ACTA GEOGRAPHICA SLOVENICA

GEOGRAFSKI ZBORNIK

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SLOVENSKE AKADEMIJE ZNANOSTI IN UMETNOSTI
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GEOGRAFSKI ZBORNIK

58-2

2018

ZALOŽBA ZRC

LJUBLJANA
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ACTA GEOGRAPHICA SLOVENICA

58-2
2018

ISSN: 1581-6613
COBISS: 124775936
UDC/UDK: 91

Published by/izdajatelj: Geografski inštitut Antona Melika ZRC SAZU
Issued by/založnik: Založba ZRC
Co-issued by/sozaložnik: Slovenska akademija znanosti in umetnosti

Address/Naslov: Geografski inštitut Antona Melika ZRC SAZU, Gosposka ulica 13, SI – 1000 Ljubljana, Slovenija

The papers are available on-line/prispevki so dostopni na medmrežju:
http://ags.zrc-sazu.si (ISSN: 1581–8314)

Ordering/naročanje:
Založba ZRC
Novi trg 2, p. p. 306, SI – 1001 Ljubljana, Slovenija
Phone/telefon: +386 (0)1 470 64 64
Fax/faks: +386 (0)1 425 77 94
E-mail/e-pošta: zalozba@zrc-sazu.si

Annual subscription/letna naročnina: 20 € for individuals/za posameznike, 28 € for institutions/za ustanove.
Single issue/cena posamezne številke: 12,50 € for individuals/za posameznike, 16 € for institutions/za ustanove.

Cartography/kartografija: Geografski inštitut Antona Melika ZRC SAZU
Translations/prevodi: DEKS, d. o. o.
DTP/prelom: SYNCOMP, d. o. o.
Printed by/tiskarna: Collegium Graphicum d. o. o.
Print run/naklada: 400 copies/izvodov

The journal is subsidized by the Slovenian Research Agency/revija izhaja s podporo Javne agencije za raziskovalno dejavnost Republike Slovenije.

The journal is indexed also in/revija je vključena tudi v: SCIE – Science citation index expanded, Scopus, JCR – Journal Citation Report/Science Edition, ERIH PLUS, GEOBASE Journals, Current geographical publications, EBSCOhost, Geoscience e-Journals, Georef, FRANCIS, SJR (SCImago Journal & Country Rank), OCLC WorldCat, and Google scholar, CrossRef.

Front cover photography: Alpine environment has witnessed changes in discharge regimes that depend on the changes in precipitation and temperature regimes, land use and human influence (photograph: Matej Lipar).
Fotografija na naslovnici: Pretočni režimi se v alpskih pokrajinah spreminjajo zaradi sprememb v padavinskem in temperaturnem režimu ter sprememb rabe zemljišč in človeških vplivov (fotografija: Matej Lipar).

ACTA GEOGRAPHICA SLOVENICA

ISSN: 1581-6613
UDC: 91
Number: 58-2
Year: 2018

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Acta geographica Slovenica, 58-2, 2018, 7–18

CHANGES IN DISCHARGE REGIMES OF RIVERS IN CROATIA

Ivan Čanjevac, Danijel Orešić

IVAN ČANJEVAC

The Krka River upstream from Skradin Falls, Croatia.

DOI: https://doi.org/10.3986/AGS.2004
UDC: 911.2:556.535(497.5)
COBISS: 1.01

Changes in discharge regimes of rivers in Croatia

ABSTRACT: This paper presents the results of the first comprehensive national analysis of changes in discharge regimes of rivers in Croatia. Seven types of discharge regimes have been defined for rivers in Croatia. We analyzed the changes in discharge regimes of all types, comparing the standard period from 1961 to 1990 with the most recent period from 1990 to 2009. We found evidence of a redistribution of discharge throughout the year, an increase in autumn and winter discharges (especially for rivers dominantly fed by snowmelt), and a decrease in summer discharge values. Furthermore, we detected a change in the month of the appearance of mean discharge maxima and minima. In most cases, the changes can be explained by changes in the regime of climate elements (temperature, precipitation, and evapotranspiration). The results are consistent with those from upstream countries; that is, Slovenia, Austria, and Bosnia and Herzegovina.

KEYWORDS: geography, hydrology, discharge, river regime, module coefficients, Croatia

Spremembe v pretočnem režimu hrvaških rek

POVZETEK: V članku so predstavljeni izsledki prve pregledne nacionalne analize sprememb v pretočnem režimu rek na Hrvaškem. V analizi je bilo ugotovljenih sedem različnih vrst pretočnih režimov. Avtorja sta pri vsaki preučevala spremembe, pri čemer sta primerjala obdobji med letoma 1961 in 1990 ter 1990 in 2009. Ugotovitve so pokazale spremembe v porazdelitvi pretoka čez leto, povečanje jesenskega in zimskega pretoka (zlasti pri rekah, na pretok katerih večinoma vpliva taljenje snega) ter zmanjšanje pretoka v poletnih mesecih. Poleg tega se je spremenil tudi mesec najnižjega in najvišjega povprečnega rečnega pretoka. V večini primerov lahko spremembe pojasnimo s spremembami podnebnih dejavnikov (temperature, padavin in evapotranspiracije). Izsledki se ujemajo z rezultati analiz, opravljenih v državah gorvodno (tj. Sloveniji, Avstriji ter Bosni in Hercegovini).

KLJUČNE BESEDE: geografija, hidrologija, pretok, rečni režim, koeficienti modulov, Hrvaška

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This paper was submitted for publication on June 2nd, 2015.
Uredništvo je prejelo prispevek 2. junija 2015.

1 Introduction

The aim of this study was to assess recent changes in discharge regimes in Croatia. What is the effect of (evident) climate change or oscillation on water resources in Croatia? Are there any significant changes in the discharge regimes of rivers in Croatia? Is it possible to draw any general conclusions regarding the change in discharge regimes that could confirm climate change observations?

Discharge regimes have traditionally been a major hydrogeographical research topic (Pardé 1933; Ilešič 1947; Grimm 1968; Riđanović 1993; Hrvatin 1998; Frantar 2003; Frantar and Hrvatin 2005). This is probably because they are the result of complex physical geographical characteristics, as well as the socio-geographical development of the upstream area. Although station-specific discharge regimes are mainly the result of the climate characteristics of the basin area, climate change or oscillations can and usually are reflected in discharge regimes. This study is the first comprehensive nationwide assessment of changes in discharge regimes.

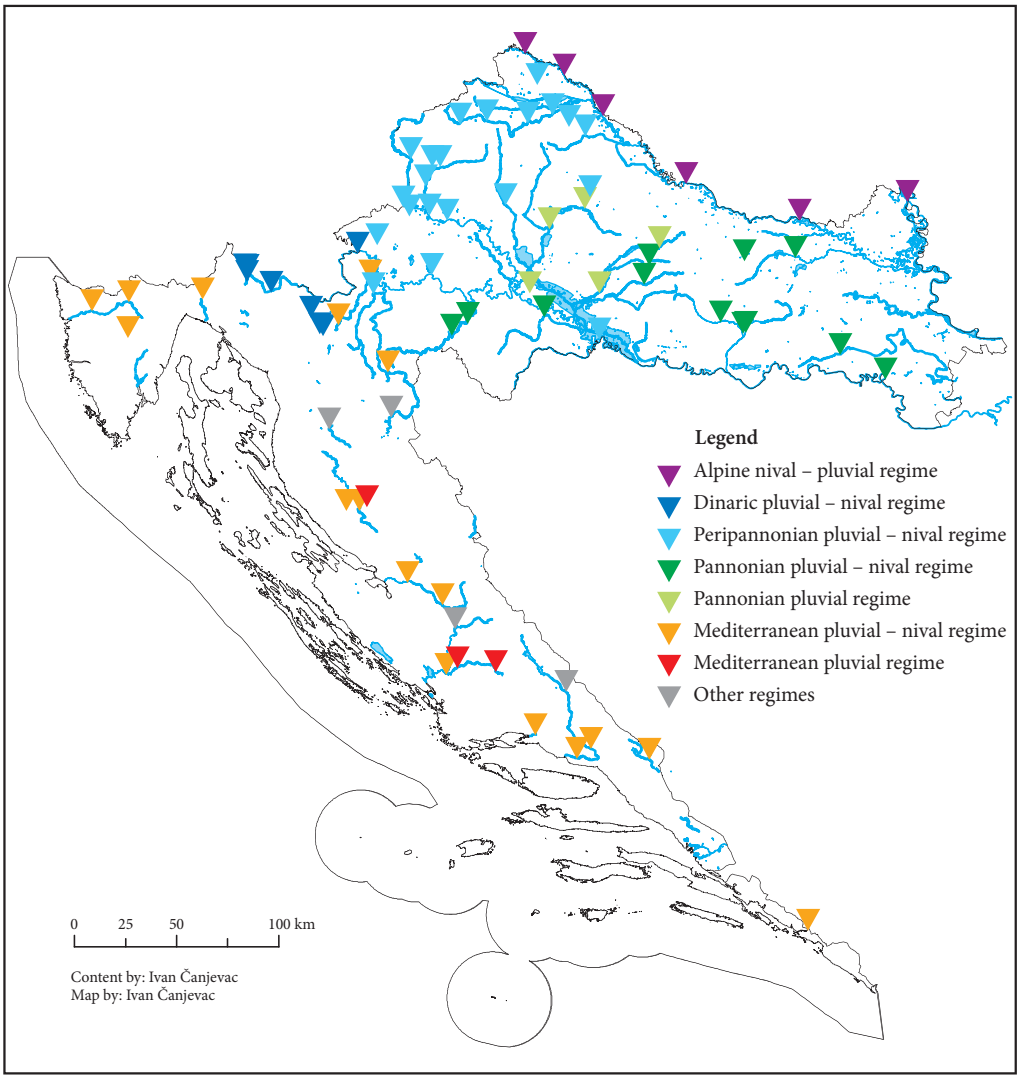

Figure 1: Types of discharge regimes in Croatia (Čanjevac 2013).

The study covers rivers and stations in Croatia with available data. Croatia has heterogeneous physical-geographical characteristics. It lies at the intersection of the Pannonian Plain, the Dinaric Alps, and the Adriatic Sea, covering an area of 56,594 km^2 with around 4.3 million inhabitants (Croatian … 2014). Its diverse climate, geological, and geomorphological conditions result in a variety of discharge regimes of rivers (Čanjevac 2013). For the purpose of this study, we compare the standard period (1961–1990) with the most recent twenty-year period (1990–2009). We are aware of possible different conclusions due to different lengths of time series, but we consider a twenty-year period long enough to avoid interannual oscillations (Dukić 1984; Shaw et al. 2010).

The discharge regimes of rivers in Croatia were studied by Ilešič (1947) and Riđanović (1993), who covered only large rivers. Regional analysis of discharge and river regimes was carried out for rivers in the Lika region (Pejnović 1991), the catchment of the Krapina River (Orešić 1995), and the catchments of the Rječina and Mirna Rivers (Knežević 2001, 2004). In addition, the discharge regimes of some rivers in Croatia were analyzed within larger-scale studies (Belz et al. 2004; Kovacs 2010). All of these studies cover parts of Croatia and did not seek to obtain the wider picture necessary to understand processes and changes for the entire Croatian area and for the correlation with neighboring and upstream countries. Therefore, for methodological reasons and spatial correlation, we also analyze the research findings from nearby countries; namely, Slovenia (Hrvatin 1998; Ulaga 2002; Frantar 2003, 2005, 2007; Frantar and Hrvatin 2005; Brilly et al. 2007; Ulaga et al. 2008), Austria (Fürst et al. 2008, 2010), Germany (Bormann 2010), Hungary (Belz et al. 2004), and Bosnia and Herzegovina (Hidrološka studija površinskih voda BiH 2012). Those studies analyze recent changes in river discharge and discharge regimes in their respective countries and for rivers in the wider area of the Danube Basin. Due to changes observed for rivers linked to changes in snowfall and snow cover duration, Swiss research is also analyzed (Birsan et al. 2005).

2 Methods

This study uses the mean monthly discharge data from 116 hydrological stations in Croatia (Meteorological … 2014). The main selection criterion was the length of time series without gaps. We chose seventy-six stations on fifty-one rivers for our analysis of the discharge regime change. All of the data were obtained from the Meteorological and Hydrological Service of Croatia.

According to the recent typology of discharge regimes (for the period 1990–2009), there are seven types of discharge regimes in Croatia (Čanjevac 2013).

The changes in each of the types were analyzed. A comparison and analysis of discharge regimes for two periods (1961–1990 and 1990–2009) were made comparing the values of module coefficients. This paper presents changes of discharge regimes in the characteristic (typical) stations for each type.

3 Results

3.1 Alpine nival-pluvial regime

Rivers with an Alpine nival-pluvial regime in Croatia are the Drava, the Mura, and the Danube. The regimes of these rivers and the uniformity of discharge in particular are affected by the construction of dams for large hydropower plants. The mechanisms of water input and change in characteristics of this regime type are shown based on the example of the Terezino Polje station on the Drava River. The regimes of the 1961–1990 standard period were compared to the period (1990-2000) for which the recent typology (Čanjevac 2013) was made (Figure 2).

