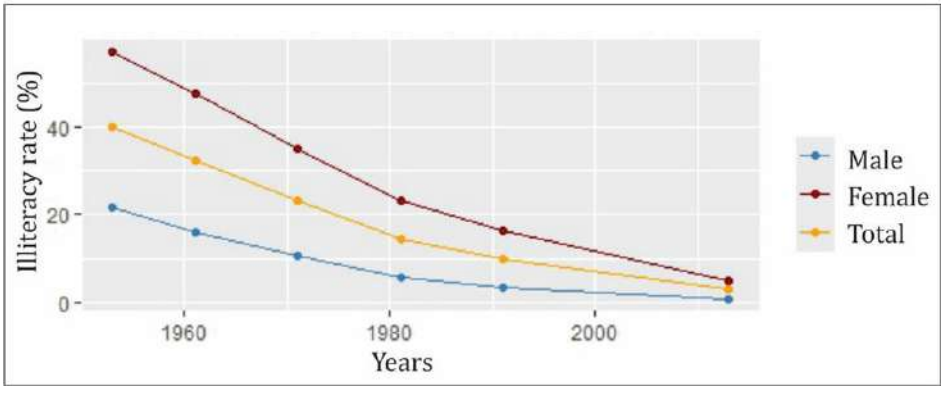


*Figure 2: Illiteracy rate of the population of Bosnia and Herzegovina in the period 1953-2013.*

According to the population census from 1953, there were 853,007 illiterate inhabitants or 40.2% of the total number of inhabitants aged 10 and over. The share of male illiterate population was 21.8%, and female 57.1%. In the same year, Sopher's disparity index is 0.68 and belongs to the category of high gender disparity in literacy, with a total literacy rate of 59.8%, of which 78.2% are males and only 42.9% are females.

According to the census data from 1961, we see that there were 772,679 illiterate inhabitants in Bosnia and Herzegovina, which is 32.5% of the total population, 47.8% were female, and 16.0% were male. The large percentage of women in the total illiterate population is a consequence of the fact that in earlier periods less attention was paid to the schooling and education of female children. Of the municipalities, Skender Vakuf has the highest illiteracy rate at 59.8% (male 37.0% and female 82.6%), and Centar Sarajevo has the lowest at 11.4% (male 5.3% and female 17.5%) (Figures 3a, 3b, 3c).

Bosnia and Herzegovina in 1961 has a gender disparity score of 0.68 and lies in the category of high gender disparity in literacy, with a literacy rate of 67.5%, of which 84.0% are males and 52.2% are females. For example, from municipalities in the category very low disparity: Kreševo (0.48) and Sokolac (0.50), low disparity: Mostar (0.61) and Ljubuški (0.62), moderate disparity: Derventa (0.64) and Foča (0.67), high disparity: Konjic (0.68) and Bijeljina (0.72) and very high disparity: Busovača (0.75) and Zvornik (0.76) (Figure 3d).

The 1971 census shows that the number of illiterates in Bosnia and Herzegovina decreased to 671,925 or 23.2% of the total population. According to this census, females are represented in the illiterate population with 35.1%, while males are represented with 10.5% of the illiterate population. The age structure of the illiterate shows that there were the most people between the ages of 35 and 49 with a total of 209,659 inhabitants (29,936 males or 14.3% and179,723 females or 85.7%), and the least inhabitants between the ages of 10 and 19 with 35,467 (9,914 males or 27.9% and females 25,553 or 72.1%). Of the municipalities, Skender Vakuf has the highest illiteracy rate, as in 1961, at 43.4% (male 25.7% and female 62.1%) and the municipality has the lowest at Novo Sarajevo 7.2% (male 2.4% and female 11.8%) (Figures 4a, 4b, 4c).

Bosnia and Herzegovina in 1971 had a Sopher disparity index of 0.70 (moderate disparity), with a total literacy rate of 76.8% (89.5% male and 64.9% female). At the local level, for example, the municipality of Kreševo is in the category of

very low disparity (0.47), while on the other hand, Neum is in the category of very high disparity (1.04) (Figure 4d).

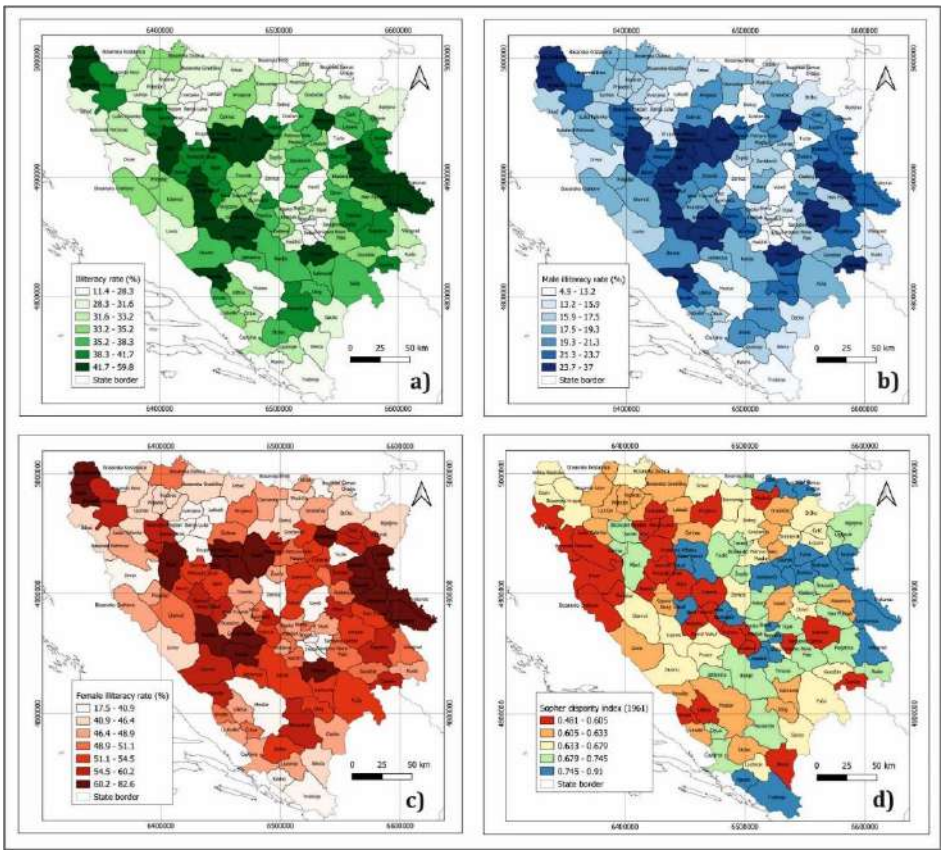


*Figure 3: Illiteracy rate and Sopher disparity index in Bosnia and Herzegovina according to the 1961 census.*

Research has shown that among the literate there are considerable differences in terms of the quality of literacy, and that a certain part of the population who were considered literate in earlier censuses in fact do not meet the set definition. The mentioned statement is mainly valid for persons who learned to read and write in illiterate courses, that is, those who completed several grades of elementary school, who did not use the acquired literacy later (Breznik, 1980).

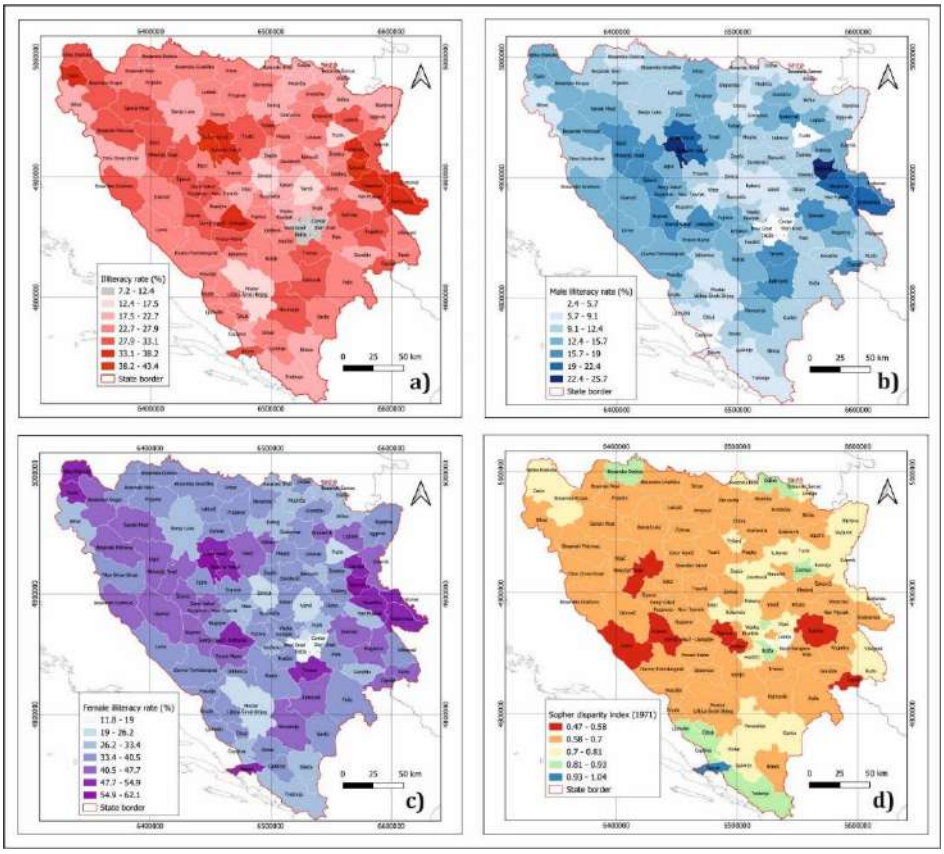


*Figure 4: Illiteracy rate and Sopher disparity index in Bosnia and Herzegovina according to the 1971 census.*

The number of illiterates in Bosnia and Herzegovina in 1981 compared to 1971 decreased to 491,044, which is 14.5% of the total population. The highest percentage of illiterates was represented by females (23.3%), while males made up only 5.5% of illiterates. The largest number of illiterates was between the ages of 50 and 64, which is 174,457 (25,972 males or 14.9% and 148,485 females or 85.1%). The least illiterate were young people aged 10 to 19 with 7,859 (2,707 males or 34.4% and 5,152 females or 65.6%). The municipalities with the highest and lowest illiteracy rates are Kalinovik with 28.0% (male 14.6% and female 41.0%) and Novo Sarajevo with 3.1% (male 0.8% and female 5.4%). (Figure 5a, 5b, 5c). In the same year, Bosnia and Herzegovina has a Sopher disparity index of 0.72 and belongs to the category of moderate gender disparities in literacy,

with a total literacy rate of 85.5%, which is 94.5% for male and 76.7% for female. For the municipalities, the order is as follows: in the category very low disparity is Fojnica (0.46), low disparity Travnik (0.58), moderate disparity Foča (0.69), high disparity Teslić (0.80) and very high disparity Čitluk (1.02) (Figure 5d).

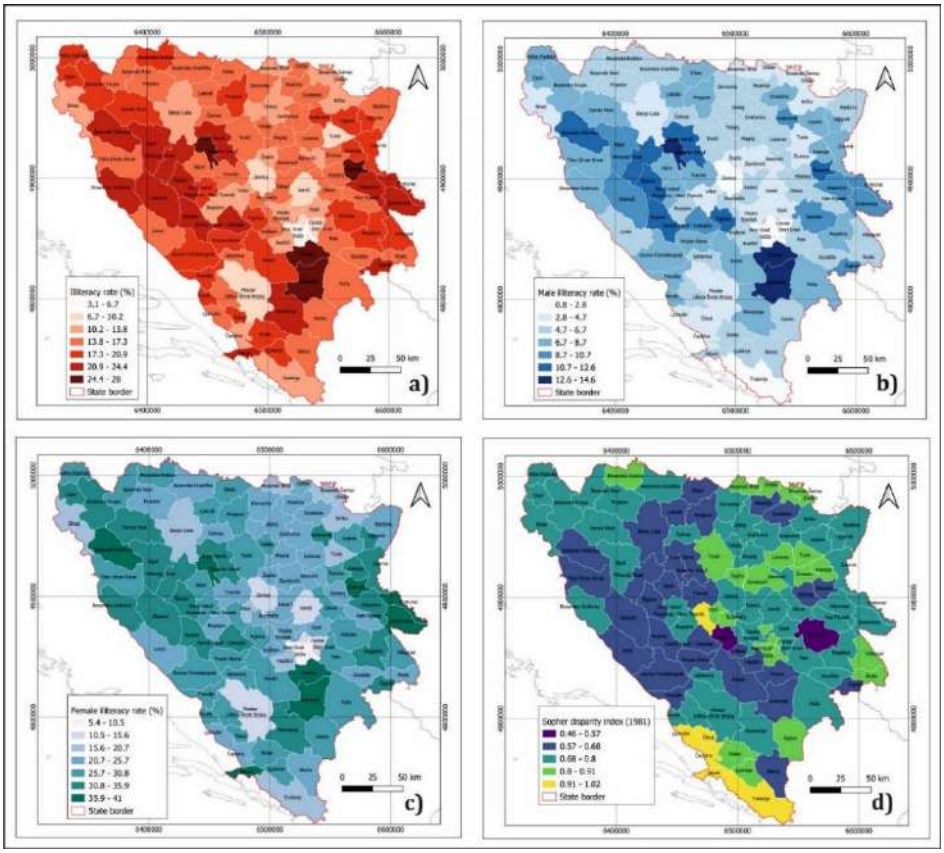


*Figure 5: Illiteracy rate and Sopher disparity index in Bosnia and Herzegovina according to the 1981 census.*

The 1991 census shows a further decrease in the number of illiterates compared to 1981. The percentage of illiterates was 9.9% of the total population older than 10 years, of which 16.4% were females and 3.4% were males. The age group of 50-64 has the most illiterate inhabitants with a total number of 154,190, of which 21,398 or 13.9% are males and 132,792 or 86.1% are females, while the least illiterate were in the age group of 10-19 and that's 5,722 (male 47.7%, or female 52.3%).

The municipality with the largest share of illiterate population is Kalinovik 27.7% (male 13.8% and female 40.6%), while the municipality with the smallest share is Centar Sarajevo 2.2% (male 0.7% and female 3.7%) (Figure 6a, 6b, 6c).

In 1991, Bosnia and Herzegovina had a gender disparity index of 0.74 and falls into the category of low disparities in literacy, with a literacy rate of 97.2%, of which 96.4% are males and only 83.6% are females. The regional differentiation is as follows: in the category very low disparity is Travnik (0.61), moderate disparity Zenica (0.82), very high disparity Čitluk (1.14), etc. (Figure 6d).

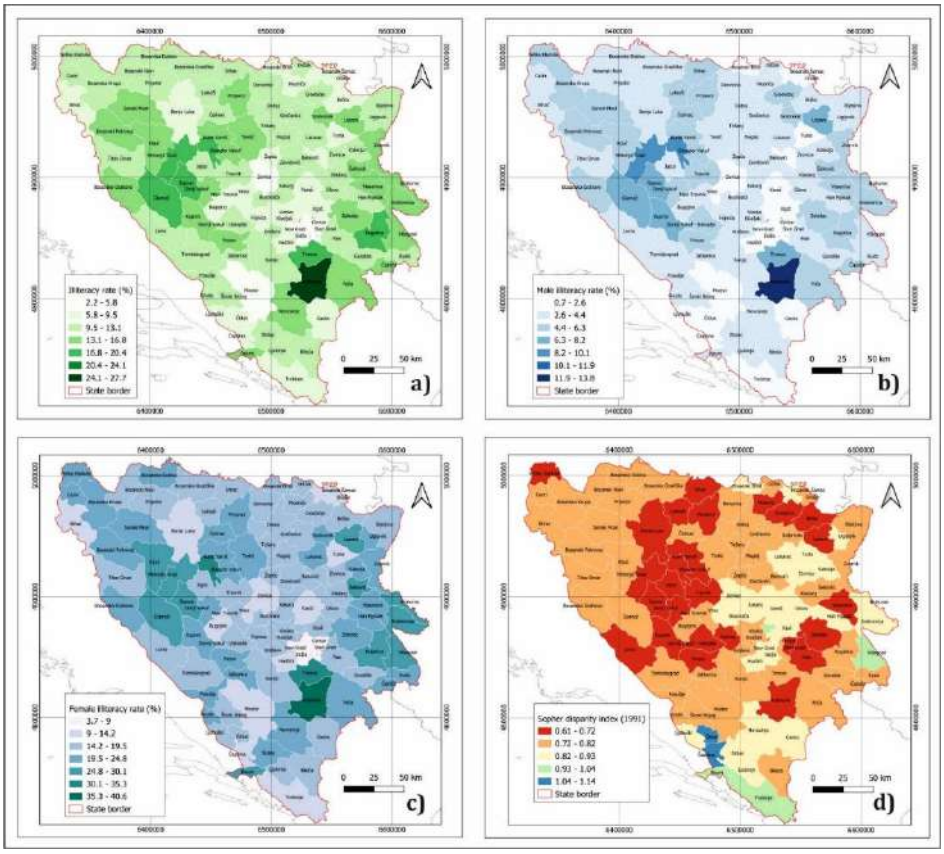


*Figure 6: Illiteracy rate and Sopher disparity index in Bosnia and Herzegovina according to the 1991 census.*

According to the results of the last population census in 2013, a total of 89,794 illiterate residents were counted. The share of illiterates was 2.8% (male 0.8%,

female 4.8%). The largest share of illiterates is in the age group of 65 and over with 68,412 (male 6,112 or 8.9% and female 62,300 or 91.1%), and the smallest in the group of young people aged 10-14 with 579 persons (male 318 or 54,9% and female 261 or 45.1%). Of the municipalities, the highest rate of illiteracy is found in small, predominantly hilly and mountainous municipalities with a predominantly rural population, such as: Kupres in the Republika Srpska entity 28.3% (male 18.1% and female 39.4%) and Kneževo 10.9 % (male 3.3% and female 18.5%), and the municipality of Trnovo 10.3% (male 1.7% and female 18.9%) and Dobretići 8.4% (male 2.6% and female 15.6%) in the entity Federation of Bosnia and Herzegovina. For example, the municipality of Kupres, which administratively belongs to the Federation of Bosnia and Herzegovina, has an illiteracy rate of only 2.4% (male 0.6%, female 4.3%) (Figure 7a, 7b, 7c).