There is evidence of changes and a transition from a nival (nival-glacial; Riđanović 1993) regime in the 1961–1990 period towards a nival-pluvial regime in the last period. This can be concluded from the decreased values of module coefficients in the high-water period, when the main input comes from snow and glacier melt, and increased coefficient values in the low-water period from September to January. Between the two periods studied, the mean monthly discharge value at the annual level decreased by 10%, from 533.37 to 480.02 m^3/s. Indirectly, we conclude that feeding by snowmelt is lessening (there is a decrease in the retardation effect) and feeding by rainfall is increasing, which corresponds to processes of climate element change in the basins analyzed (Gajić-Čapka and Cesarec 2010).

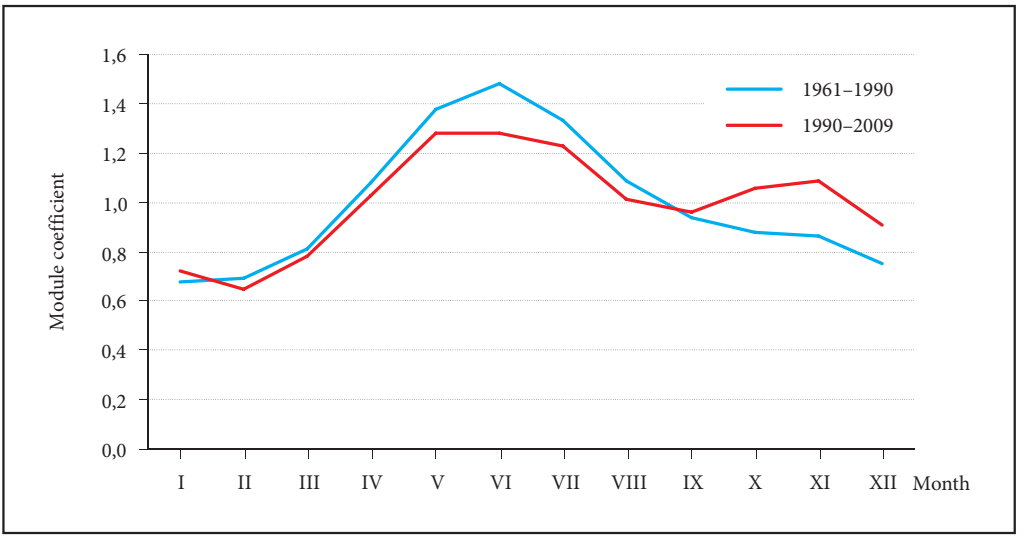

Figure 2: Module coefficient values of the Drava at the Terezino Polje station; an Alpine nival-pluvial regime.

3.2 Dinaric pluvial-nival regime

The Kupa, Čabranka, Kupica, Gornja Dobra, and Vitunjčica rivers are characterized by a Dinaric pluvial-nival regime. In order to illustrate the changes in this regime type, we chose the Kupa River and the Hrvatsko station (Figure 3). There is a notable decrease in mean monthly discharge values for the Kupa at that station by about 8% from 20.65 m^3/s to 18.94 m^3/s.

Through a parallel analysis of the regimes in the two periods, an increase in module coefficients was recorded from September to February in the second period, with the most marked increase in October.

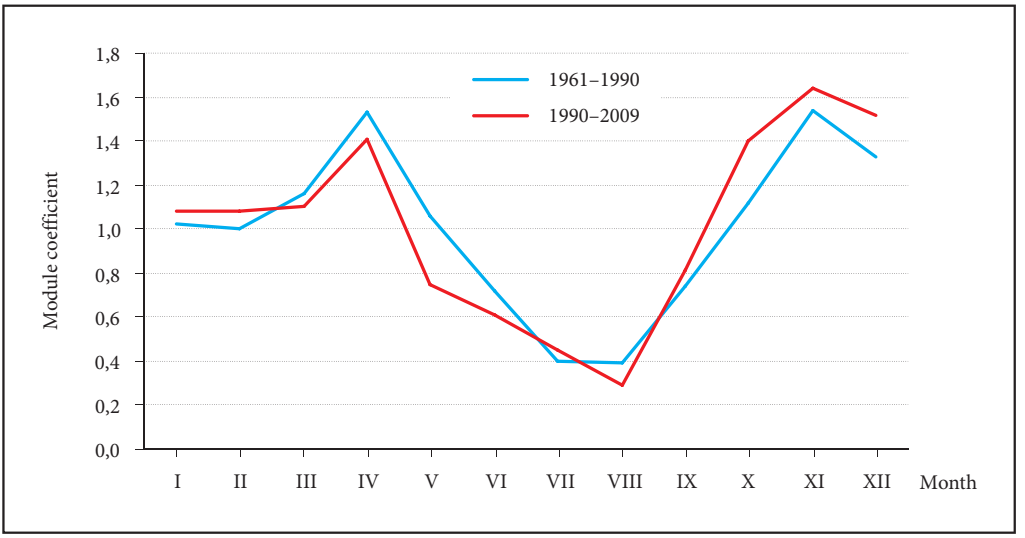

Figure 3: Module coefficient values of the Kupa River at the Hrvatsko station; a Dinaric pluvial-nival regime.

On the other hand, there was a fall in the values of module coefficients from March to August, with the most marked one occurring in May. It is precisely this pronounced decrease in discharge in May that indicates a decrease in snowmelt proportion in the total input of the river. This is the cause of increased discharges in the winter months, whereas those of the spring months are decreasing due to a smaller amount of snow, which also melts earlier. Another change noticed is that the autumn maximum is more marked than the spring one, whereas they were equal in the standard period. Generally, the autumn months have become wetter and the spring months have become drier. Furthermore, the decrease in discharge in August, which is around one-third of the average annual discharge, is a bit alarming. Due to such changes, in the twenty-year period observed the difference between the months with the highest and lowest discharge has increased significantly.

3.3 Peripannonian pluvial-nival regime

This type of regime includes over 30% of the stations analyzed. Rivers with a Peripannonian pluvial-nival regime are the Bednja, Krapina, Krapinčica, Horvatska, Sutla, Lonja, Bjelovatska, Gliboki, Koprivnica, Sava (stations: Podsused Žičara, Zagreb, Jasenovac), Bregana, Gradna, Trnava, Kupčina, Mrežnica, and Kupa (Jamnička Kiselica station). The three stations included on the Sava show characteristics of its upper and middle course in Croatia. This regime type is the most heterogeneous one and shows the diversity of climate conditions of runoff at both the meso-regional and micro-regional levels.

The Bednja River at the Tuhovec station was chosen to assess the change in this type of regime (Figure 4). The mean monthly discharge of the Bednja at the Tuhovec station between the two periods fell from 6.62 to 4.84 m^3/s (i.e., 27%).

Through a comparative analysis of the regimes, an increase in coefficient values from September to January was observed, along with a decrease from February to August. December showed the most marked increase in module coefficients, whereas the decrease, on the other hand, was most pronounced in March. Such changes indicate dryness in the spring and summer months, probably caused by reduced precipitation, but most of all by the increase in mean monthly temperatures and evapotranspiration values (Pandžić et al. 2009). The results are indicative, but in order to confirm these causal connections any future research will require an analysis of available climate elements' data series.

The Sava regime in Zagreb is somewhat different from other streams and requires a more detailed analysis (Figure 5).

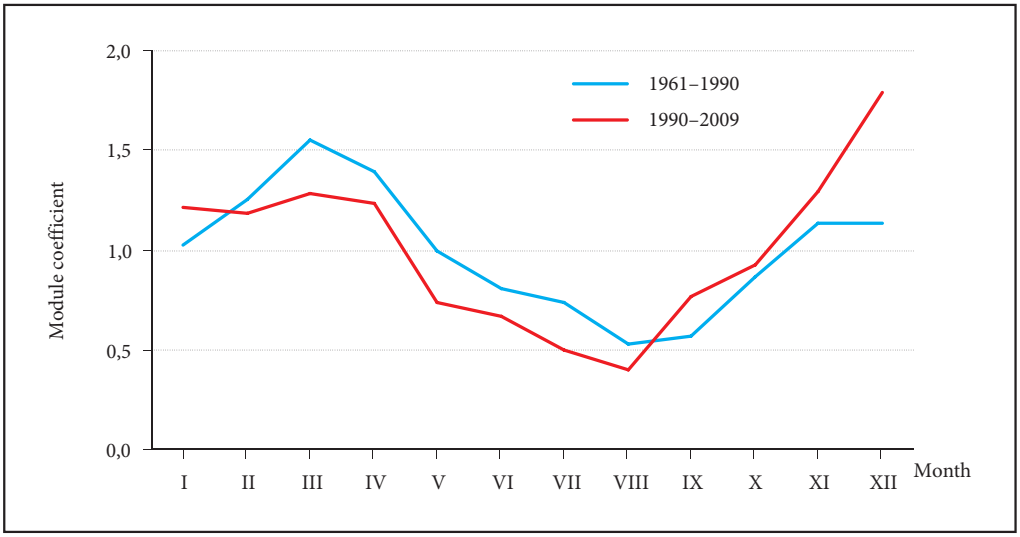

Figure 4: Module coefficient values of the Bednja River at the Tuhovec station; a Peripannonian pluvial-nival regime.

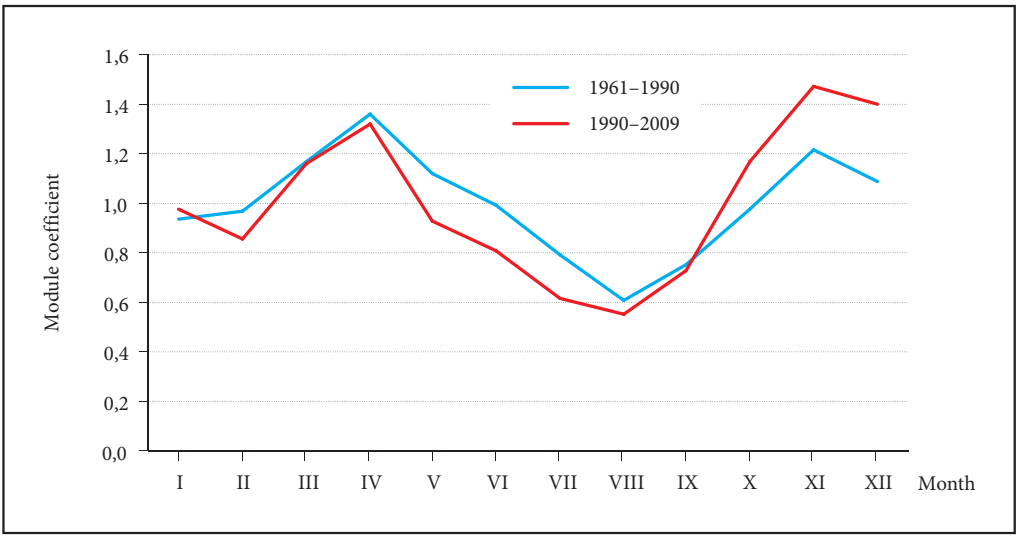

Figure 5: Module coefficient values of the Sava River at the Zagreb station; a Peripannonian pluvial-nival regime.

Comparing the Sava regime in the two periods, one can observe changes as a consequence of climate element changes, primarily in Slovenia (Brilly et al. 2007; Ulaga et al. 2008). The decreased discharge in late spring (May) and early summer (June) is evidently a consequence of a reduced amount of snow in the total amount of precipitation in the drainage area. The decreased discharge values in the summer months are a result of atmospheric pressure, rising evapotranspiration rates, and a decreasing amount of precipitation (Šegota and Filipčić 2007). Higher autumn discharges are a consequence of the prevailing rain input in comparison to snow. The same trend was detected for the Sava River in Slovenia (Frantar 2003). On the whole, the mean discharge value has dropped by about 11%, from 310.12 m^3/s to 274.25 m^3/s. This drop in discharge is marked in all months except October and December. This trend in falling mean annual discharge values has been detected since the mid-1920s (Šegota and Filipčić 2007; Bonacci and Oskoruš 2011). However, this trend (of falling mean discharges) has accelerated in the last twenty-year period, and it needs to be taken into consideration in further water management and planning as well as the construction of five new hydropower plants on the lower course of the Sava River in Slovenia.

3.4 Pannonian pluvial-nival regime

Rivers with a Panonnian pluvial-nival regime are the Bijela, Orljava, Toplica (Daruvarska), Glina, Sava (Županja Stepenica station), Voćinka, Vučica, Bić, Lonđa, and Sunja. These are mainly smaller streams in the Panonnian part of Croatia. This group includes the downstream regime of the Sava at the Županja station, which is somewhat different from the regime of the Sava in the upper and middle part of its course in Croatia. Unfortunately, we do not have data series long enough for a sufficient number of stations with this regime, and so it is impossible to draw general conclusions about the changes specific to this type of regime. Nevertheless, it is possible to perform an analysis of the Sava regime change at the Županja Stepenica station, for which there is a data series long enough (Figure 6).

Mean monthly discharge for the 1961–1990 period was 1,134.16 m^3/s, whereas the discharge for the 1990–2009 period was about 10% lower, at 1,026.28 m^3/s. Such a relatively large fall is the result of an absolute fall from January to September and a relative fall during the months before and after the spring maximum, which is in April. Except for similar changes in the upper stream part of the basin in Croatia and Slovenia, this is a consequence of the reduced amount of snowmelt in the input of main right-side tributaries (draining the Bosnian mountains), which affects the Sava regime downstream of Jasenovac

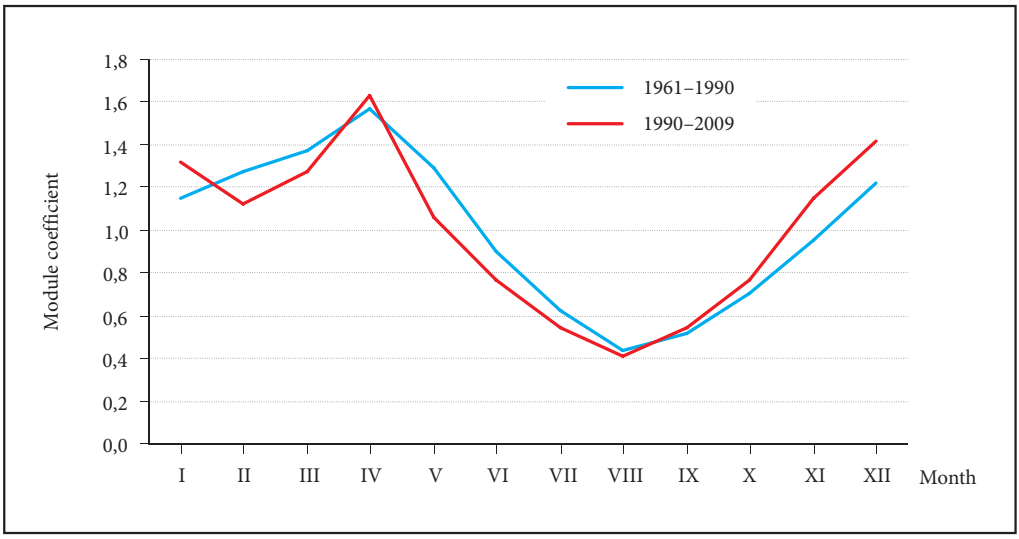

Figure 6: Module coefficient values of the Sava River at the Županja stepenica station; a Pannonian pluvial-nival regime.

(Hidrološka … 2012). Due to this station's large drainage area, which encompasses different climate areas and runoff conditions, the relationships in this case are among the most complex in Croatia.

3.5 Pannonian pluvial regime

The Česma, Ilova, and Kutina rivers have a Pannonian pluvial regime. The basic changes in the case of this regime type are shown in the example of the Česma River at the Narta station (Figure 7). The mean

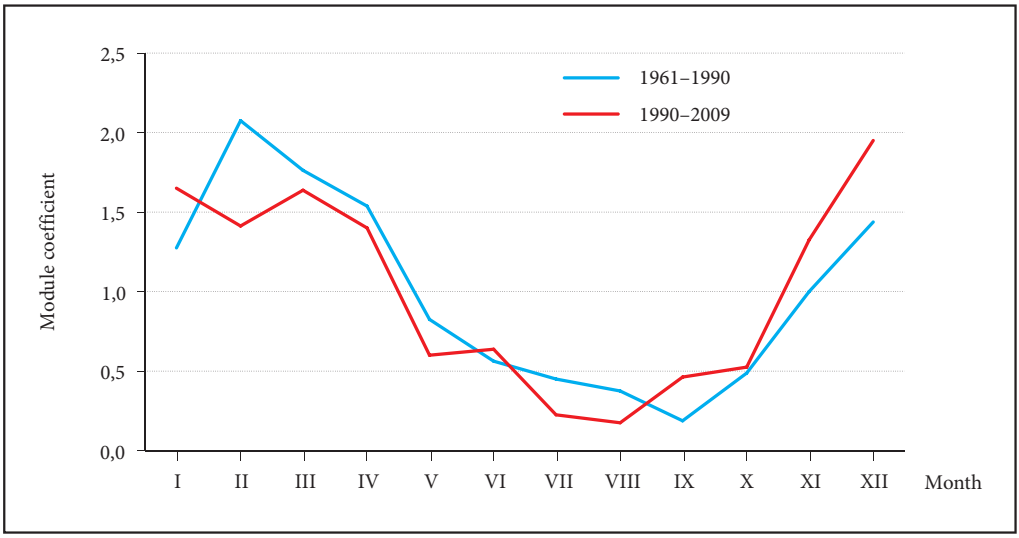

Figure 7: Module coefficient values of the Česma River at the Narta station; a Pannonian pluvial regime

monthly discharge between the two periods observed decreased by about 7%, from 5.2 m^3/s to 4.84 m^3/s. The highest increase in module coefficients is typical for autumn and partly for the winter months; for example, in December the increase moved from 1.44 to 1.95. On the other hand, the biggest decrease is significant for February, March, and the summer months.

The relative decrease in July and August is particularly significant. Due to such redistribution of discharge in the course of the year, the primary maximum shifted from February to December, and the minimum moved from September to August or even July. The changes in the colder part of the year are probably a consequence of the increase in the amount of autumn precipitation, and the decreases in July and August could also be explained by continuation of the already determined increase in temperature and rise in evapotranspiration during the warmest part of the year (Zaninović and Gajić-Čapka 1999). These changes, together with the decrease in the highest module coefficient values and an even greater relative fall in the lowest values, suggest that in the following period in this area water shortages and drought in the summer months can be expected more frequently.

3.6 Mediterranean pluvial-nival regime

This regime type is characteristic of 22% of the stations analyzed, which are mainly located on karst streams belonging to the Adriatic Basin. These are the Cetina, Vrljika, Jadro, Ombla, Krka (the Skradinski Buk Gornji station), Zrmanja, Lika, Novčica, Istrian Mirna, Pazinčica, and Rječina Rivers. This type includes two rivers of the Black Sea Basin: the (Donja) Dobra and Korana rivers. The characteristics of this regime and its changes in relation to the standard period are analyzed based on the example of the Krka River at the Skradinski Buk Gornji station (Figure 8). First, it is necessary to point out that in the case of the Krka River the mean monthly discharge values also decreased, by about 12%, from 54.16 m^3/s to 47.4 m^3/s.

In addition, one can observe a transition from a simple regime with one maximum and one minimum towards a regime with a marked second maximum in April and minimum in February and March. The increase in module coefficients has been recorded from November to January, but was especially marked in December and April. On the other hand, a significant decrease is characteristic for February and March. Apart from that, there are smaller decreases in the summer months, which can be alarming considering that a major part of the rivers with this regime have a crucial role in water supply.

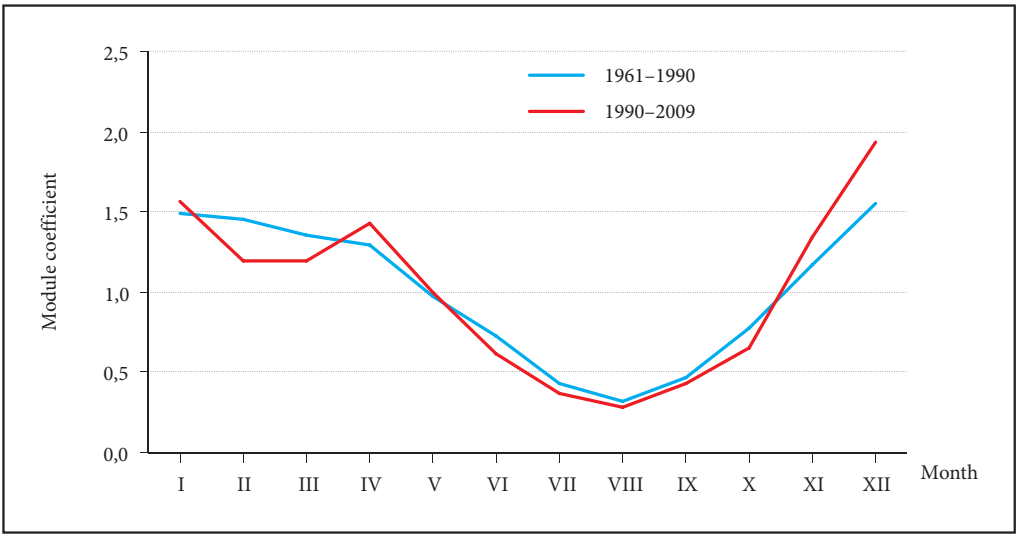

Figure 8: Module coefficient values of the Krka River at the Skradinski Buk Gornji station; a Mediterranean pluvial-nival regime.

3.7 Mediterranean pluvial regime

According to the typology made by Čanjevac (2013), only three stations on two streams belong to this regime: the Čikola River (stations: Ružić 1 and Ključice) and the Jadova River in Lika. These streams are threatened by a significant decrease in mean monthly values of discharge over the last twenty years. For the Čikola River (the Ružić 1 station) it amounts to nearly 25%, from 5.04 to 3.85 m^3/s. These data are alarming because the Čikola is an important stream in the water supply system of the town of Drniš and the surrounding area. Such a high decrease in discharge corresponds to a general trend in the Mediterranean (Ludwig et al. 2009). The changes in regime refer to a decrease in the coefficients in the autumn months, shorter and more intense duration of the winter maximum, and a more variable spring discharge (Figure 9).

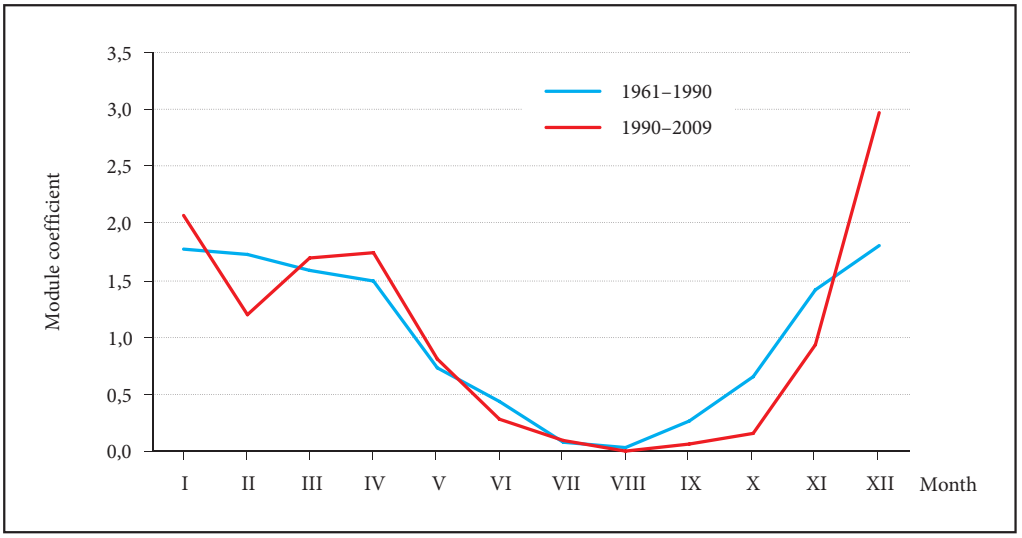

Figure 9: Module coefficient values of the Čikola River at the Ružić 1 station; a Mediterranean pluvial regime.

4 Discussion

The analysis of changes in discharge regimes in the last twenty-year period reflects a complex picture, and in most cases this could be related to changes in climate elements. Over the last century, lowland (i.e., central and eastern) Croatia has generally shown a mild increase in mean annual air temperature, a decrease in the precipitation quantity and soil humidity, and an increase in potential evapotranspiration with a statistically significant trend since 1987 (Zaninović and Gajić-Čapka 1999). Furthermore, the precipitation variability in continental Croatia increases towards the east (Maradin 2011; Maradin and Filipčić 2012). Larger rivers in the continental part (the Sava, Drava, and Mura rivers) exhibited a change in discharge regime primarily as a consequence of changing conditions in the upstream countries; that is, Slovenia (Frantar 2003, 2005, 2007) and Austria (Fürst et al. 2008, 2010). In these cases, the basin size and strong human interventions make the causal relationship of climatic elements change and runoff less clear, although observed signals are the same. A great number of hydroelectric power plants have been constructed on all three rivers, especially on the Drava (23) and Mura (26). Given that their construction has further stabilized the already steady discharge regime, the consequences of climatic changes are impossible to detect. There is evidence of increased discharge; namely, values of module coefficients in the spring, especially for rivers fed by snowmelt. Together with the evidence of an increase in mean annual temperature, this suggests that due to warmer winters with less snow (for the change in snow cover, see Gajić-Čapka 2011)

there is a change in the ratio of solid to liquid precipitation in favor of rainfall. This reduces the retardation effect of the colder months on water resources, the amount of runoff is distributed, and the spring maxima shift toward the winter months. Such trends and processes are consistent with those in the Alps (Frantar 2005; Birsan et al. 2005; Fürst et al. 2010). A decrease in the values of module coefficients in the summer months is noticed at all stations analyzed. The most pronounced decrease is for rivers with simple Pannonian and Mediterranean pluvial regimes. This is probably the result of their higher sensitivity to precipitation variability and climate oscillations in general. In addition, for the entire Mediterranean there is a significant trend of a decrease in mean discharges over the last fifty years (Ludwig et al. 2009). The nearly uniform trend of the module coefficient increase in the autumn months is a consequence of the aforementioned trend of a change in the ratio of solid to liquid precipitation in favor of rainfall. Winter months showed an increase in module coefficients in most cases, but also the occurrence of a secondary minimum, usually in February.