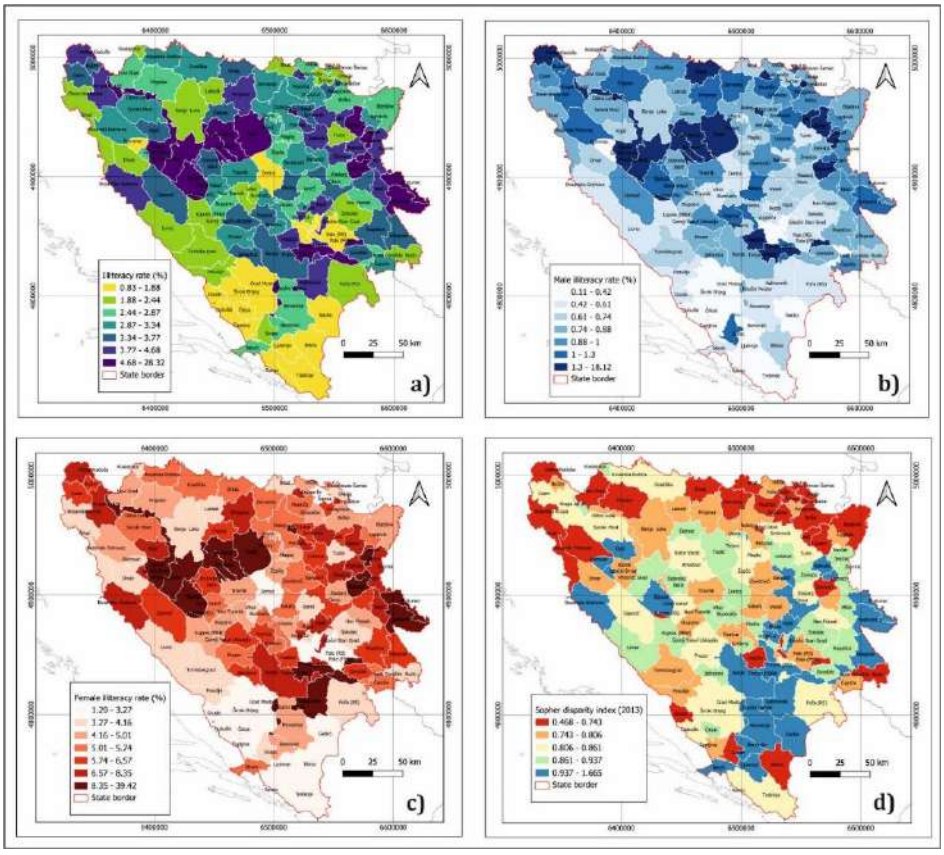


*Figure 7: Illiteracy rate and Sopher disparity index in Bosnia and Herzegovina according to the 2013 census.*

Urban areas have the lowest share of illiterates: Centar Sarajevo 0.8% (male 0.3% and female 1.3%), the city of Mostar 1.2% (male 0.3% and female 2.0%), the city of Banja Luka 2.1% (male 0.6% and female 3.5%), the city of Tuzla 2.2% (male 0.6% and female 3.7%) and Brčko District 2.8% (male 1.0% and female 4.6%) (Figure 7a, 7b, 7c).

The Sopher Index for 2013 in Bosnia and Herzegovina is 0.79 and falls into the category of low gender disparities in literacy, with a literacy rate of 90.1% (99.2% for men and 95.2% for women). At the municipal level, for example, the order is as follows: in the category of very low disparity (0.46-0.74) are Bileća and Rudo, low disparity (0.74-0.80) Vareš and Banja Luka, moderate disparity (0.80-0.86) Tuzla and Mostar, high disparity (0.86-0.93) Zenica and Livno and very high disparity (0.93-1.66) Neum and Ključ (Figure 7d).

The high rate of illiteracy of the population in Bosnia and Herzegovina was influenced by various factors, among which we single out: low level of urbanization (for example, in 1953 it was 16.3%, and in 2013 it was 42.7%), a high share of the agricultural population in the total population (in 1953 it was 62.2%, and in 1991 it was 9.3%), patriarchal relations, poverty, lack of schools, isolation and weak traffic connections of certain areas, etc. It is important to note that women made up the largest part of the illiterate population, which is a consequence of earlier times, when female children received less education. Changes in the educational structure of the female population were influenced by cultural capital, cultural deprivation, the patriarchal form of the family, the early socialization of girls and many other factors (Galeković, 2011).

Female literacy is important as it is a force multiplier for the social development of a country. Illiteracy retards the development of an individual, society and the country. Literacy also plays a significant role in reducing gender inequality (Katiyar, 2016).

Compared to the world average (13.2%), Bosnia and Herzegovina (1.7%) has a relatively low rate of illiteracy. According to data from UNESCO and the World Bank in the period 2021-2022, developed countries have a small percentage of illiterate population (on average less than 0.1%), or illiteracy has been basically eradicated (Sweden, USA, Canada, Japan, Australia, etc.). For example, most European countries have an illiteracy rate of less than 1.0% (Montenegro 1.0%, Moldova 0.4%, Russian Federation 0.1%, etc.). According to UNESCO data from 2022, there are about 771 million illiterates in the world, of which about

75% are in Sub-Saharan Africa and South Asia (almost two-thirds of illiterates are women).

The global literacy rate of the population over 15 years old was 87%, while the literacy rate of young people (15-24 years old) was 91%. About 78% of people aged 65 and over can read and write. Underdeveloped countries can have more than 50% of the illiterate population. Literacy rates below 50% are in the following countries: Afghanistan, Chad, Haiti, Niger, Mali, and others. The poverty of these countries prevents significant investment in education. There is not enough educated staff to teach them, and many children start working at an early age, in order to feed themselves and their families.

During the last population census in Bosnia and Herzegovina from October 2013, the computer-literate population aged 10 and over was also counted. Information literacy or computer literacy is determined by the level of skill in using and operating computer systems, programs and networks. It is about the skills of using modern computer tools, and its basic components are: hardware literacy (use of a personal computer, laptop, keyboard, printer, scanner, etc.), software literacy (knowledge of working with operating systems and their components, for example, operating the Windows system) and application literacy (the ability to use special, specialized software packages, for example for managing finances) (Vrkić-Dimić, 2014).

Table 2 illustrates data on the number of computer literate population in Bosnia and Herzegovina aged 10 and over by gender, based on the 2013 census.

*Table 2: Computer literacy of the population of Bosnia and Herzegovina aged 10 and over according to the 2013 population census.*

| Gender | Total | Computer literate person | Persons who are partially familiar with the work on the computer | Computer illiteate people | Unknown |
|---|---|---|---|---|---|
| Total | 3,180,115 | 1,152,353 | 758,800 | 1,229,972 | 38,990 |
| Male | 1,551,947 | 593,012 | 395,395 | 545,075 | 18,465 |
| Female | 1,628,168 | 559,341 | 363,405 | 684,897 | 20,525 |

*Source: Population census in 2013.*

Analyzing table 2, we can see that out of the total population aged 10 and over, the most computer illiterate persons are 1,229,972 or 38.7%, followed by computer literate persons 1,152,353 or 36.2% and those who partially know how to work on computer 758,800 or 23.9%. Of the total number of computer literate persons, 593,012 or 51.5% are men, and 559,341 or 48.5% are women. Among computer illiterate persons, the proportion of women is higher and it amounts to 55.7%.The largest proportion of computer-literate people are in Sarajevo's urban areas, such as: Novo Sarajevo 61.1% (male 64.7% and female 58.2%) and Center Sarajevo 60.7% (male 63.9% and female 58, 1%) and the cities of Mostar 48.1% (male 49.9% and female 46.3%) and Banja Luka 47.5% (male 48.1% and female 46.9%) (Figure 8a, 8b, 8c).

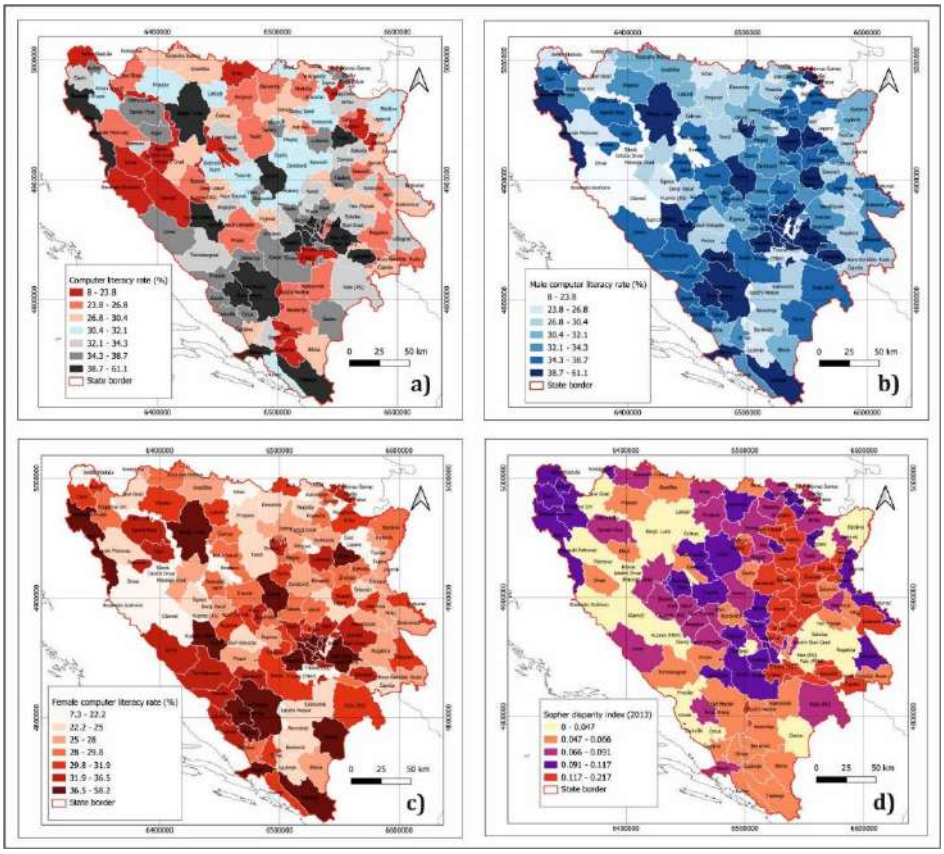


*Figure 8: Computer literacy rate and Sopher disparity index in Bosnia and Herzegovina according to the 2013 census.*

By analyzing Sopher's disparity index, it was observed that Bosnia and Herzegovina in 2013 falls into the category of low disparities in computer literacy (0.064), with a computer literacy rate of 36.2%, of which 38.2% are males and 34.4% are females. For example, in the category of very low disparities in computer literacy (0-0.04) are the cities of Banja Luka and Bijeljina, followed by low (0.04-0.06) cities of Mostar and Trebinje, moderate (0.06-0.09) cities of Tuzla and Zenica, high (0.09-0.11) the city of Zvornik and the municipality of Hadžići and the very high (0.11-0.21) municipalities of Goražde and Ilijaš (Figure 8d).

## 4. Conclusion

Reducing illiteracy and cultural backwardness, making people literate, developing and democratizing the school system, were the most important goals of the cultural and educational policy of Bosnia and Herzegovina from the Second World War until today. In the literacy of the population of Bosnia and Herzegovina, in the period of six censuses from 1953-2013, positive changes were observed. The share of the illiterate population of Bosnia and Herzegovina decreased from 40.2% to 2.8%. Particularly significant progress was achieved in the literacy of the female population (illiteracy decreased from 57.1% in 1953 to 4.8% in 2013).

Although the percentage of illiterates is highest in older age groups, there are also illiterates among young people, which means that the coverage of children in primary schools is not complete. In terms of illiteracy, there is a large regional differentiation, the percentage of illiterates is higher among the female population. In addition to the inequality according to gender, the inequality in the ratio of illiterates in rural and urban areas was also pronounced. Considering the differentiation of the territory of Bosnia and Herzegovina into smaller territorial entities, in 2013, a large number of illiterate and uneducated population have newly formed, predominantly rural-agrarian and hilly-mountainous municipalities after 1995, with intensive processes of depopulation and demographic aging. Cities like Sarajevo, Tuzla, Banja Luka and Mostar have a more favorable literacy rate and overall educational structure than the surrounding predominantly rural municipalities, and as such they can encourage more serious development of the areas that are functionally connected to them.
In the census periods 1953-2013, Bosnia and Herzegovina was in the categories of very high, through moderate, to very low gender disparities in literacy.

Also, there are significant differences in male-female literacy between municipalities and cities in Bosnia and Herzegovina. The literacy of the population was influenced by the economic underdevelopment of Bosnia and Herzegovina, a large share of the agricultural population in the total active population, patriarchal relations, cultural deprivation, low level of urbanization, poor transport connectivity of rural areas, the distance of primary schools from the settlements and their insufficient number, insufficient school attendance, etc. Progress in the literacy of the population, and in the field of education in general, should be considered the first development factor, because only educated and capable personnel can be the originators, creators and bearers of general socio-economic development.

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ARTICLES

# SOIL GEOGRAPHY IN SLOVENIA FROM PRIMARY SCHOOL TO UNIVERSITY

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*ABSTRACT*
***Soil geography in Slovenia from primary school to university***
*Soil geography has a long-standing tradition in Slovenian education. From primary school through university, the topic of soils is primarily addressed within geography curricula. On the one hand, the curriculum covers general aspects of soils including structure, properties, formation factors; on the other hand, soils are integrated into the study of regional geography of Slovenia, Europe, and the world, focusing on distribution, agricultural importance, degradation, and soils as a natural resource. Beyond geography, soil-related topics are also discussed in natural sciences, biology, and various vocational education programs, such as environmental education, agriculture, and horticulture. Despite its importance, soil is neither a central nor a particularly popular subject. Several factors contribute to this situation. A primary challenge is the limited and insufficient knowledge of teachers regarding soils. Additionally, there exists considerable confusion at all educational levels in Slovenia concerning soil-related terminology. A fundamental issue lies in the inconsistent use of the term "soil." In Slovenia, multiple terms are employed to describe essentially the same natural phenomenon. Other challenges include the absence of an official, standardized Slovenian soil classification, the occasional use of outdated soil materials in primary and secondary education, the imprecise application of international soil nomenclature, and the limited specialized education on soils at the tertiary level.*

*The ongoing curricular revision scheduled for 2024 is expected to mitigate some of these issues, ensuring that students receive more thorough and professionally grounded instruction on soil-related topics. Complementary initiatives may further improve the teaching and understanding of soils across educational levels.*

*KEYWORDS*
*soils, soil classification, WRB, school vertical, curricular reform*

## 1. Introduction

Soil science in Slovenia can be dated back to the beginning of the 20th century. We can acknowledge Bogdan Vovk as the first soil scientist and the one who determined the fundamentals of Slovenian soil science. He was followed by prominent soil scientists and teachers: Dušan Stepančič, Jože Sušin, Marjan Ažnik, Albin Stritar, and others (Vrščaj et al., 2017). The first contours of Slovenia's soil geography started to form at the beginning of the 1950s. At that time, it was clearly marked by the heritage of pedology, and geography in general took over the education on the primary and secondary levels (Vovk Korže, 2003a). Primary and secondary school geography curricula triesto provide basic soil knowledge for those who will not continue with courses in geography, agronomy, forestry, landscape architecture, geology, etc. This basic knowledge includes soil properties and processes, soil profiles and horizons, and domestic and foreign soil types. Also, at the university level, soil geography deals with soil classification outside the borders of Slovenia. Geographers are the only ones who publish expert articles about soils on all the continents (Lovrenčak, 1976, 1994; Repe, 2005b, 2005a, 2006b, 2006a; Vovk Korže, 2003b; Vovk Korže and Lovrenčak, 2004). The majority of the soil related topics in primary and secondary schools is included in the geography curriculum; only a few are included in biology environmental courses and others.