5 Conclusion

Our comprehensive study of changes in discharge regimes of rivers in Croatia comparing the 1961–1990 and 1990–2009 periods yields the following general conclusions presented at the seasonal level:

- A decrease in module coefficients in the spring months, especially for rivers fed by snowmelt.
- A decrease in module coefficients in the summer months at all stations analyzed. The most pronounced decrease is for rivers with a simple Pannonian pluvial regime and especially a Mediterranean pluvial regime.
- A nearly uniform increase in module coefficients in the autumn months.
- An increase in module coefficients in winter months in most cases, but also the occurrence of a secondary minimum, usually in February.

The changes are in general the result of changes in climate elements (mainly a temperature rise) between the two periods. The most pronounced are changes in snow occurrence and accumulation processes. Given that many rivers in Croatia have a transboundary character, the conclusion above is supported by the results of studies in upstream countries. Projections of a further decrease in snow cover duration and thickness in the Alpine area in the twenty-first century have to be taken into consideration for further planning (Steiger 2010). The intensity of change for relatively lower elevations (from 600 to 1,300 m) is particularly stressed.

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Acta geographica Slovenica, 58-2, 2018, 19–30

DOES IT REALLY RAIN MORE OFTEN ON WEEKENDS THAN ON WEEKDAYS? A CASE STUDY FOR SLOVENIA

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Climate conditions in Slovenia are changing as indicated by an increasing number of extreme events.

DOI: https://doi.org/10.3986/AGS.2255
UDC: 556.12(497.4)
504.5:502.3(497.4)
COBISS: 1.01

Does it really rain more often on weekends than on weekdays? A case study for Slovenia

ABSTRACT: The article presents the results of precipitation and aerosol (PM_{10}) data analyses in Slovenia. Analyses of rainfall data for some areas of Slovenia, such as the Ljubljana Basin, Zasavje, Šalek Valley, Celje Basin, and the coastal area, suggest that rain on the weekend is more frequent than on weekdays; nevertheless, these deviations are not statistically significant. A comparison of three separate decades showed that the pattern of weekly rainfall in the 21st century is different than that in the last period of the 20th century. The weekly cycle of PM_{10} for the considered stations is quite similar to that of some of the more contaminated regions of the world. Furthermore, the connection between PM_{10} and precipitation in most of the analyzed cases was statistically significant.

KEY WORDS: precipitation, air pollution, weekly precipitation cycle, PM_{10}, statistical tests, Slovenia

Ali res pogosteje dežuje ob koncih tedna kot med tednom? Analiza za Slovenijo

POVZETEK: Prispevek prikazuje analizo podatkov o padavinah in delcih v zraku (PM_{10}). Za nekatera območja v Sloveniji, kot so Ljubljanska kotlina, Zasavje, Šaleška dolina, Celjska kotlina ter obalno območje, je glede na analizirane podatke o padavinah značilno, da večkrat dežuje ob koncih tedna kot med tednom, vendar odstopanja niso statistično značilna. Primerjava treh desetletnih obdobij pokaže, da je vzorec tedenske razporeditve padavin v 21. stoletju drugačen kot v zadnjem obdobju 20. stoletja. Tedenski cikel delcev PM_{10} na obravnavanih merilnih mestih je precej podoben kot v nekaterih bolj onesnaženih regijah sveta. Poleg tega je povezava med delci PM_{10} in količinami padavin v večini analiziranih primerov statistično značilna.

KLJUČNE BESEDE: padavine, onesnaženje zraka, tedenska razporeditev padavin, PM_{10}, statistični testi, Slovenija

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The paper was submitted for publication on July 13th, 2015.
Uredništvo je prejelo prispevek 13. julija 2015.

1 Introduction

We often have the feeling that it rains more frequently during weekends when the majority of people are not working. Since the beginning of the 20th century, the modern society has mostly adopted a 5-day work week cycle, and Saturday and Sunday are considered as non-working days (Arts 2008; Cerveny and Balling 1998). On these days sunny weather is usually preferred. The theory about the impact of human weekly cycle on the rainfall pattern has a logical explanation and was the topic of many studies (e.g., Gong et al. 2007; Shultz et al. 2007; Bell et al. 2008; DeLisi et al. 2011; Stjern 2011). The theory is related to anthropogenic influence that became more pronounced over the last century with daily commuting and development of heavy industry (Gong et al. 2007; Arts 2008; Bell et al. 2008; DeLisi et al. 2011; Stjern 2011). Higher air pollution may increase the amount of aerosols in the air, which influences the probability of rainfall occurrence (Bell et al. 2008). This means that the accumulation of small solid particles (PM_{10}) in the air, which may increase during the weekends, could trigger the changes in the atmospheric circulations that can result in non-uniform weekly rainfall patterns (Gong et al. 2007).

Several studies dealing with this phenomenon have been carried out in recent years (Bell et al. 2008; DeLisi et al. 2011; Gong et al. 2007; Seibert et al. 2013; Shultz et al. 2007). In most of these studies, data on rainfall and PM_{10} particles (particles with a diameter up to 10 μm) were used, and their conclusions depended on the location of the study and the selected data. Shultz et al. (2007) analyzed precipitation records from 219 stations in the United States with more than 40 years of measurements. They found that neither the amount nor the occurrence of rainfall differs statistically significantly from the uniform distribution as a function of the day of the week. Similar conclusions were drawn also by DeLisi et al. (2011) who analyzed data from seven stations along the east coast of the United States. Furthermore, Seibert et al. (2013) analyzed data from 376 stations in Switzerland and the main conclusion was that in some areas and on particular days of the week there was 10 to 20% more rainfall than on other days. Moreover, Gong et al. (2007) found that the significant weekly cycle of PM_{10} and, consequently, rainfall is characteristic of urban regions in China, one of the most polluted areas in the world. In Slovenia, no study about weekly rainfall patterns has been conducted so far. However, some analyzes of seasonal characteristics of rainfall and discharge series were performed (Srebernič 2005; Bezak et al. 2015a, 2015b).

The main aim of this study was to test if it really rains more often on weekends than on weekdays in Slovenia, and to find out which parts of Slovenia are those where rainfall distribution during the week is significantly non-uniform. Other aims of the study were as follows: (i) to analyze the weekly rainfall distribution in Slovenia and the differences among seasons, (ii) to compare weekly rainfall patterns among various 10-year periods (1980–2014), and (iii) to analyze the concentration of PM_{10} particles in the air and how this relates to the weekly rainfall pattern.

2 Data and methods

Daily rainfall data from 13 rainfall stations in Slovenia (Table 1) from 1980 onwards were used to analyze the weekly rainfall pattern (ARSO 2015). Any day with at least 0.1 mm of recorded rainfall was defined as a rainy day. The complete daily rainfall series was divided into 4 periods, i.e., 1980–1989, 1990–1999, 2000–2009, and 2010–2014, which were compared in the study. Furthermore, the differences in the seasonal pattern of the weekly rainfall distribution were analyzed. December, January, and February were assumed as winter months; March, April, and May as spring months; June, July, and August as summer months; and September, October, and November as autumn months. Moreover, PM_{10} particles were analyzed in this study (the data were provided by the Slovenian Environment Agency; Table 2). Figure 1 shows the location of the considered stations where rainfall and PM_{10} particles were recorded.

Various parametric and nonparametric tests can be used to detect the changes in the time series (e.g., Kendall 1975; Maidment 1993; Esterby 1996; Rao and Hamed 2001; Kundzewicz and Robson 2004; Khaliq et al. 2009; Bezak et al. 2015a). The nonparametric χ^2 test (Haan 2002) was used in the study to test the hypothesis about a non-uniform rainfall pattern. The main advantage of the χ^2 test is that it can be applied to both continuous and discrete variables (Haan 2002) and is mostly used for hypothesis testing about distribution of samples (Turk 2012). In our study the following null hypothesis was used (H_0): rainfall distribution during the week is uniform, while the alternative hypothesis was (H_A): rainfall distribution

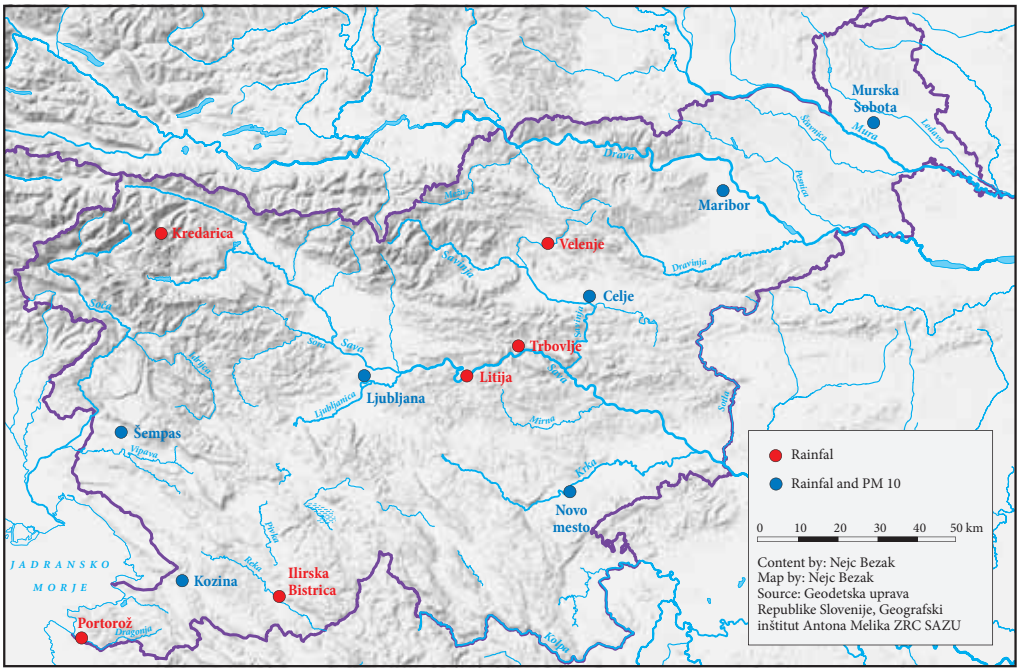

Figure 1: Location of the selected stations.

Table 1: Considered rainfall stations.

Station name	Station type	Study period
Ljubljana–Bežigrad	meteorological	1980–2014
Kredarica	meteorological	1980–2014
Maribor–letališče	meteorological	1980–2014
Murska Sobota–Rakičan	meteorological	1980–2014
Celje–Medlog	meteorological	1980–2014
Portorož–letališče	meteorological	1980–2014
Novo mesto	meteorological	1980–2014
Velenje	climatological	1980–2005
Ilirska Bistrica	climatological	1980–1999
Kozina	rainfall	1980–2014
Šempas	rainfall	1980–2014
Litija–Grbin	rainfall	1980–2004
Trbovlje	rainfall	1980–1992

Table 2: Stations with recorded PM_{10} concentrations.

Station name	Station type	Study period
Ljubljana	Urban	2012–2014
Maribor–center	Urban (traffic)	2009–2014
Murska Sobota–Rakičan	Rural	2010–2014
Celje	Urban	2011–2014
Novo mesto	Urban	2010–2014
Koper	Urban	2009–2014
Nova Gorica	Urban	2011–2014

during the week is non-uniform. Data about the number of days with rainfall were normalized against the total number of days. The χ^2 distribution with 6 degrees of freedom was used according to the number of days in the week (7). Furthermore, graphical presentations were used for analyzing the weekly rainfall distribution, where normalized data were shown together with the value of 3 standard deviations. The non-parametric Mann-Whitney test was selected for comparing the various periods. The null hypothesis (H_0) was: the tested samples are drawn from the same distribution, and the alternative hypothesis (H_A) was: the tested samples are not drawn from the same distribution. A significance level of 0.05 was selected. Moreover, critical value U_{krit} was equal to 8 since both samples have 7 elements (H_0 can be rejected if test statistic U is smaller than U_{krit}). Pearson and Spearman correlation coefficients were used to analyze the connection between rainfall and PM_{10} values.

3 Results and discussion

3.1 Weekly rainfall pattern

For 13 rainfall stations in Slovenia (Table 1), the number of rainy days on each day was determined for different periods. Table 3 shows an example of weekly rainfall distribution for station Ljubljana-Bežigrad. Days with the maximum number of rainy days in each period are shown in bold text. Furthermore, the calculated values were normalized and also presented graphically. Figure 2 shows weekly rainfall distribution for different seasons for the Ljubljana-Bežigrad station together with the values of 3 standard deviations. As shown in Figure 2, for the period 1980–1989 Sunday was the day with the maximum number of rainy days for spring, summer, and autumn. Similar results were obtained for both the last period and the entire study period.

Table 3: Weekly distribution of rainy days for different periods for the Ljubljana-Bežigrad station.