At university level, soil science is lectured in detail within geography, agronomy and forestry courses. Students can attend soil-related courses in landscape architecture, geology or archaeology degrees, among others. Nearly all soil courses are directly related to the soil scientists from Biotechnical Faculty (agronomy), except some courses at the Geography departments. Nevertheless, the soil topics taught by Slovene geographers are colourful and quite varied.

The first true soil geographical research was carried out by Prof. Lovrenčak (1970). He attempted to find the relationships between soils and vegetation and the reasons for their formation, development, and spatial extent.
Prof. Lovrenčak furthermore endeavoured to find all the possible interactions within the soil–vegetation system, and investigated soils of high altitudes and karstic areas and provided regional soil geographical descriptions of Slovenia's different regions.

At first glance soil science in Slovenia looks to be in a similar situation to that found in many European countries and their educational systems. However, there are also problems with the name of the main study object. We all teach and conduct scientific research about soils. Soil geographers and, consequently, geography teachers (on lower levels of education) use the term "prst" (the most closely related expression would be "soil", Figure 1), while all other soil scientist use the word "tla" (the translation into English would be "ground", or even more accurately, in German, Boden). To make the confusion even worse, in colloquial language most people would use "zemlja" ("earth").

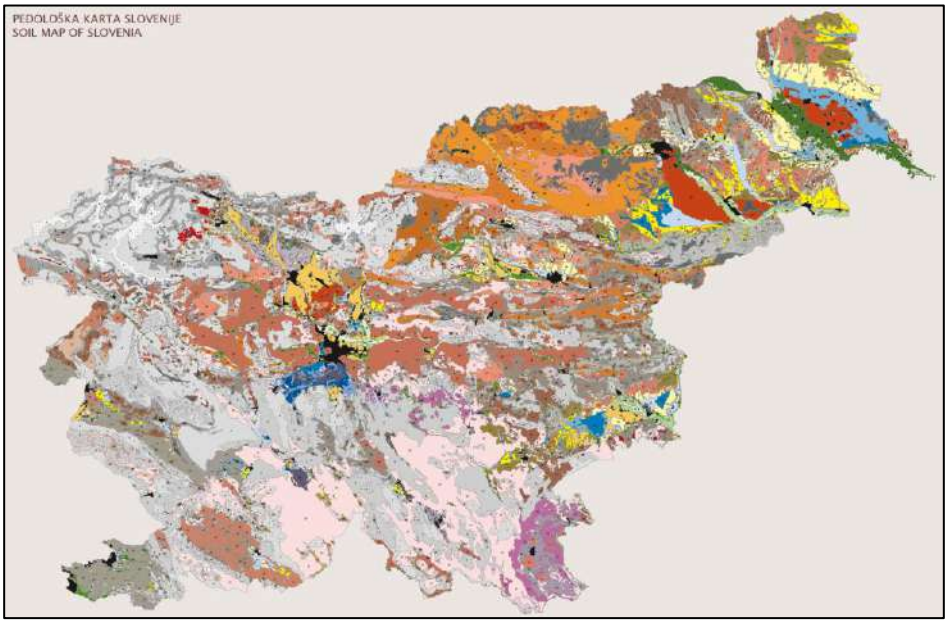



*Figure 1: Soils of Slovenia with soil map 1 : 25,000.*
*Source: Vidic et al., 2015.*

## 2. Slovenian soil classification

The origin of the Slovenian Soil Classification is linked to the development of the Yugoslavian Soil Classification (Antić et al., 1984; Škorić, 1986), since Slovenia was an integral part of Yugoslavia until 1991. The first genetic soil classification for the Yugoslavian area (including Slovenia) was introduced by Gračanin in 1951. At the following congresses of the Yugoslavian soil scientists, the classification was developed and changed by many authors over the next decades (Neugebauer et al., 1963; Škorić et al., 1985). The final Yugoslavian version was accepted in 1985 (Kralj, 2008). The Yugoslav Soil Classification has always been partly morphological and partly genetic, based on soil properties and soil genesis at the same time. All the properties were supposed to be visible, easily measurable and as quantitative as possible.

There were six levels of classification: Division – Class – Type – Subtype – Variety – Form. Subtypes, Varieties and Forms are not subdivided in a single uniform manner; subdivisions are defined individually for each type. Still based on the same Yugoslavian Soil Classification, the soil taxonomies of the former Yugoslav republics are still being independently developed and upgraded and thus have become more diverse (Čirić, 1984; Husnjak, 2014; Kralj and Grčman, 2009; Prus, 2000; Resulović and Čustović, 2002; Škorić et al., 1985; Stepančič et al., 1986; Urbančič et al., 2005). After Slovenia became an independent state, the activities related to the Slovenian Soil Classification merely continued. In part of the soil science community there is a growing need to upgrade and further improve the Slovenian Soil Classification. The main reasons are the need for the taxonomy to better reflect productivity, water holding capacity, relationships to environmental threats, environmental protection, and to be able to be correlated to the international classification – the World Reference Base (WRB). After all these years there is still no official harmonised Slovenian Soil Classification.

In very recent years, three additional publications were available, where soil classification was also presented: Soils of Slovenia with soil map 1 : 25,000 (Figure 1) (Vidic et al., 2015), Slovenian soil classification (Prus et al., 2015) Soils of Slovenia (Vrščaj et al., 2017) and soil survey manual (Repe and Perica, 2022). Unfortunately, they all heavily relay on the “old” classification or WRB and therefore do not bring new classification or naming ideas.

In 2014, activities began that were to lead to a new Slovenian classification as part of the International Year of Soils 2015. For several years, with some breaks intensive work was carried out.

The result is the document "Soil Classification of Slovenia 2019", which was published on the website of the Ministry of Environment and Spatial Planning and is labelled as work in progress. Namely, not all errors and shortcomings have been corrected and it has not been fully harmonised with all Slovenian experts (Vrščaj et al., 2019). It is intended to describe and name the soils of Slovenia. At the same time, it omits and does not describe pedogenetic factors and soil properties that have not yet been identified in Slovenia but does not exclude the addition of new soil properties or even new groups. The classification is in many ways inspired by modern, foreign classifications, such as WRB (IUSS Working Group WRB, 2022), but aims, among other things, to

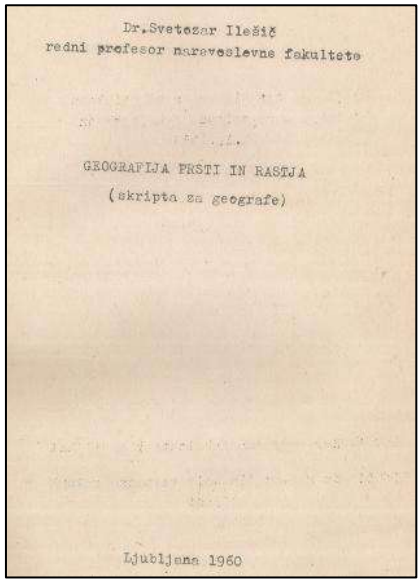
- to establish the pedon as a starting point,
- add new groups (urban, technogenic, underwater),
- reduce the number of basic types,
- consider the production, environmental and ecosystem functions of the soil, etc.

## 3. Soils in Slovenian higher education

Apart from PhD courses, there are no possibilities to exclusively study soil science or soil geography in Slovenia. There are some programmes at the university level that provide courses on soils. They are scattered across faculties and departments at the University of Ljubljana, the University of Maribor and the Faculty of Environmental Protection. Most notable is the Biotechnical Faculty and its degree in Agriculture–Agronomy, where there are special courses in Soil Science and in Land Use and Soil Protection. General soil science courses can also be attended while studying Forestry and Landscape Architecture at the same faculty and while studying Geology at the Faculty of Natural Sciences and Engineering. There are soil geography courses on both degree levels of Geography at the Faculty of Arts (Geography department) Such as Physical geography, Soil- and biogeography and Applied physical geography. A similar situation can be found at the University of Maribor. Soil science is lectured at the Faculty of Agriculture and Life Sciences and Faculty of Arts (Geography Department). While studying Environmental Protection and Eco-technologies at the Faculty of Environmental Protection a soil-science-related course (Soil Use and Protection) is available at master's level. One could only guess that for a country as small as Slovenia with its more than 82.000 enrolled students every year (SURS, 2025) there would probably not be enough interest for an interdisciplinary soil science degree.

Another problem is that there is hardly any cooperation between courses and university lecturers. There is an ocean of opportunities for improvement, especially in field research and trips. Maybe we should follow the example of Geography and Geology students and their Geo-Geo Camp (GEODSG, 2017) where they invite lecturers and experts from all fields of science, including soil scientists and soil geographers, to conduct field research.

There are also very few university textbooks available (Belec, 1983; Ilešič, 1960; Lovrenčak, 1994; Stritar, 1973; Vovk Korže, 2015) (Figure 2) and all except one are quite old editions. There are also some published laboratory and field research manuals (Repe and Perica, 2022; Vovk Korže, 2014; Vovk Korže and Lovrenčak, 2001, 2004). Unfortunately, still many of the materials remain unavailable to the public in print form, and are instead given directly to students by lecturers or as internal digital documents, hidden in the protected parts of students' IT system and e-courses web pages. There are no translated textbooks from other languages. Especially valuable for geographers is the translation of WRBinto Slovenian (Repe, 2018). It sets the terminology and names for soils that exist outside the borders of our county.


Dr.Svetozar Ilešič
redni profesor naravoslovne fakultete

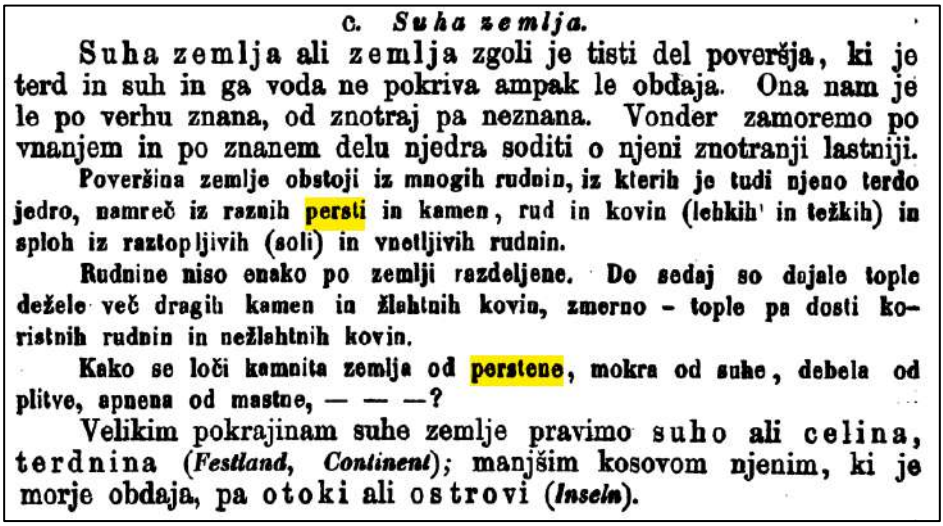
GEOGRAFIJA PRSTI IN RASTJA
(skripta za geografe)

Ljubljana 1960

*Figure 2: Cover of Geography of soil and vegetation, one of the very first geographical, university textbooks. Source: Ilešič, 1960.*

## 4. Soil related topics in Slovenian primary and secondary schools

All the difficulties concerning terminology and the absence of an official soil classification are not the only problems in the country. Although there is a very long tradition of teaching soil topics within geography courses, dating back to the middle of the 19th century (Jesenko, 1876) (Figure 3), the current situation in primary and secondary schools is less than ideal. There are three very closely related main documents regarding teaching geography (and soils) at the lower levels of education: The two curricula for primary and secondary schools and the catalogue of knowledge for the matura examination (Balažič et al., 2014; Kolnik et al., 2011; Lipovšek et al., 2008). Topics are then further reflected in the geography textbooks that teachers teach in classes, and which determine what pupils should learn about soils.



c. *Suha zemlja.*

Suha zemlja ali zemlja zgoli je tisti del poveršja, ki je terd in suh in ga voda ne pokriva ampak le obdaja. Ona nam je le po verhu znana, od znotraj pa neznana. Vonder zamoremo po vnanjem in po znanem delu njedra soditi o njeni znotranji lastniji.

Poveršina zemlje obstoji iz mnogih rudnin, iz kterih je tudi njeno terdo jedro, namreč iz raznih persti in kamen, rud in kovin (lehkih in težkih) in sploh iz raztopljivih (soli) in vnetljivih rudnin.

Rudnine niso enako po zemlji razdeljene. Do sedaj so dajale tople dežele več dragih kamen in žlahtnih kovin, zmerno - tople pa dosti koristnih rudnin in nežlahtnih kovin.

Kako se loči kamnita zemlja od perstene, mokra od suhe, debela od plitve, apnena od mastne, — — —?

Velikim pokrajinam suhe zemlje pravimo suho ali celina, terdnina (*Festland, Continent*); manjšim kosovom njenim, ki je morje obdaja, pa otoki ali ostrovi (*Inseln*).

*Figure 3: One of the first Slovenian-language geography textbooks, which included soils.*
*Source: Jesenko, 1865.*

The soil-related subjects are very variable and can be found in different topics and courses:

- The majority of soil topics are located in chapters as part of general geography – physical geography – where soils are represented as one of the geospheres or as an integral part of the landscape. The topics include

those connected directly to soil science (soil formation, properties, processes, profiles and horizons), soils of Slovenia and soils of the world – the importance of soil for mankind – and soil degradation.

- Soils are mentioned in some scattered places in the regional geography of Slovenia, e.g. karstic soils (Terra rossa, Figure 4), agricultural soils of the alluvial plains in the NE part of Slovenia, poorly developed mountainous soils, etc.
- Soils are also an integral part of the regional geography of Europe and the regional geography of the world, e.g. the agricultural soils of Russia and the Great Plains of the USA, soil desertification of the Sahel, etc. Soils are also mentioned (but not dealt with in detail) within the topics of agricultural production, irrigation, salinisation, volcanoes, permafrost, desertification and slope-related processes (erosion, landslides).


*Figure 4: Soils are an integral part of regional geography in primary school, example of Terra rossa on Karst.*
*Source: Senegačnik et al., 2010.*

In primary schools pupils should: learn about soils as part of the Earth's natural system (together with relief, waters, climate, plants and animals); know how climate, plants and soils are interrelated and how that affects the life of people; give a proper description of a local environment (including soils); describe the

most typical soils of Southern Europe; compare soil properties to climate/plants in the Pannonian lowlands; indicate the negative impacts of industry on air, water and soils. Knowledge about soils is expanded in secondary school. Pupils should:

- Understand the connections between all elements of the geosphere.
- Understand what a soil profile is.
- Using pictures, recognise some typical soils of Slovenia and of the world.
- Gain an awareness of the importance of soil protection.
- Know some soil groups of the WRB.
- Be able to dig their own soil profile, describe horizons, recognise and determine some features (depth, pH value, texture, colour, moisture, etc.) and processes (leaching, reduction, mineralisation, humification, etc.), and make a miniature replica of the profile (using plastic bags or drawing it).
- There is also a plan to conduct a field research/trip together with biology and chemistry courses in the future.

The secondary school curriculum is directly reflected in the "Catalogue of knowledge" for the matura examination (secondary school leaving exam), which includesalso field research.

A superficial reading of curricula would give the impression that geography covers soil topics rather well and that the knowledge of students entering university is rather high and comprehensive. However,the abovementioned goals are not fully achieved (personal opinion of the author): some expectations are not realistic (e.g. recognising soil types from pictures, the ability to recognise certain processes). The curricula also express that some of the topics are out of date, they are too scattered across courses and school years, and some very important topics are missing or given too little importance (soil awareness, soil functions, soil ecosystem services, soil protection, etc.). There is still much confusion related to basic soil terms.

Neither topics, teachers nor pupils use the terms "soil", "earth" and "ground" consistently; sometimes they are used synonymously, sometimes as being different parts of the Earth's surface and sometimes as one being superior to the other. Nearly teachers all confuse soil fertility and soil suitability for agricultural production. One of the most problematic parts is the naming of soils from around the world. Despite the WRB being mentioned, the curricula still use colours as the most important distinguishing and naming parameter for the soils of the world (red, yellow, grey, brown and black soils).

The author believes our school system should use at least some form of internationally accepted or WRB-related names (IUSS Working Group WRB, 2015) (Figure 5).