Period	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday	Total
1980–1989	212	216	211	211	216	215	**238**	1519
1990–1999	220	225	209	**234**	218	216	224	1546
2000–2009	206	**221**	202	198	194	205	210	1436
2010–2014	118	123	114	110	107	119	**128**	819
1980–2014	756	785	736	753	735	755	**800**	5320

The summary of the results of the basic statistical analyses (standard deviation) and the χ^2 test for all analyzed stations are given in Table 4. The days on the weekends with the maximum number of occurrences are indicated in bold text. Table 4 also shows the deviations of the results regarding the (2 and 3 times) standard deviation values. For 10 of 13 analyzed stations, there was at least 1 time period when the maximum number of rainy days was on weekends, particularly at Ljubljana-Bežigrad, Portorož, Velenje, and Trbolje stations. For the Ljubljana-Bežigrad station for 2 of 4 periods the weekends were found as the rainiest. In the first period (1980–1989), the rain on Sundays was 9.7% more frequent than on other days. Sunday was also the rainiest day for the entire period (1980–2014) and the number of rainy days was 5.3% more frequent. For the Portorož station, for 3 of 4 time periods the deviation exceeded the value of 2 standard deviations and, in the last study period, even the value of 3 standard deviations. The rainfall in the first, second and fourth study periods was 6.7%, 6.9%, and 11.2%, respectively, more frequent on Sundays than on other days of the week. Similar results were obtained for the entire study period where the percentage was 4.8. Sunday was the day with the maximum number of rainy days also for the Velenje station for the period 1980–1989 where the deviation exceeded the value of 3 standard deviations. In this period, the rain on Sunday was 9.0% more frequent that on other days. For the Trbovlje station, the rain on Sunday was by 4.6% and 4.1% more frequent than that during other days for the periods 1980–1989 and 1980–1992, respectively. These results are in accordance with other studies that concluded that non-uniform weekly rainfall distribution is more explicit for more polluted areas (Gong et al. 2007; Stjern 2011). The Šalek Valley and Zasavje are regarded as areas with relatively high pollution, Ljubljana Basin is the largest urban area in Slovenia, and the pollution at the Portorož station can be attributed to the influence of Trieste, Italy.

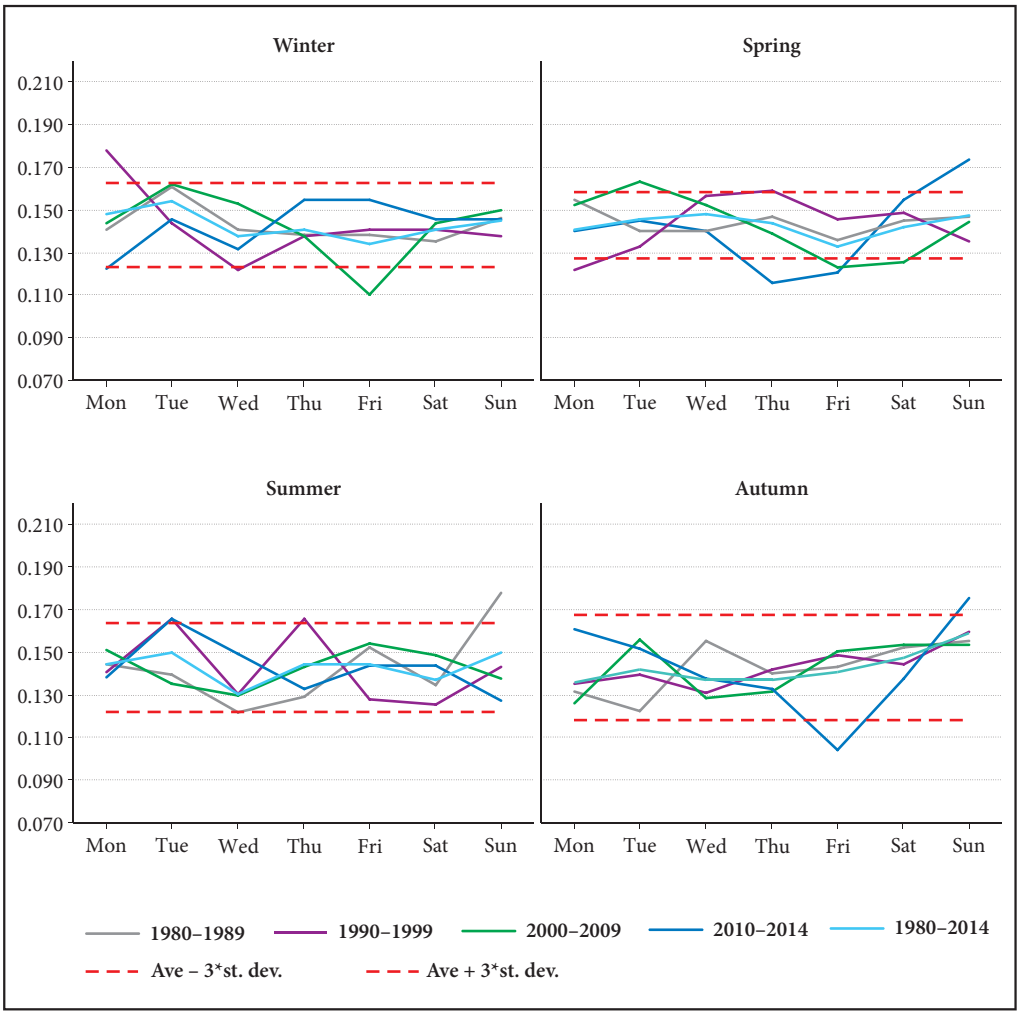

Figure 2: Normalized values of rainy days for different seasons for the Ljubljana-Bežigrad meteorological station.

These results are, to some extent, similar to those derived for Switzerland where in some cases the deviations were up to 20% (Seibert et al. 2013). Furthermore, the χ^2 test was applied to test whether the null hypothesis could be rejected with a significance level of 0.05. The null hypothesis could not be rejected for any of the 13 analyzed stations and for any of the study periods. Moreover, the same test was applied to compare the distribution of rainy days on weekends and on weekdays (H_0: on weekends and on weekdays the frequency of rainy days is the same; H_A: on weekends and on weekdays the frequency of rainy days is not the same), but, for all the considered stations and periods, the null hypothesis could not be rejected with the selected significance level (Plečko 2015).

3.2 Changes in the rainfall pattern among different periods

In the next step, we tested if the weekly rainfall pattern changed from 1980 to 2009. The Mann-Whitney test was applied and the following 10-year periods were tested: 1980–1989 and 1990–1999; 1990–1999 and 2000–2009; and 1980–1989 and 2000–2009. We compared the weekly rainfall pattern for the total period

Table 4: Summary of the results for the weekly rainfall pattern for the analyzed stations in Slovenia and the calculated p-values of the χ^2 test.

Station	Period	Day with max. number of occurrences	Deviation (2 times the standard deviation)	Deviation (3 times the standard deviation)	p-value
Ljubljana	1980–1989	**Sunday**	YES	NO	0.87
	1990–1999	Thursday	NO	NO	0.95
	2000–2009	Tuesday	YES	NO	0.90
	2010–2014	**Sunday**	YES	NO	0.84
	1980–2014	**Sunday**	NO	NO	0.59
Maribor	1980–1989	**Sunday**	NO	NO	0.91
	1990–1999	Tuesday	NO	NO	0.83
	2000–2009	Tuesday	YES	NO	0.66
	2010–2014	Tuesday	YES	NO	0.91
	1980–2014	Tuesday	NO	NO	0.29
Murska Sobota	1980–1989	**Sunday**	NO	NO	0.94
	1990–1999	Tuesday	NO	NO	0.79
	2000–2009	Tuesday	NO	NO	0.88
	2010–2014	Tuesday	YES	NO	0.98
	1980–2014	Tuesday	NO	NO	0.68
Celje	1980–1989	**Saturday**	YES	NO	0.96
	1990–1999	Thursday	NO	NO	0.75
	2000–2009	Monday	YES	NO	0.92
	2010–2014	**Sunday**, Monday	YES	NO	0.81
	1980–2014	**Saturday**	NO	NO	0.74
Novo mesto	1980–1989	Tuesday	YES	YES	0.84
	1990–1999	Friday	YES	NO	0.79
	2000–2009	Tuesday	YES	NO	0.95
	2010–2014	Monday	YES	YES	0.89
	1980–2014	Tuesday	NO	NO	0.92
Kozina	1980–1989	Tuesday	NO	NO	0.99
	1990–1999	Thursday	YES	NO	0.98
	2000–2009	Tuesday	YES	YES	0.80
	2010–2014	**Sunday**	YES	YES	0.88
	1980–2014	Tuesday	NO	NO	0.91
Šempas	1980–1989	Tuesday	YES	NO	0.89
	1990–1999	Thursday	YES	YES	0.74
	2000–2009	Monday	YES	NO	0.82
	2010–2014	**Sunday**	YES	YES	0.57
	1980–2014	**Sunday**	NO	NO	0.89
Kredarica	1980–1989	Monday	YES	NO	0.52
	1990–1999	Friday	NO	NO	0.99
	2000–2009	Thursday	NO	NO	0.99
	2010–2014	**Sunday**	YES	NO	0.87
	1980–2014	Tuesday	NO	NO	0.67
Portorož	1980–1989	**Sunday**	YES	NO	0.97
	1990–1999	**Sunday**	YES	NO	0.92
	2000–2009	Monday	YES	NO	0.98
	2010–2014	**Sunday**	YES	YES	0.61
	1980–2014	**Sunday**	NO	NO	0.83
Velenje	1980–1989	**Sunday**	YES	YES	0.90
	1990–1999	Monday	YES	NO	0.88
	1980–2005	**Sunday**, Monday	NO	NO	0.89
Ilirska Bistrica	1980–1989	Friday	YES	NO	0.90
	1990–1999	Thursday	YES	NO	0.86
	1980–1999	Friday	NO	NO	0.93
Litija	1980–1989	Thursday	NO	NO	0.99
	1990–1999	Thursday	YES	NO	0.74
	1980–2004	Thursday	NO	NO	0.95
Trbovlje	1980–1989	**Sunday**	NO	NO	0.99
	1980–1992	**Sunday**	NO	NO	0.96

and the individual seasons. Table 5 shows the results for the complete period, while Plečko (2015) presented the results for different seasons. It can be seen that for 7 stations the changes in the weekly rainfall pattern between 1990–1990 and 2000–2009 periods were statistically significant and for 4 stations the same conclusions were made for the 1980–1989 and 2000–2009 periods. The presented results indicate notable differences among the study periods, among which the last decade, i.e. the beginning of the 21th century, stands out, which indicates changes in Slovenia's climate characteristics.

Table 5: Summary of the Mann-Whitney test results used to detect changes between different time periods.

Station	Period	Test results	Test statistic *U*
Ljubljana	1980–1989 and 1990–1999	H_0 could not be rejected	14
	1990–1999 and 2000–2009	**H_0 was rejected**	5
	1980–1989 and 2000–2009	**H_0 was rejected**	6
Maribor	1980–1989 and 1990–1999	H_0 could not be rejected	10
	1990–1999 and 2000–2009	H_0 could not be rejected	16
	1980–1989 and 2000–2009	H_0 could not be rejected	15,5
Murska Sobota	1980–1989 and 1990–1999	H_0 could not be rejected	19,5
	1990–1999 and 2000–2009	H_0 could not be rejected	12
	1980–1989 and 2000–2009	**H_0 was rejected**	3
Celje	1980–1989 and 1990–1999	H_0 could not be rejected	14,5
	1990–1999 and 2000–2009	**H_0 was rejected**	7
	1980–1989 and 2000–2009	H_0 could not be rejected	8
Novo mesto	1980–1989 and 1990–1999	H_0 could not be rejected	24
	1990–1999 and 2000–2009	**H_0 was rejected**	6
	1980–1989 and 2000–2009	**H_0 was rejected**	4,5
Kozina	1980–1989 and 1990–1999	H_0 could not be rejected	17,5
	1990–1999 and 2000–2009	**H_0 was rejected**	7
	1980–1989 and 2000–2009	H_0 could not be rejected	11,5
Šempas	1980–1989 and 1990–1999	**H_0 was rejected**	6
	1990–1999 and 2000–2009	H_0 could not be rejected	15
	1980–1989 and 2000–2009	H_0 could not be rejected	16
Kredarica	1980–1989 and 1990–1999	H_0 could not be rejected	18,5
	1990–1999 and 2000–2009	**H_0 was rejected**	7
	1980–1989 and 2000–2009	H_0 could not be rejected	12
Portorož	1980–1989 and 1990–1999	**H_0 was rejected**	0
	1990–1999 and 2000–2009	H_0 could not be rejected	10
	1980–1989 and 2000–2009	**H_0 was rejected**	0
Velenje	1980–1989 and 1990–1999	H_0 could not be rejected	17,5
Ilirska Bistrica	1980–1989 and 1990–1999	H_0 could not be rejected	14
Litija	1980–1989 and 1990–1999	H_0 could not be rejected	16

3.3 Connection between PM_{10} particles and rainfall

In the last step of the study, the connection between the measured values of PM_{10} particles in the air and rainfall was analyzed. Comparisons were made only for the time periods when PM_{10} measurements are available (Table 2). Weekly distribution of PM_{10} particles is shown in Table 6 and for the selected stations in Figure 3. It can be seen that Sunday was the day with the minimum PM_{10} values for all stations. However, the day with the maximum PM_{10} values was always in the second part of the week. A similar pattern in PM_{10} particles distribution is also characteristic of much more polluted areas such as major urban regions in east China (Gong et al. 2007). Gong et al. (2007) noted that the characteristic pattern in PM_{10} particles (i.e., gradual increase until the middle or the end of the working week, and minimum values on weekends) is accompanied by some other meteorological parameters such as wind speed in the troposphere, which

is on average higher when PM_{10} concentrations are smaller. Further, increased PM_{10} concentrations could influence solar radiation, higher maximum temperatures, and the number of rainfall events (Gong et al. 2007).

Table 6: Days with maximum and minimum PM_{10} concentrations for the selected stations in Slovenia.

Station	Period	Day with maximum PM_{10}	Day with minimum PM_{10}
Ljubljana-Bežigrad	2011–2014	Friday	Sunday
Maribor-letališče	2009–2014	Thursday	Sunday
Murska Sobota-Rakičan	2010–2014	Thursday	Sunday
Celje-Medlog	2011–2014	Wednesday	Sunday
Novo mesto	2010–2014	Wednesday, Thursday, Friday	Sunday
Kozina	2009–2014	Friday	Sunday
Šempas	2011–2014	Friday	Sunday

Pearson (r) and Spearman (r) correlation coefficients were used to detect the relationship between the daily PM_{10} values and the daily rainfall values in the selected seasons (Table 7). The calculated Pearson's

Figure 3: Weekly distribution of PM_{10} concentrations at Ljubljana, Maribor, Celje, and Kozina stations.

correlation coefficients indicate a negative and relatively weak linear correlation between the analyzed variables, however the calculated p-values demonstrate that the correlation is statistically significant (significance level 0.05) for all tested stations and all seasons with the exception of the Celje station where the relationship was not statistically significant for autumn, and the Novo mesto station where the relationship was not statistically significant for spring and autumn. Moreover, similar results were obtained with the use of the Spearman's correlation coefficient where the relationship was statistically significant (significance level 0.05) for all tested stations and all seasons. We can conclude that in Slovenia PM_{10} directly and indirectly impact the rainfall occurrence and that rain events wash out large amounts of PM_{10} particles from the air. However, hourly data would be needed to identify the relationship between PM_{10} and rainfall more accurate, but such data on PM_{10} are currently not available.

Table 7: Calculated Pearson (r) and Spearman (r) correlation coefficient values between rainfall and PM_{10} particles for various seasons and the corresponding p-values.

Station	Season	r	p-value	r	p-value
Ljubljana	winter	–0.30	~0	–0.48	~0
	spring	–0.22	~0	–0.38	~0
	summer	–0.37	~0	–0.55	~0
	autumn	–0.35	~0	–0.48	~0
Maribor	winter	–0.22	~0	–0.33	~0
	spring	–0.25	~0	–0.29	~0
	summer	–0.32	~0	–0.47	~0
	autumn	–0.34	~0	–0.43	~0
Murska Sobota	winter	–0.26	~0	–0.31	~0
	spring	–0.19	~0	–0.26	~0
	summer	–0.25	~0	–0.48	~0
	autumn	–0.28	~0	–0.44	~0
Celje	winter	–0.26	~0	–0.28	~0
	spring	–0.11	0.04	–0.13	0.02
	summer	–0.13	0.01	–0.24	~0
	autumn	**–0.05**	**0.33**	–0.15	0.003
Novo mesto	winter	–0.26	~0	–0.26	~0
	spring	**–0.09**	**0.06**	–0.15	0.001
	summer	–0.12	0.01	–0.28	~0
	autumn	**–0.06**	**0.21**	–0.15	0.01
Kozina	winter	–0.22	~0	–0.29	~0
	spring	–0.24	~0	–0.38	~0
	summer	–0.24	~0	–0.39	~0
	autumn	–0.31	~0	–0.47	~0
Šempas	winter	–0.28	~0	–0.35	~0
	spring	–0.26	~0	–0.55	~0
	summer	–0.31	~0	–0.49	~0
	autumn	–0.33	~0	–0.39	~0

4 Conclusion

The weekly rainfall pattern in Slovenia depends on the region and the analyzed time period as well as on the season and the pollution of individual regions. For the Trbovlje, Velenje, Portorož, and Ljubljana stations the differences between weekends and weekdays were larger than those for other analyzed stations. In some cases, the number of occurrences of rainfall exceeds the value of 3 standard deviations. However, using the χ^2 test, a statistically significant non-uniform rainfall pattern was found neither for the tested stations nor for seasons. The comparison between different time periods shows that the weekly rainfall pattern at the beginning of the 21st century differs from that in the last decade of the 20th century. A pos-

sible reason could be the decreasing air pollution values as a consequence of abandonment of heavy industry and wood heating, and the passing of adequate laws (Gosak 2014). However, the exceeding values of PM_{10} are still relatively frequent (Gosak 2014). The weekly pattern of PM_{10} particles in Slovenia is similar to that in some other more or less polluted areas in the world. Consequently, some level of connection between the rainfall values and PM_{10} concentrations was detected for the tested stations, which was in most cases statistically significant.

To sum up, the answer to the title question is as follows: For some areas in Slovenia such as the Ljubljana Basin, Celje Basin, coastal area, Zasavje and Šalek Valley, the possibility of rain on weekends is, indeed, larger than on weekdays, but the detected deviations are not statistically significant.

ACKNOWLEDGEMENT: We would like to thank the Slovenian Environment Agency for data provision.

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Acta geographica Slovenica, 58-2, 2018, 31–46

REGIONAL DIFFERENCES IN SLOVENIA FROM THE VIEWPOINT OF ACHIEVING EUROPE'S SUSTAINABLE DEVELOPMENT

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Jovsi Nature Park: the preserved natural environment is an important potential for the region.

DOI: https://doi.org/10.3986/AGS.3309
UDC: 913:502.131.1(497.4)
COBISS: 1.01

Regional differences in Slovenia from the viewpoint of achieving Europe's sustainable development

ABSTRACT: Within the context of EU efforts to achieve the objectives of sustainable development, this article presents the findings of a study that uses a selection of thirty-two economic, social, and environmental indicators to evaluate the extent of achieving these objectives in Slovenian statistical regions from 2010 to 2014. Based on the favorable or unfavorable state and trends established, the indicator values are assigned scores that make it possible to calculate the average values for individual development areas and their total average (i.e., the indicator of sustainable regional development). The calculations confirmed the hypothesis that the differences between Slovenian regions are the greatest with regard to economic issues and the smallest with regard to environmental issues. Both in Slovenia and in the EU in general, unfavorable environmental trends resulting from unsustainable use of energy and natural resources persist, even though Slovenia's environment remains above average in terms of its conservation.

KEY WORDS: sustainable development indicator, sustainable regional development, environmental protection, socioeconomic progress, statistical regions, Slovenia

Regionalne razlike v Sloveniji z vidika doseganja trajnostnega razvoja Evrope

POVZETEK: V kontekstu evropskih prizadevanj za doseganje ciljev trajnostnega razvoja so v članku predstavljeni rezultati raziskave, ki z naborom 32 ekonomskih, socialnih in okoljskih kazalnikov vrednoti tozadevno uspešnost slovenskih statističnih regij v obdobju 2010–2014. Glede na ugodnost stanja in trendov so vrednostim kazalnikov pripisane ocene, ki omogočajo izračun povprečij za posamezna razvojna področja in njihovo skupno povprečje (kazalnik trajnostnega regionalnega razvoja). Izračuni so potrdili hipotezo, da so razlike med slovenskimi regijami največje na gospodarskem in najmanjše na okoljskem področju. Tako v Evropski uniji kot tudi v Sloveniji se nadaljujejo neugodni okoljski trendi, ki so posledica netrajnostne rabe energije in naravnih virov, vendar ima Slovenija še vedno nadpovprečno ohranjeno okolje.

KLJUČNE BESEDE: kazalnik trajnostnega razvoja, trajnostni regionalni razvoj, varstvo okolja, socialnoekonomski napredek, statistične regije, Slovenija

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The paper was submitted for publication on November 9th, 2015.
Uredništvo je prejelo prispevek 9. novembra 2015.

1 Introduction

For the past twenty-five years, Slovenia has been striving to achieve sustainable development, the global importance of which was enhanced through the 1992 United Nations Conference on Environment and Development, and the adoption of Agenda 21 (1992). In terms of the efforts made in this regard, Slovenian regions vary in success, but their progress has not been systematically assessed, even though this type of assessment has already been established at the national level and has ultimately already been part of international commitments since Agenda 21 was established (Dahl 2012; Hak, Kovanda and Weinzettel 2012; Waas et al. 2014). In 2001, a special strategy was adopted (A sustainable Europe … 2001) that requires EU member states to pursue sustainable development; this strategy was renewed in 2006 (Renewed EU sustainable … 2006) and demands that a special report be submitted every two years on the progress made according to selected indicators for the quality assessment of conditions (Rinne, Lyytimäki and Kautto 2013; van Hees 2014; Sustainable development … 2015). In addition, Slovenia must pursue sustainable development because this is required by the Europe 2020 umbrella strategy (Europe 2020 … 2010) and a series of EU sectoral policies. At the national level, the implementation of Slovenia's Development Strategy (Strategija razvoja Slovenije 2005) is monitored through annual reports on development (Poročilo … 2015) based on a number of development indicators. Sustainable development indicators for the national level have also been defined in a special publication by the Slovenian Statistical Office (Suvorov, Rutar and Žitnik 2010) and the project Indicators of Well-being in Slovenia (Kazalniki blaginje v Sloveniji 2015), which also provides a fairly general assessment of their contribution to wellbeing. All of the indicators mentioned are intended to be used exclusively at the national level, without illustrating regional conditions or any wider or global comparisons.

The regional level is often the most important for achieving sustainable development, and thus appropriate methods for monitoring progress in this area achieved at the level of statistical regions (hereinafter simply »regions«) were already developed more than a decade ago. Thirty-two indicators were defined (six economic, twelve social, and fourteen environmental ones) and used for the first time to study the period from 1996 to 2002 (Vintar 2003) and after that the period from 2003 to 2007 (Vintar Mally 2009a). This article presents the latest findings referring to the five-year period between 2010 and 2014.

By using these indicators, the current conditions and trends in the regions can be analyzed, the level of approaching or drifting away from sustainable development goals can be assessed, the relative position of Slovenian regions can be determined in relation to the national average (from the economic, social, and environmental viewpoints), and the indicators included can be incorporated into an aggregate indicator of sustainable regional development.

This article elucidates the findings for individual areas of sustainable development and ranks regions into types based on their assessed future development potential. The study is based on the hypothesis that in terms of sustainable development the differences between the regions are the greatest with regard to economic issues and the smallest with regard to environmental issues. In the discussion, the Slovenian findings are comparatively contextualized within European sustainable development efforts.

2 Methods

In line with the definition of the three basic conceptual fields of sustainable development following the thematic model (Hardi et al. 1997; Indicators … 2001; Indicators … 2007), its realization is monitored with economic, social, and environmental indicators. Already in the first study of this type (Vintar 2003), thirty-two indicators were defined, the majority of which have remained the same. In the final selection of indicators used to study the period between 2010 and 2014, a few indicators were replaced with new ones, which is why the results are not entirely comparable with those from previous studies. The indicators »life expectancy« and »average years of schooling« were replaced by »average age at death« and »share of college degree holders,« respectively, because they are no longer calculated at the level of regions as part of the aggregated human development index. In addition, the indicator referring to wastewater treatment was also replaced because the situation in this area is better illustrated by more recent data on the actual quantity of wastewater treated (as opposed to data on the capacity of the wastewater treatment plants used previously). In recent years, the indicator showing the quality of surface watercourses has proven insufficiently

sensitive because the only assessment that national monitoring still continues to use is the assessment of the chemical status (good or bad), according to which nearly all watercourses are in good chemical status, and so this indicator no longer makes it possible to monitor any differences. Therefore, this »state indicator« was replaced by the »pressure indicator« (average water consumption in households and commercial use). Due to the lack of relevant data on traffic load, the »response indicator« (the carriage by rail growth index) had to be replaced by the »pressure indicator« (the road freight transport growth index). From the methodological viewpoint, these types of adjustments in the selection of indicators are expected and recommended (Meadows 1998) because indicators must be updated in line with the changing perception of developmental issues, familiarity with how individual systems work, the availability and quality of data, and so on.

In selecting the indicators for regions, international research experience was taken into account in addition to the key criteria of conceptual and methodological quality, according to which indicators must be relevant for making decisions, understandable, measurable, sensitive to change in time and space, cost-effective, comparable, and so on (Hardi et al. 1997; Meadows 1998; Bossel 1999; Franke 1999; Seljak 2001; Morse 2004; Vintar Mally 2006; Indicators … 2007; Hildén and Rosenström 2008; Waas et al. 2014). The selection of regional indicators of sustainable development (Table 1) is based on the content of the thematic model that has been promoted around the globe primarily by the UN (Indicators … 2001; Indicators … 2007), but it is also being used at the national level by the EU (Sustainable development … 2015) and Slovenia (Suvorov, Rutar and Žitnik 2010). The final selection of indicators at the regional level is also significantly influenced by the availability of data, which is lower than at the national level.

The **economic characteristics** of Slovenian regions' development are examined based on six indicators (Table 1), whereby the focus is on the key aspects of ensuring the population's material wellbeing in terms of both the current conditions (the economic power of the region and its population, employment structure, etc.) and the efforts to build an economy that is successful and competitive in the long term (expenditure on fixed assets, R&D expenditure, etc.). Even though the intensification of economic activity and the growth in the population's purchasing power are usually connected with increasing environmental pressures (Vintar Mally 2009b; Aşici 2013; Apergis 2016), economic indicators in the selected thematic model were evaluated exclusively from the economic viewpoint because related social or environmental impacts are monitored by other indicators.

The selection of twelve **social indicators** (Table 1) was used to study the individual regions' success rate in providing a higher quality of life to their residents. The basic demographic features (population changes, population vitality, etc.), the accessibility of education and healthcare, housing conditions, utilization of human resources, and exposure to poverty and social exclusion (especially of more vulnerable groups) were examined.