**Prsti polsuhih in suhih, tudi sredozemskih območij**

**Dosedanje poenostavljeno poimenovanje:** puščavske prsti, rdeče in rjave sredozemske (mediteranske) prsti.
**Najpomembnejše skupine WRB razvrstitve prsti:** Slončaki, Solonci, Arenosoli.
**Glavne skupne značilnosti**: Nam najbližje so prsti sredozemskih območij (v Sloveniji jih imenujemo jerovica, drugod jih imenujejo terra rossa), katerih značilna rdeče in rdečerjave barva je odraz močne oksidacije železovih oksidov, ki obarvajo minerale glin. V še bolj sušnih in toplih razmerah prihaja do mehanskega preperevanja kamninske podlage, zato so prsti zelo skeletne ali peščene (npr. Arenosoli). V takšnih razmerah se organska snov hitro razkraja. Močno primanjkuje vode. Če je prisotna podtalnica, se ta dviguje proti površju, kjer izhlapeva in povzroča kopičenje soli v prsteh, tj. zaslanjevanje (Solončaki, Solonci).
**Splošna primernost za kmetijstvo**: V povezavi z visokimi temperaturami je pomanjkanje vode izrazito omejitveni dejavnik za vse oblike kmetijstva. Kjer pa je vode dovolj, so te prsti primerne za kmetijstvo. Za poljedelstvo je potrebno namakanje, zelo je razvita nomadska živinoreja. Območja ob velikih vodotokih (Nil, Mezopotamija, Ind, Ganges ...)

*Figure 5: Part of the one of the new secondary school textbooks with proper use of WRB soil group names.*
*Source: Baloh et al., 2017.*

## 5. Possible solutions for the soil geography problem

### 5.1 Curricular reform 2024–2033

In 2022, the procedures for revising the curricula (Ahačič et al., 2022) for primary and secondary schools began, including for the subject of geography (Figure 6). The curricula were developed over two years in collaboration with advisors from the Institute of Education, experts from academia and practising teachers. Both documents (for primary and secondary schools) were finalised at the end of 2024 and approved in summer 2025. The curriculum consists of individual topics ("tema") that represent longer, well-rounded learning units (e.g. Physical Geography of Slovenia). Each topic contains several objectives ("cilj"). The topic mentioned above contains four objectives: Surface, Lithology and Soils of Slovenia; Climate, Weather and Vegetation of Slovenia; Waterways of Slovenia; and Protected Areas of Slovenia. For each objective, knowledge

standards (“standardiznanja”) are defined that represent the expected knowledge of the student at the corresponding level. In this topic, the knowledge standard related to soils is: "The student compares the relationship between lithology and the formation of the surface, waterways and soils." The most important technical terms follow. Deep and shallow soils are associated with soils. At the end of each topic you will find didactic recommendations (“didaktična priporočila”) to help teachers implement the curriculum. They refer to various materials, resources and literature (e.g. cartographic material such as a pedological map) and suggest classroom or field activities ("When discussing the topic of soil, the teacher can show different soil samples in class and together with the students "recreate" a soil profile which they display in a glass jar") and offer additional explanations (how rocks and the surface affect the depth of the soil cover). An important theme was the introduction to geographic research, where students learn about different methods in the classroom and in the field, as well as the profession of geography.


*Figure 6: Covers of the new primary (left) and secondary (right) school curriculum.*

Based on the primary school curriculum (Poglajen et al., 2024), students learn about soil in the following topics and objectives:
• At the beginning, they learn that soil is a topic of geography and that the terms soil and earth are synonymous.
• An important objective is Climate, Soil and Vegetation, which conveys the relationships between these elements of the landscape. In this objective, soils are presented descriptively without using names.
• In the context of the regional geographical themes of the world and Europe, soil is treated as a natural resource that provides various services, enables food production and must be protected. Important agricultural areas are highlighted.
• As already mentioned, soils are dealt with in the context of the topic Natural Geographical Features of Slovenia.
• Geographical research enables various practical activities related to soils (e.g. field observations).

It should be noted that pupils learn about the basic characteristics of soil (structure, properties, etc.) in the Natural science course in the 5th year of primary school.

The new secondary school curriculum (Poglajen, Vidovič, Polšak, Konečnik Kotnik, et al., 2024) has the same organisation and structure as the primary school curriculum. It provides for a thorough deepening of knowledge about soil:
• Soil is dealt with separately in the subject General Geography, objective Soil and Vegetation. Students will learn about basic concepts, soil properties, structure, pedogenic factors, profile and horizons, main soil groups (names according to WRB) and the importance of soil for life on Earth and its role in the ecosystem. Students also learn about the interaction with vegetation. Soil is also mentioned in the objectives on climate (climate change) and natural disasters (landslides). The curriculum points out the possibility of interdisciplinary links with biology and chemistry.
• In the subject Regional Geography of the World and Europe, soil is dealt with for all continents when it comes to the physical geographical elements of the landscape, especially in connection with climate and vegetation.
• In the regional geography of Slovenia, students learn about the most important soil types of the Slovenian soil classification, their characteristics, their distribution and their suitability for agricultural use.
• In the subject area of Project and research work, it is recommended that students familiarise themselves with the properties, structure and certain processes (e.g. illuviation) in detail, excavate and draw soil profiles, evaluate soils from an

agricultural perspective, observe degradation processes, compare soils from different areas, etc.

At both levels of education, soils are treated more broadly as an integral part of the landscape and ecosystem, emphasising their role in the ecosystem and their importance to life on Earth, with particular emphasis on their protection as an important natural and unrenewable resource for future generations. Many factual parts (naming of soils in primary school) and overly demanding content (identifying soil types from photographs) have been removed.

Both curricula will come into force in the 2026/27 school year, with the sixth year in primary school and the first year in secondary school.

### 5.2. Good practices of knowledge transport of to lower levels of education and to the public

Many cases show positive results regarding teaching soils in primary and secondary schools. Among those good practices examples include:

- Constant life-long learning activities. Faculties and soil-related departments (geography, agronomy and forestry) should be organising (more) symposiums, summer schools and workshops where scientists should present the newest findings in the field of soil science and soil geography. A good example isa biennial meeting for geography teachers (Prof. Ilešič days) where new discoveries can be presented. One such case was in 2005 (Repe 2005a) that introduced theWRB to secondary school geography teachers.
- Field research. Soil scientists and experts should offer their knowledge and organise soil-related field research and trips for pupils and their teachers. Since field research is one of the most interesting parts of soil courses, it would give expert insight in the methodology and raise awareness about soils. The Centre for Soil and Environmental Science (Biotechnical Faculty) and Geography Department (Faculty of Arts) offer some field research that is directly related to courses The latter organizes joint field researches with university and secondary-school students as part of the matura examination on the one side and a course on Organisation of Field Research on the other.
- Summer schools. There many available summer school programs like this year soil related ERASMUS blended intensive course Know Your Landscape, Know Your Soils (Geopedological Workshop) (https://geo.ff.uni-lj.si/en/en/vodic-za-studente/mednarodne-izmenjave-

na-oddelku-za-geografijo/Know-Your-Landscape). The course was available for students and teachers from Slovenia and Europe. Geography department from the Ljubljana University was also organizing summer schools for secondary school students in order to promote the study of geography. Soil field research was also the topic (Figure 7).

*Figure 7: Soil field work and the participants during ERASMUS blended intensive programme soil summer school in Slovenia (photo: Blaž Repe).*

- An extremely good example is Nature's Classroom (http://www.ipvo.si/slo/ucni-poligon-za-samooskrbo-dole)with its summer schools, field research, workshops, learning trails and its nearly exclusively soil related training ground near Poljčane in the Dravinja Valley in the NE of Slovenia. They conduct soil-science- and soil-geography-related education in the field for all ages, adults and preschool children included.
- Soil science and geography associations (e.g. the Soil Science Society of Slovenia and the Association of Ljubljana's Geographers) should organise more field trips with soil topics, especially for the public.
- Popular publications, papers and articles in newspapers: there are too few of these, and most are related to problems concerning soil degradation (contamination, urban sprawl, landslides, etc.) when experts give a warning or an opinion. A good example was an attempt to compile articles from soil geographers and soil scientist. This has been accomplished twice in Geographical Horizon. Both issues were

thematically dedicated to soils (http://zgs.zrc-sazu.si/en-us/publications/geographichorizon.aspx, issues 53/1, 2006 and 63/2–3, 2015).

- There also some occasional soil-related web conferences, chat rooms, public lectures and even TV and radio shows in order to raise soil awareness and bring soil topics to the public or teachers (Figure 8).


*Figure 8: Public article and video about the problematic soil sealing in Slovenia on the portal of the national radio and television MMC, 11th April 2025.*
*Source: RTVSLO, 2025.*

## 6. Conclusion

There are many obstacles to the teaching of soils at all educational levels in Slovenia. The lack of a Slovenian soil classification, the still-poor level of acceptance of WRB, the problem with basic soil terminology and consequent rivalry and arguments among soil scientists and soil geographers (i.e. teachers) certainly will not improve the situation. On the other hand, there are many activities that are steadily improving the situation. Some are mentioned above, but we have to also mention the establishment of the Global Soils Partnership (https://www.gov.si/zbirke/projekti-in-programi/slovensko-partnerstvo-za-tla/) on International Soil Day in 2017 under the patronage of the Ministry of the Environment and Spatial Planning. We have set a few primary goals, including the promotion of soil topics at all levels of education and the improvement of geography curricula in primary and secondary schools so that soils are taught properly and with a modern scientific background. In the current year (2024/25) on the International Soil Day special topic was dedicated to Eco-gardens and care for soils by the youngest (https://www.gov.si/assets/ministrstva/MOPE/Okolje/Tla/Srecanje-Slovenskega-partnerstva-za-tla-2024/05_Solski-ekovrtovi-kako-najmlajsi-skrbijo-za-tla.pdf).

There is also a new generation of younger and advanced school textbook writers (Senegačnik and Drobnjak, 2017) and publishing editors (Baloh et al., 2017) that are favourable to the modernisation of soil topics. We can expect new and updated textbooks to probably emerge in the near future. Specialists in soil science or geography must also contribute to writing parts about soils. On the other hand, university departments should produce new soil science and geography textbooks and manuals and make them accessible to everyone. First steps have certainly been taken with the publication of Soils of Slovenia (Vrščaj et al., 2017), Soils of Slovenia With Soil Map 1:250,000 (Grčman et al., 2015) and Fertile Earth (Vovk Korže et al., 2017) (Figure 9).

However, all this is still not enough. We should concentrate on setting up soil-related web and social media pages, producing promotional material such as soil calendars, stickers, YouTube videos, games, puzzles, memes, paper pads for food trays, etc. We should not only clearly and loudly celebrate, 5th December, International Soils Day in schools and publicly across all media, but extend it over at least a week of activities, with complete support from the government and non-governmental organisations. And above all, we have to start educating and raising awareness at the lowest age possible, in kindergarten.


*Figure 9: Covers of two Soils of Slovenia publications.*

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ARTICLES

# FARM TOURISM IN SLOVENIA – PERSPECTIVES AND DEVELOPMENT CHALLENGES

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*ABSTRACT*
***Farm tourism in Slovenia – perspectives and development challenges***
*Farm tourism in Slovenia represents an important complement to the agricultural sector, enabling farmers to more easily market their own produce and products, provide partial or full employment for household members, and generate additional income. It also promotes more efficient use of available farm resources, contributes to the vitality of agricultural holdings and rural communities, helps preserve the cultural landscape and rural settlement, and adds value to agricultural products and services. All of this is crucial for the sustainable development of rural areas. Moreover, it fosters closer intersectoral cooperation and strengthens trust and relationships between farms and consumers. Farm tourism establishments also serve as custodians of Slovenia's culinary heritage and culture. This paper presents the selected results of an extensive and rather complex study conducted from early 2021 to early 2023. Its purpose was to identify the main characteristics of tourist farms, analysing their offerings and determining their needs in relation to integration into broader tourism programmes and services. We conducted the survey among the holders of supplementary activities or their immediate family members; in many cases, several family members participated in the discussion, particularly when responding to open-ended questions and providing final comments. Direct, on-site surveying proved to be an invaluable source of information, enriched by personal interaction and on-location observation of the tourist farms. We also*

*conducted a survey among visitors to tourist farms in Slovenia, which provided us with some important insights into expectations and motivations in relation to what tourist farms have to offer.*

*KEYWORDS*
*Farm tourism, rural areas, sustainable development, Slovenia*

## 1. Introduction

If traditional rural economies were historically based on three pillars—the use of natural resources, the activation of other resources, and the production of goods and services—today's approach, aligned with contemporary policies, seeks to strengthen sustainable rural development through environmentally innovative practices. This involves promoting economic activities that make sustainable use of diverse rural environmental resources while simultaneously providing benefits and added value to rural areas. The transition from a traditional rural economy to an "eco-economy," which gradually directs farms, agriculture, and rural areas toward multifunctional and sustainable development, requires adaptability and flexibility both from individual farms and the wider rural environment (Lampič and Potočnik Slavič, 2017). In this context, farms engaged in supplementary activities – particularly agritourism – hold a distinct advantage and remarkable opportunity (Kerma et al., 2023).

Agritourism represents a valuable complement to the agricultural sector, enabling farmers to sell their products more easily, provide part-time or full-time employment for household members, generate additional income, and make more efficient use of available farm resources. It contributes to the vitality of agricultural holdings and rural communities, helps preserve the cultural landscape and settlement patterns, and adds value to agricultural products and services. Moreover, agritourism fosters stronger intersectoral cooperation and builds trust and closer relationships between farms and consumers (Kerma et al., 2023).

Tourist farms also play a key role as custodians of Slovenia's food heritage and culture – acting as "gastronomic banks" that safeguard and promote the country's culinary distinctiveness. Farms that have developed various forms of agritourism (particularly excursion farms, tourist farms with accommodation, and wine cellars) and supplementary processing activities (such as dairy processing, meat production, or fruit and vegetable juice production), alongside their primary agricultural work,

actively contribute to improving both the quantity and quality of national food self-sufficiency. By offering their products directly to visitors, they gain easier market access, while processing raw materials into value-added goods enhances the diversity and attractiveness of their offerings (Cigale et al., 2022; Kerma et al., 2023).

It is crucial to recognize that farmers' perceptions of their own role and the importance of agriculture in contemporary society serve as strong indicators of their ambitions and motivation to continue farming in the future. Earlier studies already show that the public maintains a positive attitude toward agriculture, and that the perceived role of farming and farmers in society is strengthening (Potočnik Slavič et al., 2016). Field surveys further reveal that the public tends to value agriculture as a vital activity for society even more highly than farmers themselves do.

## 2. Literature review

A detailed selection and review of relevant literature, studies, and other written sources addressing the broader dimensions of supplementary on-farm activities – with a focus on farm tourism – was conducted to identify the main characteristics of farmers as producers and as providers of supplementary activities, rural tourism, dimensions of effective communication, the role of meaning-making, and the contribution of wine and gastronomic tourism to rural development.

Given the nature of the research, the review primarily focused on Slovenian literature, as it most directly reflects the national context. International studies were used mainly to complement domestic findings and to fill existing knowledge gaps in areas not yet sufficiently addressed in Slovenia, particularly regarding the development potential of wine and gastronomic tourism on (tourist) farms and in rural areas. Previous research has highlighted several important aspects of agritourism, including wine and food tourism, which were relevant for the subsequent stages of the study – such as the key features of successful tourist farms, factors affecting their vitality, emerging trends in gastronomic and tourism offerings, the comparative position of Slovenian farm tourism within the European framework, characteristics of providers, the role and necessity of branding, and modern approaches to communication in tourism.

Agritourism represents an important supplement to the agricultural sector, as it enables farmers to market their products more easily, create part-time or full-time employment for family members, generate additional income, make more

efficient use of available resources, contribute to the vitality of farms and rural communities, preserve cultural landscapes and settlement patterns, and add value to agricultural products and services (Cigale et al., 2013; Cigale et al., 2014; Flanigan et al., 2015).

Farm tourism is a demanding and dynamic form of tourism – deeply rooted in tradition yet open to innovation and change. Compared to mainstream tourism, farm tourism exhibits distinctive features, such as the close interaction between the host's private life and the visitor's experience (Nilsson, 2002). Its characteristics vary significantly across countries (e.g. Sidali 2011; Dubois and Schmitz 2013; Talbot 2013), as do the patterns of supply and demand. While farm tourism generally plays a modest role in the overall tourism economy (Nilsson 2002; Solsona Monzonís, 2006), its local impacts on rural areas can be highly significant (Brandth and Haugen, 2011).

In Slovenia, farm tourism is classified as a supplementary on-farm activity that allows better use of production capacities and labour while generating additional income. By the end of 2020, there were 4,930 agricultural holdings registered with at least one supplementary activity, totalling 20,195 registered activities. Among them, 957 were tourist farms offering hospitality services, jointly providing 1,219 tourism-related supplementary activities: 589 farms offered accommodation, 490 operated as excursion farms, 100 as wine taverns, and 40 as "osmice" (seasonal farm inns). Farms are organized within an association, and those categorized with at least two apples (the national quality mark) may choose to specialize their offer, although specialization is not mandatory (Kerma et al., 2023).

Farm tourism, as part of rural tourism, can play a significant role in employment and income diversification on farms and in rural areas, thereby contributing to their sustainable development (Bojnec, 2010). Over the past decades, its importance within the broader context of Slovenian rural development and tourism has steadily increased, reflected in the growing academic and professional interest in the topic. To date, farm tourism has often been examined at the local or regional level (e.g., Polajnar Horvat and Smrekar, 2010; Perpar 2012; Kerma et al., 2014) or through studies focusing on individual segments of the offer (e.g., Podmenik et al., 2012). One of the most comprehensive elaborations of the topic was the national Potentials of Supplementary Activities and Entrepreneurship in Rural Areas, carried out within the Target Research Programme and later expanded into a monograph (Potočnik Slavič et al., 2016).