The fourteen **environmental indicators** (Table 1) selected include indicators showing the environmental pressures caused by the population and economic activities (pressures caused by human settlement and the subsequent generation of waste, water consumption, and the expansion of built-up areas, pressures caused by intensive food production and livestock farming, pressures caused by road traffic, etc.), indicators showing the social responses to environmental issues (the extent of organic farming, the share of protected areas, the use of wastewater treatment and district heating, and the extent of expenditure in environmental protection), and indicators referring to the state of individual landscape components (quality of air, wooded areas).

The study was carried out for the twelve Slovenian statistical regions, in the scope and with the names they had before the 2015 changes. The calculations are based on the 2010–2014 data, which were the last data available at the time of the study. The majority of data are regularly monitored and published by the Slovenian Statistical Office (Podatkovni portal … 2015), and data from the Records on the Actual Use of Agricultural and Forest Land (Evidenca dejanske rabe … 2015) and data on the borders of Natura 2000 sites (Natura 2000 … 2015) were used for indicators referring to land use and the Natura 2000 network. With regard to air quality, data provided by the Slovenian Environment Agency (Bolte et al. 2010) were used, and online audience measurement (MOSS) studies (Slovenska … 2014) were used to determine internet use.

Indicators were calculated in three stages. First, all individual indicators were calculated and interpreted for all of the regions, after which a score was assigned to the values calculated in terms of their contribution to sustainable development. At the stage of selecting and methodologically defining individual indicators, it was clearly defined whether the highest possible value (e.g., the highest possible share of organically farmed

Table 1: Set of sustainable development indicators.

Economic indicators	Social indicators	Environmental indicators
• Gross domestic product, 2013 [€/capita]	• Unemployed with uncompleted or completed primary school, 2012 [%]	• Organically farmed land, 2010 [%]
• Gross value added, 2013 [€/capita]	• Share of unemployed women, 2014 [%]	• Wooded areas, 2012 [m^2/capita]
• Expenditure on fixed assets, 2013 [€/capita]	• Population density, 2014 [people/km^2]	• Road freight transport growth index, 2005–2014
• Average R&D expenditure, 2010–2012 [% GDP]	• Population growth index, 2009–2014	• Intensively farmed land, 2012 [m^2/capita]
• Disposable income, 2011 [€/capita]	• Aging index, 2014	• Quality of air, 2009 [assessment]
• Service sector employees, 2011 [%]	• Average age at death, 2013 [years]	• Municipal waste, 2013 [kg/capita]
	• Recipients of social assistance benefits in cash, 2011 [no. of recipients/1,000 people]	• Natura 2000 sites, 2013 [%]
	• Usable floor area, 2011 [m^2/capita]	• Water consumption, 2013 [m^3/capita]
	• Registered unemployment rate, 2014 [%]	• Average expenditure on environmental protection, 2011–2013 [% GDP]
	• Students, 2012/2013 [no. of students/ 1,000 people]	• Built-up areas, 2012 [%]
	• Internet users, 2014 [index]	• Treated wastewater, 2013 [m^3/capita]
	• College degree holders (25–64 yrs), 2013 [%]	• Housing with district heating in place, 2011 [%]
		• Motorization rate, 2013 [cars/1,000 people]
		• Livestock density index, 2010 [LSU/ha]

land) or the lowest possible value (e.g., the smallest possible share of the unemployed) of the indicator was preferred. Lower values are preferred for certain social and environmental indicators (marked with an asterisk in Tables 3 and 4). Four scores were possible for each indicator: + or ++ for a positive contribution to sustainable development in an individual area, and – or – – for a negative impact on sustainable development. For each value of the indicator attained, a score was defined for each region using the standard deviation. In the case of less than one standard deviation from the arithmetic mean, the score assigned was + or –, and for larger deviations the score was doubled (++ or – –). In the third stage, the sum of all scores for an individual development area (economic, social, and environmental) was used to calculate the average score (as the quotient of the sum of all scores and the number of indicators in an area), after which the arithmetic mean of all three areas, referred to as the indicator of sustainable regional development (ISRD), was calculated. This method makes it possible to analyze the current state of the regions and the differences between them, but it does not make it possible to also directly compare the values of the aggregate indicator in various periods because the calculation of scores is based on the regions' average in each period.

To determine the success of Slovenia's sustainable development efforts compared to other European countries, the leading international development indicators were studied. In the discussion, only the findings regarding the official selection of EU sustainable development indicators, the ecological footprint, the human development index, the environmental performance index, and the sustainable society index are highlighted.

3 Results

The most favorable economic conditions can be found in the Central Slovenia region, which is greatly above average in terms of all of the indicators and has the maximum average score. It is followed by the Southeast Slovenia, Gorizia, and Coastal–Karst regions, which still have distinctly positive scores. A very unfavorable economic status in Slovenia is typical especially of the Mura region (with a negative score for nearly all indicators) and the Central Sava region. The situation is slightly better, but still of concern, in the Drava and Carinthia regions (Table 2). Compared to the situation just over a decade ago (Vintar 2003), the relative situation improved the most in Southeast Slovenia (climbing from fifth to second place) and worsened the most in Upper Carniola (falling from third to sixth place). Other regions experienced minor changes in their rankings, but there are still exceptionally great economic differences between regions; the differences in the average score between the highest- and lowest-ranked regions is a full 3.17.

Table 2: Economic indicators for Slovenian statistical regions.

Indicator/Statistical region	Mura	Drava	Carinthia	Savinja	Central Sava	Lower Sava	Southeast Slovenia	Central Slovenia	Upper Carniola	Inner Carniola–Karst	Gorizia	Coastal–Karst
Gross domestic product, 2013 [€/capita] $\overline{\chi} = 15{,}360$; $\sigma = 3{,}390$	−	−	−	+	−−	−	+	++	−	−	+	+
Gross value added, 2013 [€/capita] $\overline{\chi} = 13{,}274$; $\sigma = 2{,}943$	−	−	−	+	−−	−	+	++	−	−	+	+
Expenditure on fixed assets, 2013 [€/capita] $\overline{\chi} = 1{,}893$; $\sigma = 817$	−	−	−	++	−−	+	++	++	−	−	−	−
Average R&D expenditure, 2010–2012 [% GDP] $\overline{\chi} = 1.76$; $\sigma = 1.17$	−	−	−	−	−	−	++	++	+	−	+	−
Disposable income, 2011 [€/capita] $\overline{\chi} = 10{,}416$; $\sigma = 593$	−−	−−	+	−	−	−	−	++	+	+	++	+
Service sector employees, 2011 [%] $\overline{\chi} = 59.9$; $\sigma = 6.7$	−	+	−−	−	+	−	−	++	+	−	−	++
Total score (sum)	−7	−5	−5	+1	−7	−4	+4	+12	0	−4	+3	+3
Average score	−1.17	−0.83	−0.83	0.17	−1.17	−0.67	0.67	2.00	0.00	−0.67	0.50	0.50
Ranking	11–12	9–10	9–10	5	11–12	7–8	2	1	6	7–8	3–4	3–4

Note: $\overline{\chi}$ = arithmetic mean; σ = standard deviation

Table 3: Social indicators for Slovenian statistical regions.

Indicator/Statistical region	Mura	Drava	Carinthia	Savinja	Central Sava	Lower Sava	Southeast Slovenia	Central Slovenia	Upper Carniola	Inner Carniola–Karst	Gorizia	Coastal–Karst
Unemployed with uncompleted or completed primary school, 2012 [%]*, $\overline{\chi} = 36.3$; $\tilde{A} = 3.9$	−−	++	+	+	−	−	−−	++	+	+	+	+
Share of unemployed women, 2014 [%]* $\overline{\chi} = 50.0$; $\sigma = 2.7$	−−	−	−−	−	+	+	−	++	+	−	++	++
Population density, 2014 [people/km^2]* $\overline{\chi} = 100.1$; $\sigma = 49.8$	+	−	+	−	−−	+	+	−−	+	++	++	−
Population growth index, 2009–2014, $\overline{\chi} = 100.4$; $\sigma = 2.2$	−−	−	−	−	−−	−	+	++	+	+	−	++
Aging index, 2014* $\overline{\chi} = 126.3$; $\sigma = 13.2$	−−	−	+	+	−−	−	++	++	+	+	−	−
Average age at death, 2013 [yrs] $\overline{\chi} = 76.1$; $\sigma = 0.8$	−	−	−−	−	+	−	−	+	+	++	++	−
Recipients of social assistance in cash, 2011 [no. of recipients/1,000 people]*, $\overline{\chi} = 44.0$; $\sigma = 15.0$	−−	−−	−	−	−−	−	+	++	++	+	++	+
Usable floor area, 2011 [m^2/capita] $\overline{\chi} = 27,5$; $\sigma = 1,1$	+	+	−	−−	−−	−	−	−	+	++	++	+
Registered unemployment rate, 2014 [%]* $\overline{\chi} = 13.5$; $\sigma = 2.5$	−−	−	+	−	−−	−	−	+	++	+	+	+
Students, 2012/2013 [no. of students/1,000 people] $\overline{\chi} = 45.9$; $\sigma = 3.3$	−	−	+	+	−	+	++	+	+	−	++	−−
Internet users, 2014 [index] $\overline{\chi} = 104.0$; $\sigma = 17.5$	+	−	++	−−	++	−−	+	−	+	+	−−	−
College degree holders (25–64 yrs), 2013 [%] $\overline{\chi} = 22.5$; $\sigma = 3.6$	−−	−	−	−	−	−	−	++	+	+	+	+
Total score (sum)	−13	−8	−1	−8	−11	−7	+1	+11	+14	+11	+11	+3
Average score	−1.08	−0.67	−0.08	−0.67	−0.92	−0.58	0.08	0.92	1.17	0.92	0.92	0.25
Ranking	12	9–10	7	9–10	11	8	6	2–4	1	2–4	2–4	5

Note: $\overline{\chi}$ = arithmetic mean; σ = standard deviation
*Lower indicator values mean more positive contributions to sustainable development.

Table 4: Environmental indicator for Slovenian statistical regions.

Indicator/Statistical region	Mura	Drava	Carinthia	Savinja	Central Sava	Lower Sava	Southeast Slovenia	Central Slovenia	Upper Carniola	Inner Carniola–Karst	Gorizia	Coastal–Karst
Organically farmed land, 2010 [%] $\bar{\chi} = 7.4$; $\bar{A} = 4.5$	−−	−−	+	−	+	−−	+	−	−	++	+	++
Wooded areas, 2012 [m²/capita] $\bar{\chi} = 7{,}903$; $\sigma = 5{,}110$	−	−	+	−	−	−	++	−	−	++	++	−
Road freight transport growth index, 2005–2014* $\bar{\chi} = 102.0$; $\sigma = 11.3$	+	−	+	+	−−	++	+	+	−	++	−	−
Intensively farmed land, 2012 [m²/capita]* $\bar{\chi} = 1{,}284$; $\sigma = 1{,}322$	−−	−	+	+	+	−	−	+	+	+	+	+
Quality of air, 2009 [assessment], $\bar{\chi} = 10.3$; $\sigma = 0.4$	+	−−	−−	−	+	+	+	−−	+	+	+	+
Municipal waste, 2013 [kg/capita]* $\bar{\chi} = 309$; $\sigma = 41$	+	−	++	+	−	−	++	−−	+	+	−−	−−
Natura 2000 sites, 2013 [%], $\bar{\chi} = 37.1$; $\sigma = 14.9$	+	−	−	−−	−−	−−	+	−	+	++	+	++
Water consumption, 2013 [m³/capita]* $\bar{\chi} = 77.3$; $\sigma = 23.3$	+	+	++	−	+	+	+	−	−	−	−−	+
Average expenditure on environmental protection, 2011–2013 [% GDP], $\bar{\chi} = 0.9$; $\sigma = 0.7$	−	−	+	++	+	+	−	−	−	−	−	−
Built-up areas, 2012 [%]*, $\bar{\chi} = 5.46$; $\sigma = 1.82$	−	−−	+	−	−	−	+	−−	+	++	++	−
Treated wastewater, 2013 [m³/capita] $\bar{\chi} = 28.5$; $\sigma = 10.5$	+	+	−	+	−	−	−	++	−	−	−	++
Housing with district heating in place, 2011 [%] $\bar{\chi} = 11.8$; $\sigma = 8.1$	−−	−	++	+	++	−	−	++	−	−−	−	−
Motorization rate, 2013 [cars/1,000 people]* $\bar{\chi} = 521$; $\sigma = 28$	+	+	+	+	++	−	+	+	+	−−	−−	−−
Livestock density index, 2010 [LSU/ha]* $\bar{\chi} = 0.83$; $\sigma = 0.27$	+	−	−−	−	−	+	+	−	−−	++	+	++
Total score (sum)	−1	−11	+7	0	0	−5	+8	−5	−3	+8	−1	+2
Average score	−0.07	−0.79	0.50	0.00	0.00	−0.36	0.57	−0.36	−0.21	0.57	−0.07	0.14
Ranking	7–8	12	3	5–6	5–6	10–11	1–2	10–11	9	1–2	7–8	4

Note: $\bar{\chi}$ = arithmetic mean; σ = standard deviation
*Lower indicator values mean more positive contributions to sustainable development.

Table 5: Indicator of sustainable regional development for Slovenian statistical regions.