The authors analysed farm tourism as one of the key supplementary activities, finding that the distribution and offer of tourist farms depend primarily on the needs and expectations of farm owners or holders of supplementary activities. Demand only selectively influences supply, as farmers often shape their offers based on existing practices, thereby creating a specific image of farm tourism that appeals to only part of the potential tourist market. Studies (Cigale et al., 2014; Potočnik Slavič et al., 2016) have also pointed out that the growth of farm tourism is clearly visible on the demand side. Another important research effort, Potentials and Barriers for the Development of Supplementary On-Farm Activities in Slovenia (Udovč et al., 2018), identified both underutilized opportunities and the numerous challenges faced by providers of supplementary activities. Farm tourism was recognized as one of the more complex supplementary activities – one that must respond most quickly and flexibly to social changes and market demands – while also being among the most promising, particularly in the underdeveloped fields of wine and gastronomic tourism (Kumer et al., 2019, Lešnik Štuhec 2021; Cigale et al., 2022).

Geographers have also devoted considerable attention to the spatial distribution of tourist farms. Analyses have shown that three main types of tourist farms can be identified in Slovenia based on their location, with the types not being mutually exclusive and sometimes overlapping (Cigale et al., 2014):
• Tourist farms located in the hinterlands of major tourist destinations or in particularly attractive landscapes, where their emergence and visitation are influenced not only by farmers' interests and opportunities but also by environmental features. These are mainly accommodation-oriented or catering-oriented farms.
• Tourist farms with a catering focus, situated near urban markets, in peri-urban hinterlands (including cross-border areas), or within viticultural regions.
• Tourist farms located in areas without strong demand-related locational factors, where their emergence is primarily linked to favourable supply-side conditions (available labour, facilities, tradition) and the need for supplementary income.

The spatial distribution of accommodation capacities on tourist farms shows that farm tourism does not contribute significantly to overtourism in the most visited regions. In fact, 50.4% of all tourist farm beds are located in less-visited municipalities, compared to only 15.0% of total beds across all accommodation types in such areas (Cigale et al., 2014; Kerma et al., 2023).

## 3. Trends in farm tourism in Slovenia

Farms that have developed various forms of farm tourism – particularly excursion farms, tourist farms with accommodation, and wine taverns (vinotoči) – as well as complementary activities related to the processing of primary agricultural products (e.g., milk processing, animal slaughter and meat processing, fruit and vegetable juice production, etc.), together with their core agricultural activities, make an especially active contribution to both greater and higher-quality food self-sufficiency. Farm tourism thus also supports the implementation of other supplementary on-farm activities. By offering their own produce and products directly to visitors, farms gain easier access to markets, while through culinary and other services, as well as the processing of raw products into diverse food items, they enrich and enhance the attractiveness of their own offerings and those of the broader local or regional environment. Above all, farm tourism increases the flexibility and adaptability of farms in the face of unexpected changes (Lampič and Potočnik Slavič, 2017).

The relationship between primary agricultural activity and supplementary on-farm activities can be assessed both through a review of relevant literature and completed projects, as well as by means of quantitative analyses of data primarily provided by the Ministry of Agriculture, Forestry and Food, the Agency of the Republic of Slovenia for Agricultural Markets and Rural Development, and the Statistical Office of the Republic of Slovenia. The most demanding and sensitive aspect involves the collection, organization, and appropriate preparation of extensive datasets (together with relevant spatial layers), which in their original institutional settings are typically not designed for cross-analysis or synthesis interpretation (Kerma et al., 2023).

To better understand the current role of farms with supplementary activities (hereinafter referred to as farms with SA), we first summarize several previous findings that provide insight and a broader interpretation of the topic. A brief overview of the development of supplementary activities in Slovenia to date can roughly be divided into three developmental phases (Potočnik Slavič et al., 2016):

• The introductory phase of supplementary activities (from the 1980s to 2000) marks the period when a small number of innovative farm holders, often following foreign examples (e.g., Austria, Italy), began engaging in “classic” forms of supplementary activities – particularly farm tourism in recognizable tourist areas, among others.

• The phase of significant quantitative and qualitative growth (from 2000 to 2015) saw extensive expansion, leading (likely due to the rapid growth) to the regulation of these activities (through legislation and decrees) as well as increased financial incentives for investments in supplementary activities. The growth was remarkable: in 2004, Slovenian municipalities registered 2,215 supplementary on-farm activities, while by 2014 the number had already risen to 13,444. Consequently, most professional and scientific discussions during this period focused on farms engaged in tourism as a supplementary activity (Pažek et al., 2005; Potočnik Slavič et al., 2012; Lampič and Slabe, 2013; Cigale et al., 2014, etc.).
• The phase of "self-regulation" and strengthening ties with the core agricultural activity (after 2015) corresponds with the adoption of the new Decree on Supplementary On-Farm Activities (Official Gazette of the Republic of Slovenia, No. 57/2015). Growth dynamics have since been more moderate, with relatively steady increases observed in farm tourism, activities linked to traditional agricultural knowledge, and services involving agricultural and forestry machinery, equipment, tools, and animals (Udovč et al., 2018).

Current developments in agriculture and tourism compel farmers – holders of supplementary activities – to adapt and seek new approaches in tourism offerings connected to farms, agriculture, and the countryside. These processes were identified during our field research, where we observed significant dynamism in the registration of supplementary activities, discrepancies between official registries and the actual situation, and instances where a registered tourist farm exists alongside other formal business structures on the same farm (e.g., simultaneous registration of a sole proprietorship) (Kerma et al., 2023).

## 4. Characteristics of the offer at selected tourist farms, identification of their development obstacles and needs

Through extensive field surveys, we were able to identify the characteristics of tourist farms and their needs in terms of inclusion in tourist programs and services. The main research activity was therefore devoted to surveying providers of the supplementary activity of "farm tourism," which we supplemented and, to a certain extent, upgraded by conducting in-depth interviews with rural tourism development planners. The main purpose of conducting the survey among tourist farms was to identify the key characteristics of their offerings and to determine their needs regarding integration into broader tourism programs and services.

The extensive and complex questionnaire comprised several thematic sections designed to address the following objectives:
• To analyse the characteristics of tourist farms (visitation, investments, typology, categorization, membership in the Association of Tourist Farms of Slovenia, etc.),
• To analyse the specific offer of food and beverages, agricultural products, processed goods, and services provided by tourist farms,
• To examine the prevalence of the use of indigenous and lesser-known or forgotten genetic resources on tourist farms,
• To identify and assess the needs of tourist farms (in terms of education and networking), including obstacles to development and opportunities for recognizing the potential of farm and rural tourism.

We generally surveyed the holders of supplementary activities or their close family members, although often a larger number of family members participated in the discussion. Conducting the survey on an individual farm typically took between one and two hours. Usually, two members of the project team carried out the field survey, and in addition to the formal questionnaire, they discussed other relevant related topics with the participants. In this way, the survey provided a range of additional useful information and a more detailed insight into the structure, operations, functions, and problems related to supplementary activities on the farm. Direct field surveying thus proved to be an irreplaceable source of information, obtained through both conversation and observation of tourist farms.

As already mentioned, the selection of farms for the survey was based on a random sample (generated by a computer algorithm). One of the most important criteria in sampling was to ensure appropriate spatial distribution of the farms included in the survey across all 12 statistical regions of Slovenia. The spatial distribution of respondents indicates that regional representation of farms was influenced partly by the actual number of active farm holdings with supplementary activities, particularly farm tourism, as well as by the activity of field surveyors. A slightly higher concentration of responses is evident in northeastern Slovenia (Slovenske gorice) and the Goriška Brda region, which, given the research topic, is actually advantageous.

### 4.1. Some characteristics of tourist farms and their holders

We analysed selected relevant content for all farms together and comparatively by groups according to the typology of tourist farms and their age or duration of performing supplementary tourism activities on the farm. The demographic data of the surveyed holders of supplementary activities in farm tourism are as follows: men predominate (57%), although their ownership or role as holders is no longer as dominant. We observe that the representation of women in this role is increasing. The average age of the surveyed holders of supplementary activities is relatively high (50.5 years), but the age structure also shows that a significant proportion of younger holders (under 40) exists, accounting for 25% of all respondents. Educational attainment is also relatively high, as 45% of surveyed holders have completed higher or tertiary education (including a doctorate). Notably, the fields of education are very diverse, with agriculture not particularly standing out.

The structure of farm tourism by typology shows a slightly higher proportion of farms with accommodation at 56%, about one-third are excursion farms, a little over 10% are wine taverns, and the rest are “osmicas” (small local wine tasting establishments). In the analysis, it was considered that some farms combine or have registered different supplementary activities. Among the surveyed tourist farms, the most common combination was farms with accommodation and excursion farms, making up to 27%. Pure farms with accommodation accounted for slightly over one-third, exclusively excursion farms for one-quarter, while wine taverns and osmicas together made up 13%.

Regarding categorization (which applies only to tourist farms with accommodation), more than half of the surveyed farms either have no rating (number of apples) or the information is missing; 3% have one apple, 19% have two, 21% have three, and 7% have four apples (the highest standard). Clearly, some tourist farms with accommodation have not yet succeeded in categorizing their offer or ensuring adequate accommodation quality. A higher number of apples indicates higher quality and a greater range of services. The rating from 1 to 4 apples reflects the overall standard of the farm, with the greatest emphasis on the tidiness and condition of the guest areas. The rating also includes the quality and variety of food and beverages, as well as options for leisure activities. This underscores the need for quality labelling for excursion farms, wine taverns, and osmicas as well.

Among the surveyed tourist farms establishments, 57 have a service quality rating, with most having two or three apples. Eight of the surveyed farms have the highest quality rating (4 apples).
Thus, the survey predominantly included farms with accommodation that offer medium to high service quality. The table below (Table 1) shows some regional deviations.

*Table 1: Surveyed farms by quality label – number of apples, by statistical regions.*

| | **Statististical region** | **No data** | **No label** | **1 apple** | **2 apples** | **3 apples** | **4 apples** | **Total** |
|---|---|---|---|---|---|---|---|---|
| 1 | Pomurska | 1 | 16 | | 1 | 1 | 2 | 21 |
| 2 | Podravska | 3 | 9 | | 1 | 6 | | 19 |
| 3 | Koroška | 1 | | | | 1 | 1 | 3 |
| 4 | Savinjska | | 11 | | 2 | 5 | 1 | 19 |
| 5 | Zasavska | | 1 | | 1 | | | 2 |
| 6 | Posavska | 1 | 1 | 1 | 1 | | | 4 |
| 7 | Jugovzhodna Slovenija | 1 | 5 | 1 | 2 | 1 | 2 | 12 |
| 8 | Osrednjeslovenska | 2 | 4 | | | | | 6 |
| 9 | Gorenjska | | 4 | | 6 | 3 | | 13 |
| 10 | Primorsko-notranjska | | 2 | | 2 | 2 | | 6 |
| 11 | Goriška | | 6 | 1 | 4 | 4 | 1 | 16 |
| 12 | Obalno-kraška | | 3 | | 2 | 1 | 1 | 7 |
| **Surveyed farms - total** | | **9** | **62** | **3** | **22** | **24** | **8** | **128** |

The surveyed farms have varying lengths of experience with supplementary activities in hospitality and tourism. Some registered these activities as early as 1980 (and re-registered in the 1990s), while others are just starting out. An interesting comparison among different types of farm tourism shows that, on average, the longest-standing or most experienced are the “pure” excursion farms (which are also the most traditional), while the “pure” accommodation farms have the least experience.

The traditional character of excursion farms is also reflected in their membership in the professional organisation, the Association of Tourist Farms of Slovenia (ATFA, see the website: www.farmstays-slovenia.si). In general, younger tourist farm operators are less inclined to join the ATFA. Overall, only half of the surveyed tourist farms are members of the ATFA. Respondents could state reasons for not being members, as well as reasons for (dis)satisfaction with potential membership.

We found that especially among well-developed tourist farms, which are gradually seeking ways to expand their tourism activities beyond the farm itself, the ATFA no longer plays a major role as an information provider, advertiser, etc.

Looking more closely at respondents' answers regarding the role of the ATFA – what they gain from membership and what they are satisfied with – they most often highlighted the important role of informing and communicating that ATFA provides for its members. Many respondents considered the information timely, and a significant number emphasised the importance of updates on legislation and developments related to farm tourism supplementary activities. Promotion conducted by the ATFA for its members was also particularly noted, with individuals highlighting the organization of events and the opportunity for free participation in fairs and educational programmes.

### 4.2. Visitors to the surveyed tourist farms

The introductory questions in the survey were intended to check guest accommodation capacities and estimate visits to tourist destinations in 2019–2021. Most tourist farms with day visitors report an average of up to 2,000 daily guests per year, while tourist farms with accommodation report slightly more than an average of 1,000 guests (who stayed overnight) per year. Compared to excursion farms, the decline in the number of guests was smaller at tourist farms with accommodation (positive effect of tourist vouchers provided by the Slovenian government during COVID-19).

At excursion farms, there were on average 28% fewer guests in 2020 compared to the baseline (pre-coronavirus) year 2019, and 18% fewer in 2021. In tourist farms with accommodation, there were on average 18% fewer guests in 2020 compared to 2019, and only 6% fewer in 2021. The largest decline in visits (especially in excursion farms due to COVID-19) was noticeable in tourist farms with a larger capacity to accommodate guests.

Most visitors to tourist farms are domestic guests. The proportion of foreign guests varies significantly depending on the type of tourist farm. Farm stays stand out, with 32% of foreign guests visiting them, while tourist farms that only accept daily guests, i.e., day trippers, were visited by only 16% of foreign visitors. Germans, Austrians, Italians, and Dutch visitors predominate among foreigners. There are also significant regional differences in the number (share) of foreign guests: it is significantly higher in western Slovenia (the Alps, the

Soča Valley, Brda, the Vipava Valley, the Karst, and Istria), while in eastern Slovenia, the Savinja Valley and the northwestern part of the Slovenske gorice stand out with a higher share. The most common groups (types) of tourist farms visitors are couples, both with and without children. Almost half of the respondents also mention extended families, seniors, and groups of friends as frequent visitors.

However, we note certain indicative differences between individual tourist farms in terms of target visitor groups. Excursion farms are most often visited by extended families and couples with children, who are also the most common group of visitors to farms with accommodation and combined tourist farms (together with couples without children), while wine taverns and/or osmicas are most often visited by groups of friends.

In a separate survey, we also determined the behaviour and behavioural factors of visitors to tourist farms, which are crucial for identifying potential and developing wine and gastronomic tourism in rural areas. A study among a random sample of experienced tourist farms visitors in Slovenia shows that just over 64% of respondents visit tourist farms several times a year, most often with family, while visits to other dining establishments are significantly less frequent. The main reasons for dining at tourist farms are culinary experiences (homegrown or locally produced food) and the rural environment. Alongside organically produced food and unique culinary offerings (different from other food establishments), these are the most important factors that make tourist farms attractive.

Regarding tourist farms attributes for staying overnight, the rural environment, culinary offerings, and personalised guest relations are the key factors. For half or more of the respondents, factors such as specialisation of the tourist farm in healthy living, viticulture, and being family-friendly help in deciding to visit. The potential for developing rural wine and gastronomic tourism should be based on the valorisation of the environment, natural surroundings, offerings (especially wine and culinary), and the authentic way the services are delivered, as visitors recognize these attributes as the main features of tourist farms (Kerma et al., 2023).

In the culinary context, it is also necessary to expand the variety of culinary offerings, improve wine quality, and adapt to modern dietary needs and guest expectations. There is also a highlighted need to improve infrastructure quality.

While the study cannot be generalised to the entire population of tourist farm visitors, it 1) provides insight into the development potential of wine and gastronomic tourism at tourist farms from the perspective of visitors, and 2) indicates the need for a more extensive and representative survey across the entire population of tourist farm visitors. This would also allow analysis of the stability of visitor behaviour based on socio-demographic and status characteristics.

### 4.3. Identification of obstacles and needs of tourist farms and assessment of potential for further development of farm tourism

Slovenian farms face numerous obstacles in developing farm tourism activities. In the survey questionnaire, we listed the most frequently mentioned obstacles, and respondents assessed to what extent these apply to their tourist farm (1 – does not apply at all, 5 – fully applies).

A major barrier to developing tourism on farms is excessive administration, with too much time spent on various reports, record-keeping, and applications for subsidies and grants. This also includes overly complex and lengthy bureaucratic procedures for renovating or constructing new buildings and for conducting different supplementary activities (cited by 63% of surveyed tourist farm operators). To address this, respondents suggest more frequent inspections and higher penalties for violators, simplification of procedures for obtaining public funding for investments and building permits, and easier registration of supplementary farm activities. Some farms have registered more than 20 different supplementary activities due to their diverse offerings.

High taxes and other levies are also a significant obstacle (cited by 45% of respondents), reducing income amid the constant rise in prices for fertilisers, energy, fuel, and other costs. This leaves very little money for essential renovations, let alone investments in new buildings and equipment. About 42% of respondents report a lack of financial resources and access to favourable investment opportunities, such as grants and loans (36%). This is particularly true for smaller farms, which have difficulty obtaining grants.

Because so much time is spent on administration, there is a shortage of suitable labour even for existing workloads, making it difficult to consider expanding either the core or supplementary farm activities (29%). In many cases, there are no successors, as younger family members do not see a future in agriculture and tourism. In addition to rising costs, they are burdened by unfavourable and

excessive working hours on weekends and holidays. Consequently, young people prefer jobs outside farming, away from home, with higher incomes and, above all, better working hours.

For about one-fifth of respondents (22%), inadequate infrastructure represents a significant obstacle, with broadband internet and proper sewage systems being particularly missed. Road, water, and electricity networks are generally well-developed. Similarly, 20% cited poor information about development opportunities, and 18% noted limited cooperation with the Slovenian Tourist Organization (STO).

The smallest obstacles for the development of tourist farms are non-cooperation with local and regional tourist organizations (12%), other providers (15%), and local action groups (LAGs) (16%), indicating that collaboration among rural tourism stakeholders is fairly well organized and functions effectively. Very few respondents (in only two cases) noted insufficient cooperation between municipalities.

Tourist farms are generally open to various forms of collaboration and networking. Among the key identified areas, they assign the greatest support to joint promotion programmes and joint training and education programmes. The need for additional education is relatively strong, but farmers often face the problem of limited free time. Among the various relevant education/training options, respondents were particularly interested in marketing of tourism services/offers, promotion of rural tourism, and participation in study tours and culinary workshops.

When assessing the potential for further development of tourism on farms (see Figure 1, which shows the average values of development potential assessments by individual categories), we used a 5-point Likert scale (ratings from 1 to 5).

Nearly three-quarters of respondents gave the highest value (5) to local drinks (73%) and food (71%). This clearly shows that wine and gastronomic tourism will continue to represent the main comparative advantage of Slovenian tourist farms. This is followed by respect for local heritage and culture (64%), thematic routes – especially wine routes (60%), accommodation infrastructure (55%), indigenous plant varieties (42%), and knowledge of global trends in rural gastronomy (40%).

A smaller-than-expected potential is seen in organic agriculture (36%) and eco-labelling of agricultural products (29%), local supply networks (35%), indigenous animal breeds, and the development of territorial collective brands (32%), as well as in the protection of agricultural products and food within European (28%) and national quality schemes (26%). This is linked to excessive administration and certification costs, as well as the lack of recognition of higher prices for organic products on the market. Therefore, farms prefer to offer food from their own gardens and orchards, where tourists and visitors can see for themselves the environmentally friendly production methods.

Only a small proportion of respondents recognise very high potential (13%) in gastronomy market brands such as Gault Millau, Michelin, The Slovenia Restaurant Award, Gostilna Slovenija, and others.

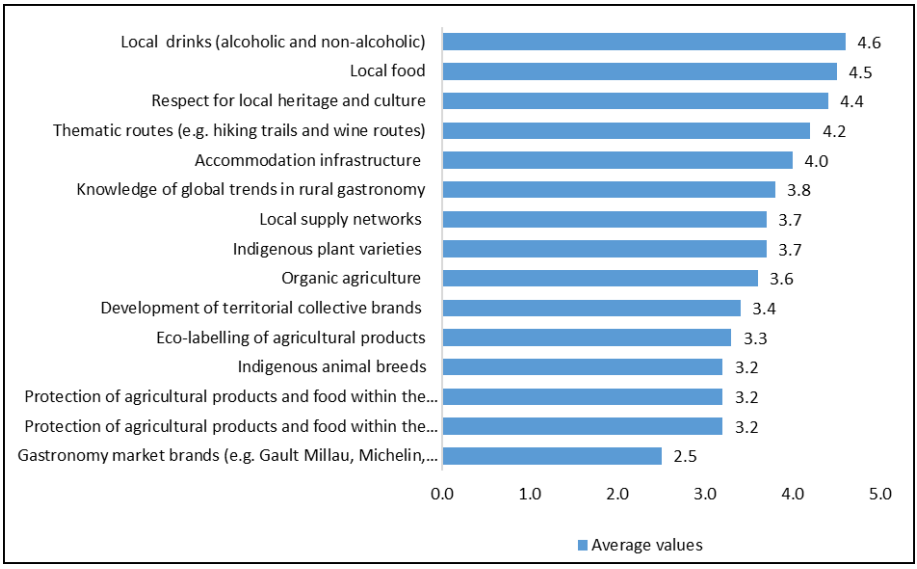


*Figure 1: Assessment of the potential for further development of tourism on farms.*

## 5. Conclusion – future perspectives and development challenges

The analysis of attitudes among holders of supplementary activities on tourist farms and their family members reveals cautious optimism despite a distinctly critical perspective on the current situation. Survey participants assess the development of farm tourism realistically, highlighting challenges such as rising agricultural production costs, low prices for their own produce, and the high level of competence required by farmers to survive in the current environment. Despite these challenges, respondents offered numerous constructive suggestions, notably innovative tourism offerings (e.g., cultural and artistic activities, thematic tours), enhanced collaboration between local providers and municipalities, greater involvement of tourist farms in local tourism associations, and the need for professional support and advisory services to foster innovation.

Visitors to tourist farms dine significantly less frequently than in other food service establishments (64% only a few times per year). The primary motivations for visits remain locally produced food, distinctive flavors, and the rural setting, whereas distance and price are not major factors. Visitors value personalized services, culinary offerings, ambiance, and the opportunity to experience rural life, with strong interest also in locally sourced, organic, and typical foods presented in innovative ways. Key competitive advantages of tourist farms include ambiance, gastronomy, services, and the overall offering, while notable gaps pertain primarily to the variety of dishes and wines and the adaptation to contemporary dietary needs of visitors.

Based on these findings, systemic support for tourist farms as strategic rural development units is recommended. This includes their integration into the national system for measuring tourism impacts, financial support for visibility and development, registration of new supplementary activities, and revitalisation of wine routes. Strengthening education and competencies in wine and gastronomy tourism, training of professional advisors, implementation of thematic study tours, and improved communication between tourist farms, visitors, and other stakeholders are also essential.

A further development of farm tourism in Slovenia should be grounded in a comprehensive, internationally comparable strategy that facilitates the integrated connection of local food and drinks, hospitality and rural tourism, while promoting cross-sectoral collaboration among agriculture, culture, and tourism in line with sustainable regional development. Special emphasis is required on preserving the authenticity, heritage, and unique offerings of the Slovenian

countryside, as the declining number of farms threatens the cultural and gastronomic identity of destinations. Tourist farms can play a significant role in rural tourism but must remain committed to their primary agricultural activities, with tourism serving as an added value and enhancement of farm operations.

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ARTICLES

# THE FRENCH PROPOSAL AND NORTH MACEDONIA'S EUROPEAN PERSPECTIVE: A POLITICAL GEOGRAPHY

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*ABSTRACT*
***The French proposal and North Macedonia's european perspective: a political geography***
*This paper examines the so-called French Proposal, a diplomatic framework specifically designed to overcome Bulgaria's veto and facilitate the continuation of North Macedonia's accession process to the European Union. The proposal's most contested element is the requirement to amend North Macedonia's Constitution to explicitly include Bulgarians as a constituent people —an obligation that serves as a gateway for opening a broader negotiation process. This requirement is embedded within a broader framework that incorporates the 2017 Treaty of Friendship, Good-Neighbourliness, and Cooperation, thereby elevating a long standing bilateral dispute to the level of a formal EU accession criterion. By integrating identity-related and historical disputes into the negotiation process, the proposal effectively Europeanizes a bilateral issue. This study argues that the constitutional amendment represents only one aspect of a deeper and enduring challenge: the identity-based dispute with Bulgaria, now institutionalized within the EU framework, will remain a decisive factor influencing both the pace and prospects of North Macedonia's European integration.*

*KEYWORDS*
*French proposal, North Macedonia, Bulgaria, European Union, Good-neighborliness*

## 1. Introduction

The French proposal was not the first document to stir political imbalance in North Macedonia. Three key agreements have significantly shaped North Macedonia's political sphere: the Ohrid Framework Agreement, which ended the inter-ethnic conflict of 2001; the Prespa Agreement (2018), which settled the dispute with Greece over the naming issue and all implications associated with the name "Macedonia"; and finally, the Treaty of Friendship, Good-neighborliness, and Cooperation (2017) signed with Bulgaria; treaty intended to resolve all outstanding issues between North Macedonia and Bulgaria before the dispute became as intractable as the one with Greece.

Former President of the Macedonian Parliament, Tito Petkovski (2014) writes that EU and NATO leaders have consistently highlighted the Ohrid Framework Agreement (OFA) as an essential step toward integration. After North Macedonia gained candidate status in 2005, the axiom "the road to Brussels passes through Ohrid" emerged (Pendarovski, 2012). Following the OFA, the next major precondition was the name issue with Greece, which complicated EU and NATO procedures due to member-state veto power (Frčkoski, 2016). Matthew Nimetz (2020) writes that back then, he warned that if unresolved, this [naming] issue could prevent North Macedonia from aligning with Croatia's EU accession timeline; a prediction later confirmed as negotiations stalled in 2019 under President Macron's call for restructuring (Cvetanoska, 2019) and again in 2020 due to Bulgaria's blockade. North Macedonia joined NATO as its 30th member in 2020, leaving only the European process unrealized.

Amid the new global political challenges in 2022, during France's presidency of the European Union, an injury-time draft proposal emerged aimed to resolve the blockade imposed by Bulgaria. The so-called French proposal rendered North Macedonia's European process analogous to Schrödinger's cat experiment: the negotiations are in a state of simultaneous commencement and suspension, contingent upon the principal condition of the proposal: the constitutional amendment to include ethnic Bulgarians in North Macedonia's preamble. Following the Ohrid Framework Agreement (2001) and the Prespa Agreement (2018), both of which were critical preconditions for the country's European

aspirations, through the French Proposal, the 2017 Agreement was, in a sense, institutionalized, thereby establishing an integration relation between Skopje, Brussels, and Sofia.

This study uses a qualitative, document-based analytical approach. Primary sources, including the French Proposal (2022), the 2017 Treaty of Friendship, Good-Neighborliness, and Cooperation, and EU Council Conclusions, were examined. The French Proposal is situated within the broader historical trajectory of North Macedonia's integration efforts, including the Ohrid Framework Agreement (2001) and the Prespa Agreement (2018), with purpose to identify patterns of external conditionality and internal political responses. Public statements by political leaders, EU officials, and civil society figures were reviewed to assess competing narratives surrounding identity and integration. The aim of this study is to demonstrate that the main contentious point: the inclusion of Bulgarians in the constitution is not the sole condition. On the contrary, reservations regarding identity issues, which Bulgaria has consistently raised with North Macedonia, will need to be addressed during the negotiation process, given that through the French proposal, the Treaty also forms part of the negotiating framework (Kitevski, 2024).

## 2. The European Union and the Macedonian integration: Brief overview

The European Union (EU) is a unique economic and political union (European Commission 2024). Originally limited to Western Europe, the EU underwent a significant expansion into Central and Eastern Europe in the early 21st century (Gabel, 2025). Today, it consists of 27 member states with a total population of 448.4 million and 24 official languages, spanning on 4 million $km^2$ (European Union n.d.). Since its inception in 1951, enlargement policy has been an integral part of the EU integration process, gaining particular momentum in the 1960s and 1970s (Bauerová, 2022). To date, five waves of enlargement have occurred (Varbanova, 2007). Between 2004 and 2007, the EU expanded to include ten formerly communist countries and two Mediterranean island states (Anghel and Jones 2021). The accession of Croatia in July 2013 marked the seventh enlargement round (Schwarz, 2016). It has now been twelve years since the last country joined the EU, and in contrast, one major member, the United Kingdom, left the Union in 2020 following the 2016 Brexit referendum. EU enlargement has always been a political process (Basheska, 2022), becoming increasingly complex over time. The procedure evolved from an almost rule-free policy in the 1960s to one governed by a highly detailed set of criteria that aspiring members

must meet (Kovačević, 2022). For candidate countries, accession negotiations have often proven more difficult than initially anticipated (Anghel and Jones 2021).

In 2000, the Western Balkans were included in EU enlargement process (Vukasović, 2018), and at the Thessaloniki Summit in 2003, the European Union expressed its unequivocal support for the European perspective of the Western Balkan countries (Panagiotou, 2020), a commitment it reaffirmed at the Sofia Summit in 2018 (Bauerová, 2022). Although the EU accession process and its attitude toward the Western Balkans can, without doubt, be described as slow and never-ending (Herceg Kolman and Bandov, 2022), significant efforts have been made to reform the process. In 2020, the European Commission adopted a new enlargement methodology, calling for a more credible process with a stronger focus on fundamental reforms in the rule of law, public administration, economy, and the strengthening of democratic institutions (Korpalo & Rabinovych, 2025).

The aim was to make the enlargement process more credible, predictable, dynamic, and subject to stronger political steering. This represents the fourth occasion on which the EU has formally introduced new rules for accession negotiations (Tilev, 2020). However, what was intended to be predictable was quickly challenged by geopolitical conditions. Following Russia's invasion of Ukraine in February 2022, the EU intensified its diplomatic engagement with the Western Balkans due to the region's geopolitical and security significance (Christidis, 2024). Moreover, the push for enlargement has shifted the process away from a strictly merit-based approach, favoring political considerations instead (Couteau et al., 2024). Within this context of new political polarization, candidate status was granted to Ukraine, Moldova, Georgia, and Bosnia and Herzegovina, while North Macedonia and Albania advanced further in the accession process.

The European path of North Macedonia, both in terms of internal political orientation and public support, has never been in question throughout the country's independence. European integration and NATO membership have consistently been central themes in the political campaigns of the largest parties, across both the Macedonian and Albanian blocs. North Macedonia has been a candidate for EU membership since 2005, receiving its first recommendation to open negotiations in 2009, but remained under constant blockade from Greece due to the lasting naming dispute. Only with the Prespa Agreement was a solution finally reached regarding the name and everything the name symbolized

(Kitevski, 2023). The name dispute was an extremely sensitive issue for Macedonians, the majority of whom rejected the idea of changing the country's name simply because of Greece's disapproval (Bozhinovski, 2019). This was evident in the referendum's failure, although the consultative referendum itself was also tied to European and NATO aspirations. Prior to the vote, prominent world leaders either visited the country or sent direct appeals urging citizens to vote "yes" for the country's European and Euro-Atlantic future. In their rhetoric, NATO membership was presented as a done deal. EU membership, however, was never explicitly guaranteed by international actors (Kitevski and Mijalov, 2023).

Following the name change, the Republic of North Macedonia indeed became the 30th member of NATO, from a process directly linked to resolving the Greek dispute, as had already been clear since the 2008 Bucharest Summit. EU integration, however, has been a different story. The supposedly "clean" post-Prespa path was first delayed by the EU's need to adopt a new enlargement methodology in 2019. A few months later, in March 2020, the Council of the European Union finally adopted conclusions to open accession negotiations with North Macedonia, though without setting a date for the first intergovernmental conference (Malinka, 2020). Later that year, Bulgaria imposed a veto, citing non-compliance with previously agreed commitments. This move was not entirely unexpected: in 2019, Bulgaria had adopted a framework position outlining conditions for North Macedonia, based on the 2017 Treaty of Friendship (Christidis, 2019). Although for years Greece was perceived as the sole opponent of Macedonia's EU path, in 2012 Bulgaria also joined the blockade (Karadzoski and Adamczyk, 2014), demanding the signing of a friendship treaty, which, took place in August 2017. Yet, the dispute with Bulgaria is far from trivial: it is layered, complex, and arguably even more sensitive than the naming issue with Greece.

## 3. North Macedonia and Bulgaria: a persistent issue

The core of the problem lies in Bulgaria's view of North Macedonia as an artificial nation, whose ethnic identity and language were constructed during the Yugoslav socialist period, with Macedonians considered to have Bulgarian origins (Marinov, 2013a; Marinov, 2013b) In short, Bulgaria disputes aspects of Macedonian history that Greece had no objections to, leaving these issues "unresolved" even after the 2018 Prespa Agreement. This stance toward the Macedonian national question has experienced some historical fluctuations,

largely influenced by developments in relations between Yugoslavia and the Soviet Union (Sfetas, 2012). However, a definitive position, regardless of geopolitical circumstances was established during the era of Todor Zhivkov, when the main points of the Bulgarian perspective were carved out: 1. There is no Macedonian nation as a historical entity; 2. The falsification of Bulgaria's history by historians in Skopje and the creation of the Macedonian nation on an anti-Bulgarian basis are unacceptable; 3. There is no Macedonian minority in Bulgaria; 4. Macedonian national consciousness is being cultivated in the People's Republic of Macedonia, but it is a product of political conditions that facilitated the transformation of Bulgarians into Macedonians (Sfetas, 2012).

The Treaty of Friendship, Good-Neighborliness, and Cooperation (Ministry of Foreign Affairs of the Republic of North Macedonia, 2017), signed in Skopje on 1 August 2017 and in force since February 2018, can be seen as a continuation of the 1999 Agreement. That earlier treaty, among other things, in some way, resolved the language dispute with a formula stipulating that "bilateral agreements between the two countries would be signed in the official languages of both parties, according to their Constitutions respectively," thus avoiding the explicit use of the languages' names (Vangelov, 2015). The 2017 Treaty, in turn, sought to reconcile all outstanding differences concerning unresolved identity and historical issues between the two countries. This is evident in several articles, including the creation of a Joint Multidisciplinary Expert Commission on historical and educational matters, tasked with producing scientifically grounded interpretations of historical events and submitting annual reports.

The Treaty provides for joint commemorations of shared historical figures and events, aimed at reinforcing good-neighborly relations (Art. 8). Furthermore, the Treaty affirms that North Macedonia's Constitution cannot serve as a basis for interference in Bulgaria's internal affairs, while both states commit to preventing hostile propaganda and discouraging activities that incite hatred or violence (Art. 11). Additionally, a Joint Intergovernmental Commission, co-chaired by the ministers of Foreign Affairs is established to oversee the Treaty's implementation, enhance bilateral cooperation, and resolve emerging issues through annual and, when necessary, ad hoc meetings (Art. 12). In the preamble of the Treaty, which refers to a common history, there exists a divergence in understanding and interpretation: for Bulgaria, it implies sameness, whereas for North Macedonia, it implies shared history (Brunnbauer, 2020). This subtle, perhaps unintended difference reflects the very essence of the problem the Treaty is intended to guide the two states toward resolving.

## 4. The French proposal: A (no) way forward

France delivered a draft proposal to the authorities of North Macedonia and Bulgaria aimed at removing Bulgaria's veto (Vasileska, 2024). While the proposal divides the process into a formal political opening with screening and a subsequent negotiation stage, it introduces a new condition for negotiations to truly commence: North Macedonia must amend its constitution to recognize ethnic Bulgarians (Vangelov, 2023).

The document that the Government of North Macedonia published is said to be the modified version of the original proposal, which had been deemed unacceptable by the Macedonian authorities. The new, revised version was described by President Stevo Pendarovski as a "transitional compromise that was acceptable" (Pendarovski, 2022), and, according to Prime Minister Dimitar Kovačevski, as a means by which "the country will be brought into the EU by 2030" (Government of the Republic of North Macedonia, 2023). The announcement of the proposal's acceptance triggered mass opposition-led protests, with critics framing it as an attempt to assimilate and Bulgarize the state. Despite these protests and widespread public dissent, the Macedonian Parliament adopted the proposal on 16 July 2022 (Gjorgjioska, 2022; Christidis, 2024). In July 2022, the Intergovernmental Conference on accession negotiations was held with North Macedonia, and the European Commission initiated the screening process (European Commission, 2025). This formally marked the beginning of negotiations, with the key condition for their substantive progress being the constitutional amendments to include Bulgarians (Vangelov, 2023).

The so-called proposal from the French Presidency, namely the Draft Council Conclusions (European Union, 2022b), was released alongside two additional documents for informational purposes, even though procedurally they follow as steps in the opening of accession negotiations: the EU common position (European Union, 2022c), reflecting the text from the political meeting of the Intergovernmental Conference on North Macedonia's accession, which follows immediately after the adoption of the proposal; and the Ministerial Meeting of the Intergovernmental Conference Completing the Opening of the Negotiations on the Accession of North Macedonia to the European Union, which applies after North Macedonia implements the required constitutional amendments (European Union, 2022a).

The Draft Council Conclusions contain seven points. They reaffirm the 2021 Council Conclusions and commend North Macedonia's reform efforts, while

stressing the need for tangible results and faithful implementation of bilateral agreements, notably the Prespa Agreement (2018) and the Treaty with Bulgaria (2017). Special emphasis is placed on the latter, with the protocol from the second intergovernmental commission welcomed as an important contribution to good-neighbourly relations, a key element of both the enlargement process and the Stabilization and Association Process (SAP). The core of the French proposal, outlined in point four, highlights the strengthening of minority rights in North Macedonia, contributing to compliance with the Copenhagen criteria. The Council also welcomes North Macedonia's commitment to constitutional amendments, including the explicit recognition of Bulgarians. According to the proposal, the Council approves the Negotiating Framework, with an initial intergovernmental conference to follow.

A second conference will be held once constitutional amendments are adopted, meaning that the negotiation process formally begins but its completion depends on the inclusion of Bulgarians in the constitutional preamble. The second document contains 18 points, several of particular importance. Point three stresses that opening negotiations demonstrates unequivocal support for the Western Balkans' European perspective, while point four underlines that the EU fulfills its commitments once conditions are met—implicitly placing responsibility for delays on candidate countries. Point 14 reiterates that regional cooperation and good-neighbourly relations remain essential, again highlighting the Prespa Agreement and the Treaty with Bulgaria. The third document enters into force once constitutional amendments are adopted.

Its EU Opening Statement, comprising eight points, reaffirms regional cooperation and good-neighbourly relations as core elements of enlargement, explicitly calling for tangible implementation of the Prespa Agreement and the 2017 Treaty with Bulgaria. Within the Negotiating Framework, the "Principles Governing the Negotiations" are central: point five specifies that progress depends on meeting the Copenhagen criteria, fulfilling the Stabilization and Association Agreement, and maintaining good-neighbourly relations, including full implementation of both agreements and annual reviews under Article 12. Equally significant, point 13 allows the Commission, in cases of serious and persistent breaches of EU values, to recommend suspension of negotiations, thus underscoring that North Macedonia must fully honor its commitments, particularly those stemming from the Prespa Agreement and the Treaty with Bulgaria.

One day after the Assembly of North Macedonia adopted the French Proposal, the foreign ministers of North Macedonia and Bulgaria signed in Sofia the second bilateral Protocol for the implementation of the 2017 Treaty of Friendship, Good-Neighborliness, and Cooperation, pursuant to Article 12 (Ministry of Foreign affairs of North Macedonia, 2022). The Protocol, serving as the minutes of the intergovernmental meeting, contains four points, two of which are substantive. Point two approves the annual reports from thirteen meetings of the Joint Multidisciplinary Expert Commission on Historical and Educational Issues (10 June 2019 – 10 June 2022). While the Commission's work fell short of expectations, both states committed to supporting more effective outcomes, implementing results achieved, and publishing future findings. Point three outlines guidelines for implementing the Treaty in the upcoming period and signals Bulgaria's readiness to hold the first political intergovernmental EU–North Macedonia conference, contingent on North Macedonia adopting constitutional amendments to include Bulgarians. This point is divided into measures to be taken before and after the conference for completing the opening phase of accession negotiations.

Prior to the conference, North Macedonia agrees that the next intergovernmental conference will occur only after constitutional amendments enter into force, while Bulgaria pledged to lift its reservations on the draft Frontex Agreement following adoption of the French Proposal. North Macedonia also committed, under Article 11(5) of the Treaty, to ensure that its Constitution does not interfere in Bulgaria's internal affairs or in the rights of non-Macedonian citizens. The pre-conference measures cover three thematic areas: (1) hate speech: both states commit to prevent, combat, and sanction all forms of hate speech, establish rapid-response procedures, and counter malicious propaganda; (2) rehabilitation of victims of communist-era repression: North Macedonia shall condemn the Yugoslav repressive apparatus and establish a legal framework for archival access; and (3) history: both states shall publish existing results and commemorate historical events and figures agreed upon by the Commission.

Post-conference measures include revising the 7th-grade geography textbook to remove unfounded ethnic or territorial claims and applying similar revisions across educational programs, with mutual notification. The three thematic areas are reinforced: (1) hate speech: information exchange and compliance with the Treaty across all publications; (2) rehabilitation of communist-era victims: North Macedonia to establish the legal framework within one year, drawing on Bulgaria's experience; (3) history: commemorations, public rhetoric, and educational content must reflect the Commission's outcomes. Both governments

pledge continued support for the Commission to complete its work on all periods of the "common history" in line with Article 8(2) of the Treaty.

The final section of the Protocol is very important. The Republic of North Macedonia will take measures to ensure effective access to equal rights, protection against discrimination, and the safeguarding of the culture and identity of the Bulgarian community. These measures include achieving sustainable results in preventing and responding to instances of hate speech against Bulgarians in public spaces, ensuring the investigation and prosecution of hate crimes and discriminatory acts, strengthening awareness and institutional mechanisms for human rights, and fostering the Bulgarian community's trust in these institutions. Additionally, North Macedonia commits to guaranteeing the free exercise of the rights of Bulgarians to express, protect, and develop their identity and specific community characteristics, including the unrestricted use of their community symbols (Ministry of Foreign affairs of North Macedonia, 2022).

## 5. Results and discussion

The European Union's enlargement policy is politically driven. In the wake of Russia's aggression against Ukraine in 2022 and the emergence of a new geopolitical reality, the EU swiftly granted candidate status to Ukraine, Moldova, and Georgia, while also seeking to resolve the long-standing stalemate between North Macedonia and Bulgaria. In a repetition of history, this time verging on farce, a last-minute solution emerged under the French Presidency of the Council of the EU. Ironically, France had been the very state that, in 2019, advocated for a new enlargement policy to prevent the mistakes of prior accession rounds. North Macedonia became the first "integration victim" of this revised approach, before being formally vetoed by Bulgaria in 2020. The so-called French Proposal, intended to break the stalemate, in fact introduced potential pitfalls for further vetoes, particularly from Bulgaria (Vangelov, 2022). The proposal required constitutional amendments in North Macedonia, notably the inclusion of Bulgarians in the Preamble, as a transitional step before accession negotiations could formally commence. Simultaneously, the negotiating framework incorporated provisions of the 2017 Treaty of Friendship, Good-Neighborliness, and Cooperation between North Macedonia and Bulgaria initially intended to serve as a stepping stone, ultimately became an additional stumbling block.

The French Proposal provoked intense debate across Macedonian society. The then-ruling government defended it as a minor concession "merely adding Bulgarians to the Constitution", arguing that this was insignificant compared to Bulgaria's more maximalist demands. The dominant narrative emphasized that the key priority was to commence accession negotiations and that, through this process, the "Macedonian language" had already been safeguarded, a position further reinforced by the signing of the Frontex agreement. The government maintained that North Macedonia should not remain blocked by the prospect of another veto (Telma TV, 2022). European Commission President Ursula von der Leyen also underscored the meaning of the "Macedonian language" in her address to the Macedonian Parliament prior to the proposal's adoption (Directorate-General for Neighbourhood and Enlargement Negotiations, 2022).

For the opposition at the time, and now the governing party, the French Proposal represented a Bulgarian diktat, a potential path to Bulgarization, and an unacceptably high cost for EU membership. Although its rhetoric has softened since coming to power, the government has continued to assert that the proposal does not provide a clear pathway to the EU. The constitutional amendments, including the formal recognition of Bulgarians, were perceived as only the initial step (Government of North Macedonia, 2022b). Consequently, the new government frequently calls for guarantees from Sofia against future conditions, despite it is clear that provisions of the 2017 Treaty, particularly those addressing historical issues, are already integrated into the negotiating framework. Nonetheless, there are indications that constitutional changes may eventually be implemented. A narrative has emerged suggesting that the amendments could be introduced with delayed effect, a position supported by several political actors, including President Gordana Siljanovska-Davkova, who has advocated that the changes take effect only once North Macedonia achieves full EU membership (Mircheski, 2024).

North Macedonia's Constitution, belongs to "the new generation of European constitutions" and was drafted in the spirit and tradition of European constitutionalism (Dokmanović, 2011). While constitutional amendments are inherently complex and contentious (Majhoshev & Denkova, 2013), in its short history of independence North Macedonia has already amended its Constitution eight times, introducing 36 amendments. Three of these interventions resulted directly from external political pressure. The earliest, in January 1992, just 50 days after the Constitution was adopted, saw amendments I and II introduced, declaring that the Republic had no territorial claims against its neighbors, that borders could only be changed by consent and international norms, and that

Macedonia would not interfere in the sovereign rights or internal affairs of other states. The most extensive amendments occurred in 2001, following armed conflict and internationally supervised negotiations between Macedonian and Albanian parties (Gaber Damjanovska, 2011). These aimed to strengthen internal integration of all ethnic communities without assimilation and to provide a basis for long-term interethnic stability (Czymmeck, 2011). The most recent significant amendments followed the Prespa Agreement, changing the country's name to the Republic of North Macedonia and introducing Amendments XXXIII–XXXVI, with Amendment XXXIV modifying the Preamble to incorporate the 2001 Framework Agreement (Kitevski, 2020).

Perspectives on the inclusion of Bulgarians in the Constitution vary considerably. Optimists contend that the amendment would represent Bulgaria's implicit recognition of the distinct Macedonian nation, otherwise, they ask, why demand the explicit inclusion of Bulgarians? Pessimists, conversely, fear far-reaching consequences, suggesting that Bulgarians could acquire rights analogous to those of the Albanian community under the Ohrid Framework Agreement, although they are represented in an insignificant percentage of the total population in North Macedonia. According to the Protocol from the second intergovernmental session, North Macedonia is obliged to protect and nurture the identity of Bulgarians in the country, to develop their identity and the specific characteristics of the community, as well as their unhindered right to use community symbols. Bearing this in mind, it can be assumed that once the Bulgarians are inscribed in the constitution, it will be difficult to measure the extent to which the state fulfills their right to identity without being assessed as insufficient or discriminatory. As an illustration of the potential, in 2022, in Bitola and Ohrid, new Bulgarian cultural clubs were opened, named after figures from Bulgarian history who, at the very least, are considered controversial in Macedonian historiography. That move provoked condemnatory reactions in the public, and the openings were also assessed and condemned as a provocation by both the government and the opposition. Both clubs were banned in 2023, following a decision by a government commission that naming the clubs after controversial figures constituted an offense and a provocation to the Macedonian public (Telma TV, 2023).

According to the 2021 census, 3,504 citizens self-identified as Bulgarians (State Statistical Office, 2022). Nevertheless, this figure may be (mis)used in political discourse, particularly given the sensitivity surrounding the granting of Bulgarian citizenship to Macedonian citizens. In fact, the central Bulgarian objective may relate less to the officially registered minority and more to the

approximately 120,000 citizens of North Macedonia holding Bulgarian passports obtained through claimed ancestry (Kyuchukov, 2021). For years, largely due to Bulgaria's EU membership (since 2007), a large number of Macedonian citizens have applied for and obtained Bulgarian citizenship. The essence of the problem lies in the very manner in which citizenship is acquired. In order to obtain Bulgarian citizenship, applicants must meet several conditions (six in total), though more flexible criteria exist for those of Bulgarian origin (Risteski, 2014). Macedonian citizens applying for a passport submit a document (birth certificate or passport) proving that at least one parent is of Bulgarian origin (Neofotistos, 2016). This means that a Macedonian who acquires a Bulgarian passport can continue to identify as a Macedonian, according to their personal sense of identity, but given that they obtained Bulgarian citizenship on the basis of ancestry, it implies that their origin is Bulgarian, while Macedonian is their contemporary identity: a reflection of the Bulgarian stance over the Macedonian question. Contrary to Bulgaria's maximalist policy of not recognizing the existence of a Macedonian nation and language, at its core lies "political reality," that is, acknowledged modern political realities, and "does not dispute the citizens of North Macedonia's right to self-determination and identity" (Kyuchukov, 2021), while explicitly referring to the historical process that led to the current situation. In the direction of modernity and reality was also the rhetoric concerning the "pure Macedonian language and identity," continuously emphasized as "something preserved" both from the Macedonian side and by Europe, through the diplomatic process surrounding the French proposal and the opening of negotiations.

In the same line of modernity and reality was the statement of European Commissioner Marta Kos during her visit to Skopje in July 2025 (Džundeva, 2025). In order to explain that Macedonians should not fear for their identity, she vividly explained that what matters is how they feel, and that their identity consists of elements of spiritual, material, and culinary culture. The Prime Minister, Mickoski, in a form of reply, added that identity is not only culture, but also history and historical figures, such as Goce Delchev, Shapkarev, and the Ilinden Uprising. This identity-based polemic between Kos and Mickoski essentially reflects the positions regarding historical truths that will be part of the negotiations once the Bulgarians are incorporated into the constitution. The entire essence lies in the fact that, in the end, Bulgaria would recognize reality, in line with the definition of identity articulated by Commissioner Kos, once North Macedonia and Bulgaria agree on the remaining part: history and figures such as Delchev and Ilinden.

By the very fact that the principle of good-neighbourliness is part of both international law and the fundamental values of the European Union (Gadkowski, 2021; Kalicka-Mikołajczyk, 2019) the 2017 Treaty, explicitly named and dedicated to these values, automatically becomes part of North Macedonia's negotiating process with the European Union. The progress of Western Balkan states toward EU accession has consistently depended on their bilateral relations with member states, particularly neighbors (Basheska, 2022), and although the Stabilization and Association Process emphasized good-neighborliness from the outset, the 2018 EU Enlargement Strategy for the Western Balkans was the first to explicitly condition accession on the improvement of such relations (Petrović and Wilson, 2021). At the Sofia Summit (2018), the EU reaffirmed the Thessaloniki perspective and underscored commitments to strengthening good-neighbourly relations, regional stability, and reconciliation. The Zagreb Declaration (2020) was even more explicit, highlighting the need for faithful implementation of both the Prespa Agreement and the Treaty with Bulgaria. The Brdo Declaration (2021) reaffirmed the same principle.

Documents stemming from the French proposal likewise underscore the EU's expectation that North Macedonia will demonstrate tangible results in implementing both the Prespa Agreement and the 2017 Treaty with Bulgaria. Given that Bulgaria blocked North Macedonia's accession on the grounds of insufficient compliance with the 2017 Treaty, it is reasonable to expect that divergent Bulgarian interpretations of its implementation will signal to Brussels that North Macedonia is not adequately fulfilling one of the EU's core conditions, that is good-neighbourly relations. This is particularly important in the context of the Commission's revised enlargement methodology, which grants individual member states increased influence in the accession process (Petrović and Wilson, 2021). Since EU enlargement policy is inherently politically driven, the interpretation of the Treaty's provisions and the degree of flexibility tolerated will largely depend on evolving geopolitical dynamics.

## 6. Macedonian sunk cost fallacy

The sunk cost effect refers to the tendency to persist with an endeavor once an investment of money, effort, or time has been made (Arkes and Blumer, 1985). In political science, this phenomenon is often discussed as the "sunk costs fallacy," a concept borrowed from organizational psychology and behavioral economics, describing situations in which decision-makers escalate commitment

to failing projects in an attempt to "recoup" prior investments (Miller, 2019). Even when negative outcomes become evident, individuals and institutions frequently continue along the same path, illustrating the powerful influence sunk costs can exert on judgment and decision-making (Schulreich et al., 2022).

Under the narrative of its eventual accession to the EU and NATO, North Macedonia underwent the painful process of changing its name. As a result of the Prespa compromise, North Macedonia became the 30th member of NATO, and a smooth integrative path toward the European Union was anticipated. The underlying assumption was that the substantial sacrifices made under the Prespa deal would ultimately yield the desired outcome, primarily the full EU membership. However, as it became increasingly evident that EU accession would not be readily attainable despite the Prespa compromise, a perception emerged that an excessively high price had been paid for comparatively meager returns. While NATO membership represented a tangible achievement, public perception framed it as insufficient compensation for such a painful process and outcome. This scenario also sent a broader signal to the region, particularly to states facing similar outstanding issues, raising questions about the consequences should they follow North Macedonia's example (Kitevski, 2023).

Nonetheless, the EU does not consider itself indebted to North Macedonia. Following the French proposal, the responsibility shifted to North Macedonia to deliver the constitutional amendments necessary to formally start accession negotiations. The document produced by the first Intergovernmental Conference on the initiation of accession talks emphasized that the EU fulfills its commitments when candidate states meet the required criteria, echoing the 1999 statement of the former Commissioner for Enlargement, Günter Verheugen: "Negotiations should proceed on the basis of merit, not on the basis of compassion" (Müftüler-Bac, 2002; Alexandrescu, 2020).

The Russian invasion of Ukraine in 2022, along with new geopolitical polarization, and the rapid NATO accession of Sweden and Finland, partially alleviated the post-Prespa frustration that nothing had been gained from the asymmetrical deal with Greece. Nonetheless, the French proposal does not signal a new "Prespa moment." If the Prespa Agreement required North Macedonia to make significant historical concessions to Greece in exchange for progress toward the EU, it remains uncertain whether North Macedonia could endure another identity-related compromise without a guaranteed outcome. Some key Bulgarian demands regarding history challenge fundamental aspects of North Macedonia's national narrative, making compromise difficult and requiring

considerable goodwill and creativity from both sides (Christidis). As expected, the government led by Hristijan Mickoski remains reluctant to pursue further EU-aligned reforms without a credible signal of commitment from the EU (Couteau, 2024). But, despite the perception that the path to the EU is sometimes a "two steps forward, one step back" process, the ultimate target and goals remain unchanged (Panagiotou, 2020).

The EU offers North Macedonia neither concrete incentives nor deterrents, aside from the enlargement package decision to separate Albania from North Macedonia in the process. Given the public and civic narrative that Albania is "rapidly advancing toward the EU," a strong sense of being left behind is being created, as well as political pressure, particularly through the Albanian political bloc; similar to the case of the issue with Greece, the Albanian community in North Macedonia raises the stakes in the political arena, expressing frustration that integration is stalled by issues that do not directly concern them (Pendarovski, 2012).

## 7. Conclusion

In 2025, it marks 20 years since North Macedonia was granted candidate status for the European Union; 5 years since the country became a full member of NATO; and 3 years since the French proposal was set and accepted to unblock North Macedonia's EU integration path.

Intended as a solution, it has proven to be a stumbling block, which not only is not a transitional option for resolving the problem with Bulgaria, but on the contrary, it generates the differences in the understanding of history between North Macedonia and Bulgaria in values that need to be addressed during negotiations between North Macedonia and the EU. If the Prespa Agreement of 2018 finally settled the naming issue between Greece and North Macedonia, the Treaty on Friendship, Good-Neighborliness, and Cooperation reflects, in its naming, the issue between North Macedonia and Bulgaria. Signed in 2017, a few years after Bulgaria expressed its reservations regarding North Macedonia's European path, among other things requesting an agreement specifically on good-neighborliness, the treaty did not resolve all differences on historical matters. Instead, it proved to be a reason for the blockade in 2020, which lasted until the French proposal, which since then transferred responsibility for the incompletely initiated negotiations to the Macedonian side.

The precondition that the proposal carries: the amendment of the preamble of the Constitution of North Macedonia to include the Bulgarian ethnic minority among the already existing ones, has not yet been realized.

This study shows that constitutional amendment is not the only factor separating North Macedonia from joining the European family. On the contrary, the set of documents published as the "French proposal" continuously affirms the need for tangible results regarding good-neighborliness and cooperation, particularly emphasizing the necessity of implementing the Prespa Agreement and the treaty with Bulgaria. Good-neighborliness is certainly part of the SAP, but it is explicitly highlighted in the 2018 EU Enlargement Strategy for the Western Balkans as a prerequisite for accession. Good-neighborly relations are also emphasized in declarations from Sofia, Zagreb, and Brdo.

The fact that North Macedonia and Bulgaria have signed a Treaty on Friendship, Good-Neighborliness, and Cooperation—visible even in the name of the treaty, in line with good-neighborliness as a recognized value in international law and the foundations of the European Union, indicates that respect for the treaty and its provisions will be a prerequisite dictating North Macedonia's progress through the enlargement procedure. Without setting a concrete estimate for when the constitutional amendments that will trigger the negotiation process will take place, it is easy to conclude that identity issues addressed in the 2017 treaty will remain a topic throughout the process, especially in conditions where, according to the revised enlargement methodology, individual member states have increased influence in the accession process.

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INSTRUCTIONS FOR AUTHORS

# INSTRUCTIONS FOR AUTHORS FOR PREPARATION OF ARTICLES IN THE JOURNAL "GEOGRAFSKI PREGLED"*

## 1. Introduction

The Department of Geography, at Faculty of Science in Sarajevo and the Association of geographers of the Federation of Bosnia and Herzegovina, who support issuance of the journal "Geografski pregled", have issued special instructions on presenting the journal, as a whole, and the articles as its integral parts. Instructions are based on B&H ISBN, made according to international ISO: SIST ISO 4 (Rules for the abbreviation of the title words and titles of publications), SIST ISO 8 (Presentation of periodicals), SIST ISO 215 (Presentation of contributions to articles other serials), SIST ISO 214 (Abstracts for publications and documentation), SIST ISO 18 (Contents list of periodicals), SIST ISO 690 (Bibliographic references - contents, forms and structure), SIST ISO 690-2 (Bibliographic references, 2. part: Electronic documents and their parts), SIST ISO 999 (Contents of publications), SIST ISO 2145 (Numbering of divisions and sub-divisions in written documents) and SIST ISO 5122 (Abstract sheets in serial publications). Faculty of Science of the University in Sarajevo and the Association of Geographers of the Federation of Bosnia and Herzegovina have, at the same time, demanded that periodical scientific journal should be issued only once a year. On the grounds of the request of Faculty of Science at the University in Sarajevo and the Association of Geographers of the Federation of Bosnia and Herzegovina and Decision of Editorial Board of "Geografski pregled", the below given instructions on preparation of articles for "Geografski pregled" have been created.

## 2. Orientation of journal

"Geografski pregled" is a scientific journal of the Department of Geography, at Faculty of Science in Sarajevo and the Association of Geographers in the Federation of Bosnia and Herzegovina. It has been intended for presentation of scientific and expert achievements from all fields of geography and related branches.

At the end of the journal, instructions for preparation of articles and other contributions in journal "Geografski pregled" are published.

## 3. Integral parts of submitted articles

Submitted articles must contain the following parts:

- Main title of an article,
- Author' s name and surname,
- Author's education and title (e.g. Dr, MSc, Professor of Geography, or Associate Professor
- Author's address (e.g. Department of Geography of Faculty of Science at University in Sarajevo:
  Zmaja od Bosne 33-35, 71 000 Sarajevo, Bosnia and Herzegovina),
- Author's e-mail address,
- abstract (along with spacing up to 800 characters),
- key words (up to 8 words),

article (together without spaces up to 50,000 characters).

Article has titles of sections and titles of sub-sections designated in ordinals (e.g. 1. Introduction, 1.1. Methodology, and 1.2. Terminology). Division of articles to chapters is obligatory; sub-chapters may be exceptionally used by author. It is desirable that an article has the chapters: Introduction and Conclusion.

## 4. Citing in an article

When citing quotations in the text, supply the author's surname followed by the year of publication, and page number, for example: (Nurković, 2014) or (Drešković and Mirić, 2008; Černe, 1974).

Entries in chapter References will be written in alphabetical order of authors' surnames, and for the same authors classified by years.

If there are more references of the same author from the same year, the years are followed by letters (for example: 1999a and 1999b). Each entry is composed of three items. In the first item, before a colon the author and the year of publication are inserted (if there are more authors, they are separated by comma, authors' surnames and initial letters of their names are also separated by comma, between the initial letter of the name and the year there is no comma), and are followed by title and eventual subtitle, which are separated by comma.

Several examples:

Melik, A. 1955a: Kraška polja Slovenije v pleistocenu. Dela Instituta za geografijo 3. Ljubljana.
Melik, A. 1955b: Nekaj glacioloških opažanj iz Zgornje Doline. Geografski zbornik 5. Ljubljana
Mihevc, B. 1998: Slovenija na starejših zemljevidih. Geografski atlas Slovenije. Ljubljana.
Natek, K., Natek, M. 1998: Slovenija, Geografska, zgodovinska, pravna, politična, ekonomska kulturna podoba Slovenije. Ljubljana.
Richter, D. 1998: Metamorfne kamnine v okolici Velikega Tinja. Diplomska naloga, Pedagoška fakulteta v Mariboru. Maribor.
Šifrer, M. 1997: Površje v Sloveniji. Elaborat, Geografski institut Antona Melika ZRC SAZU. Ljubljana.

Example: for citing electronic sources
Perko, D. 2000: Sporna in standardizirana imena držav v slovenskem jeziku. Available at http://www.zrc-sazu.si/dp (accessed on 8.8.2000).

If author is not known, only the following is mentioned:
http://www.zrc-sazu.si/dp (accessed on 8.8.2000).

## 5. Tables and illustrations in article

All tables in article are included in a single numbered series and have their headings. Between a number and a heading a colon is placed. At the end of the heading the full-stop is placed.

Example:
*Table 1. Population numbers in Sarajevo according to single censuses.*

All illustrations (photographs, maps, diagrams and alike) in the article are included in a single numbered series and have their headings. Between the number and the heading, the colon is placed. At the end of the heading, the full-stop is placed.

Example:
*Figure 1: Population growth in Sarajevo according to mentioned census.*

*Figure 2: Source of topographic map in scale 1:25.000, sheet Sarajevo. For graphical illustrations for which authors do not have copyright, permissions for publications must be provided from owners of copyrights. Authors write the name of the figure's author.*

## 6. Additional rules and recommendations

Titles of articles and other attachments should be as short as possible.

Footnotes should be avoided by authors.

While writing numbers bigger than 9999, for separation of millions and thousands commas are used (for example: 12,535 or 1,312,500).

When writing the scales for maps, the colon is written without touch, which means with the space before and after the colon (e.g.: 1 : 100,000).

Symbols in mathematical calculations are written with the space, except for the parentheses (for example: p = a + c -b - (a + c: b)).

## 7. Receipt of contributions

Authors must submit their contributions in digital form, recorded in Word programme. Digital record of the written paper should be simple, without complicated forms, justified right margin, separation of words, underlining and similar. Authors should mark only bold and italic font. Words should be written in small letters (naturally except the initial, capital letters), without unnecessary shortening and abbreviations. Maps should be made in digital vector version in Arc GIS software or similar software, and diagrams in Excel or similar programmes. Photographs and other graphical attachments authors must submit in a form suitable for scanning, or in digital raster form with a possibility of only 120 dots per cm, respectively 300 dots per thumb, preferably in TIFF or JPG formats. If authors cannot submit the attachment and graphical attachment prepared in specific programmes, they should previously consult the editor. Authors of articles must attach a copied, filled-in and signed Application Form, along with a statement with which authors confirm that they accept the publishing rules in "Geografski pregled". Application Form compensates for the

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## 8. Reviewing of articles

The review procedure is confidential. Reviewer receives the article without mentioning the name of article's author, the author of article receives a review and the reviewer's identity is not released. If a review does not require a correction or revision of article, it is not sent to author, but only notification on acceptance of paper.

## 9. Copyright

For author's paper sent for publishing in "Geografski pregled", all moral copyrights belong to author, material copyrights of reproduction and distribution in Bosnia and Herzegovina and in other countries are free of cost, once forever, for all cases, for unlimited number of copies printed, and for all media are without exception transferred to publisher.

Author takes care of professional translation of abstract, key words and summary of his article, with obligatory mentioning his translator's name and surname.

If author submits an edited text, proof-reader's name and surname should be mentioned. If the text is incomplete in terms of language, editorial staff will return it to author, who will take care of professional proofreading of his text.

*If volume of author's paper is not in accordance with publishing rules, author satisfies the publisher's demand to adjust his paper according to need.*

*Publisher undertakes that all articles with a positive review are published in 'Geografski pregled' if funds for publishing are provided, according to rules and in accordance with a number of received contributions.*

Author receives 1(one) free digital copy of publication.

**APPLICATION FORM**

**Author**

Name _____

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I submit the contribution with the title _____

_____

_____

for publishing in the journal "Geografski pregled" and confirm that I agree with rules of publishing in the journal "Geografski pregled", which are stated in Instructions to authors for preparation of articles in the last printed journal "Geografski pregled".

Date:_____ Signature:_____

# THE FORM FOR REVIEW OF ARTICLES IN THE JOURNAL "GEOGRAFSKI PREGLED"

**1. Title of article:** _____

_____

**2. Evaluation of article:**

| | |
|---|---|
| Is the title of article clear enough? | No Partially Yes |
| Does the title of article sufficiently reflect the contents of article? | No Partially Yes |
| Does the article's abstract sufficiently reflect the contents of article? | No Partially Yes |
| Are the key words of article well chosen? | No Partially Yes |
| Does the introduction of article clearly present the objectives of research? | No Partially Yes |
| Are the methods of work in article presented in full detail? | No Partially Yes |
| What is the novelty level of methods in research? | Low Medium High |
| Did the Conclusion of article clearly represent the research results? | No Partially Yes |
| What is the novelty level of research results? | Low Medium High |
| What is the clarity level of text in article? | Low Medium High |
| Is the list of references in article sufficient? | No Partially Yes |
| Which tables are not necessary in article | No._____ |
| Which figures are not necessary in article? | No._____ |

**3. Final evaluation:**

| | |
|---|---|
| Article is not suitable for publishing | X |
| Article is suitable for publishing with greater corrections | X |
| Article is suitable for publishing with minor corrections | X |
| Article is suitable for publishing without corrections | X |

**4. Column and COBISS designation:**

| | | | |
|---|---|---|---|
| The most suitable column for article is: | Discussion | Views | Methods |
| The most suitable COBISS designation for article is: | 1.01 (original scientific) | | |
| | 1.02 (review scientific) | | |
| | 1.04 (expert) | | |

**5. Shortened evaluator's remarks:**

**6. Attachments with evaluator's remarks for corrections of article:**

**7. Date of evaluation** _____

**8. Evalutor's signature:** _____

# GEOGRAFSKI PREGLED
## GEOGRAPHICAL REVIEW