Average score /Statistical region	Mura	Drava	Carinthia	Savinja	Central Sava	Lower Sava	Southeast Slovenia	Central Slovenia	Upper Carniola	Inner Carniola–Karst	Gorizia	Coastal–Karst
Economic indicators	−1.17	−0.83	−0.83	0.17	−1.17	−0.67	0.67	2.00	0.00	−0.67	0.50	0.50
Social indicators	−1.08	−0.67	−0.08	−0.67	−0.92	−0.58	0.08	0.92	1.17	0.92	0.92	0.25
Environmental indicators	−0.07	−0.79	0.50	0.00	0.00	−0.36	0.57	−0.36	−0.21	0.57	−0.07	0.14
ISRD	−0.77	−0.76	−0.14	−0.17	−0.70	−0.54	0.44	0.85	0.32	0.27	0.45	0.30
Ranking	12	11	7	8	10	9	3	1	4	6	2	5

The social indicators also point to more favorable conditions in the six regions in the western half of the country (Figure 1). Upper Carniola stands out with the highest positive score, whereas the lowest average scores are characteristic of the regions in eastern Slovenia, which are primarily burdened by a poorer educational structure, higher unemployment rate, shorter life expectancy (judging from the age at death), greater exposure to poverty and social exclusion, and subsequently stagnation or even decline of the population alongside an above-average aging index. The social differences between Slovenian regions are smaller than the economic ones, but they are nonetheless significant considering that the difference in scores is a full 2.25. Over the past decade, the relative situation of the Lower Sava region has improved the most, having moved up from last place, which it shared with the Central Sava region. The situation deteriorated the most in the Mura region, which fell from tenth to last place (Vintar 2003). Changes in the rankings of other regions were smaller and some have retained their rank (e.g., Upper Carniola has remained in the lead).

With regard to environmental indicators, the positive or negative scores are distributed more evenly across the entire county, which is also reflected in the regions' final rankings. In contrast to the economic and social areas, here no east-west division can be observed (Table 4). The most favorable conditions can be found in the Southeast Slovenia and Inner Carniola–Karst regions, followed by Carinthia. The lowest scores compared to this are typical for the Drava region, followed by the Central Slovenia and Lower Sava regions at the bottom of the scale. Over the past decade, the greatest differences in the rankings of individual regions have been observed in this area. The greatest decline was experienced by the Gorizia region (falling from first to seventh/eighth place) and the Upper Carniola region (falling from second/fourth place to ninth), whereas the Mura region experienced the greatest improvement (moving up from last place to seventh/eighth place). The difference between regions is also the smallest in this development area (i.e., 1.36).

From 2010 to 2014, the indicator of sustainable regional development ranged from +0.85 (Central Slovenia) to −0.77 (Mura), which reflects great differences between the regions in all development areas (Table 5). The ISRD values show a distinctly bipolar picture: the regions in the eastern half of Slovenia have a negative value and the six regions in the western part of the country have a positive value. The regions' relative situation over the past decade (Vintar 2003) has not changed significantly. The greatest changes can be observed in Southeast Slovenia (climbing from fifth to third place) and Upper Carniola (falling from second to fourth place).

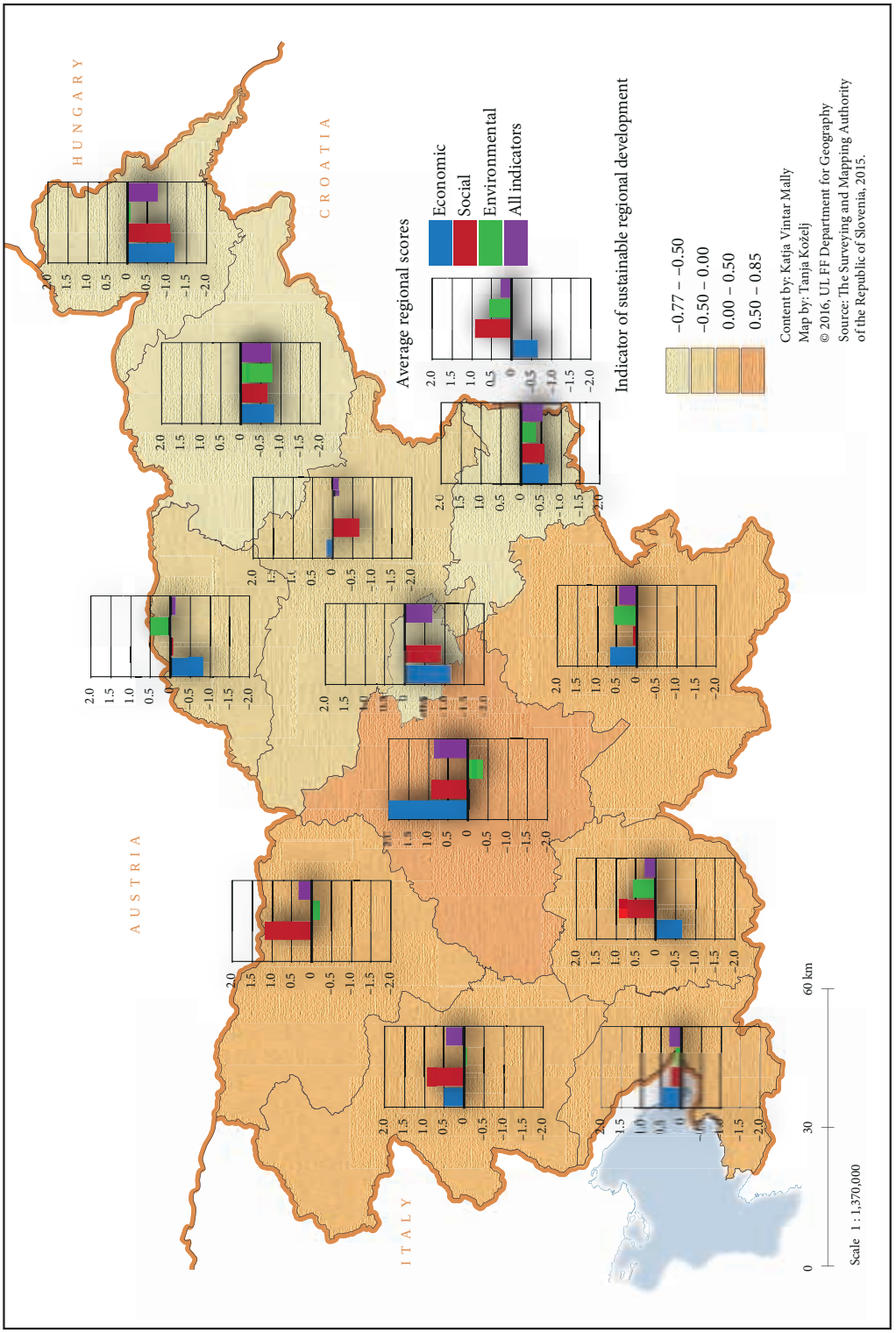
4 Discussion

4.1 Regional development differences in Slovenia

Every Slovenian region has its own unique range of development potentials, but also obstacles to achieving a sustainable development path, which by definition requires seeking opportunities for socioeconomic progress within the existing environmental limitations or by taking into account the carrying capacity of the environment (Moran et al. 2008; Kissinger, Rees and Timmer 2011; Moldan, Janoušková and Hák 2012; Hoekstra and Wiedmann 2014). A preserved natural environment represents an important regional potential, whereas a degraded environment is a limiting factor that reduces residents' quality of life and economic opportunities. Based on the premises described, Slovenian regions can be ranked into four types by similarity and the following two criteria: the combination of (negative or positive) average scores of individual development areas on the one hand, and the regions' ISRD values on the other (Figure 2).

In terms of the indicators studied, the Mura, Drava, Central Sava, and Lower Sava regions have very limited opportunities for achieving sustainable development because they do not have a positive average score in any of the development areas and consequently show a high negative ISRD value (between −0.77 and −0.54). It will be extremely difficult for these regions to achieve a balanced and significant improvement in all three development areas. Better, but still limited, opportunities can be ascribed to the Carinthia, Savinja, and Inner Carniola–Karst regions, the ISRD value of which ranges from −0.17 to +0.27 and the economy of which still lags behind considerably. In this regard, the exception is the Savinja region, which only achieved a slightly above-average score of the economic indicators in the last period studied,

Figure 1: Indicator of sustainable regional development of Slovenian statistical regions, 2010–2014. ► p. 41
Figure 2: Synthesized assessment of opportunities for sustainable development realization in Slovenian regions. ► p. 42


HUNGARY
CROATIA
AUSTRIA
ITALY
Average regional scores
Economic
Social
Environmental
All indicators
Indicator of sustainable regional development
–0.77 – –0.50
–0.50 – 0.00
0.00 – 0.50
0.50 – 0.85
Content by: Katja Vintar Mally
Map by: Tanja Koželj
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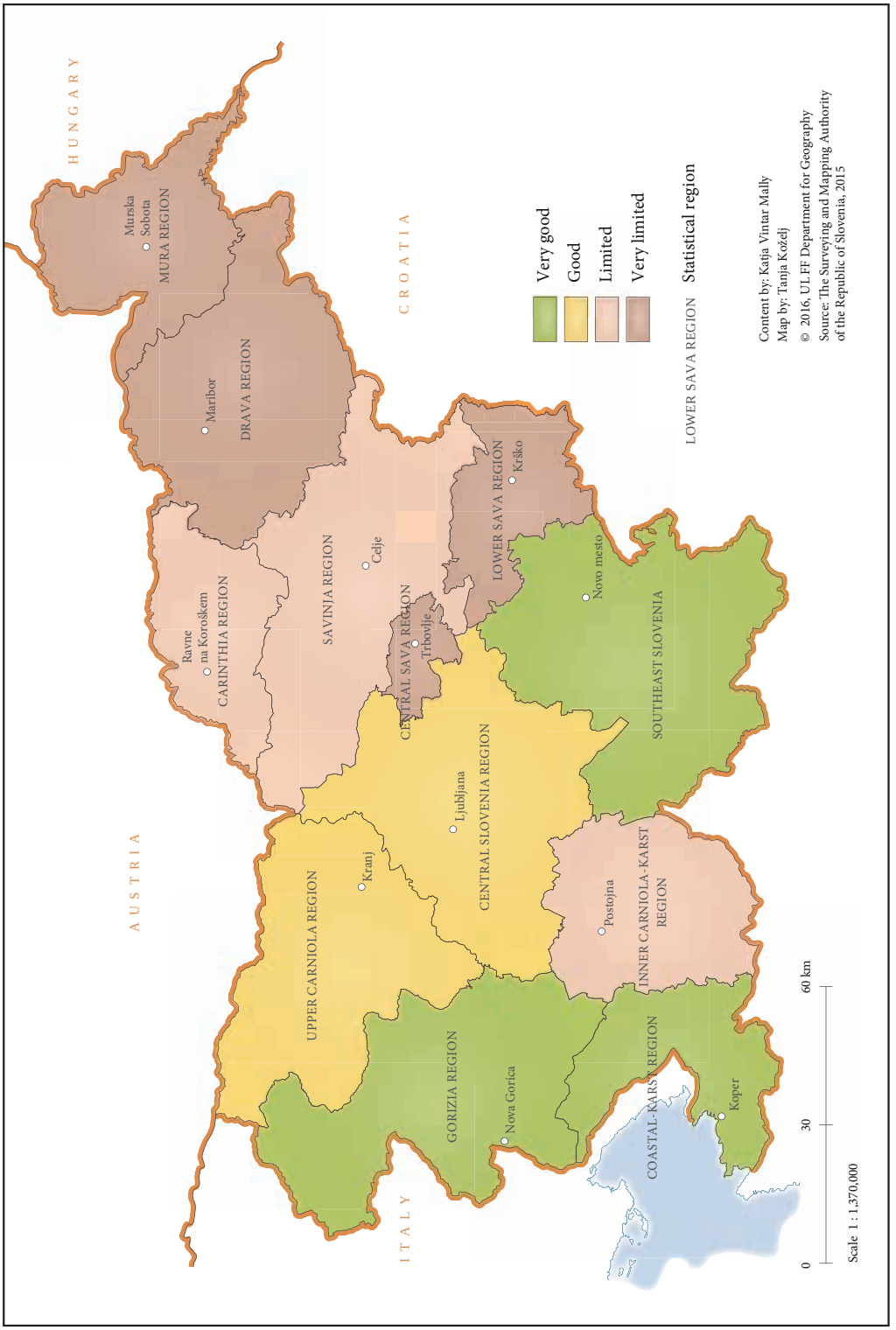
Source: The Surveying and Mapping Authority of the Republic of Slovenia, 2015.
Scale 1 : 1,370,000
0
30
60 km


HUNGARY
AUSTRIA
ITALY
CROATIA
Murska Sobota
MURA REGION
Maribor
DRAVA REGION
Ravne na Koroškem
CARINTHIA REGION
SAVINJA REGION
Celje
CENTRAL SAVA REGION
Trbovlje
LOWER SAVA REGION
Krško
Novo mesto
SOUTHEAST SLOVENIA
Ljubljana
CENTRAL SLOVENIA REGION
Kranj
UPPER CARNIOLA REGION
Postojna
INNER CARNIOLA-KARST REGION
GORIZIA REGION
Nova Gorica
COASTAL-KARST REGION
Koper
Very good
Good
Limited
Very limited
Statistical region
LOWER SAVA REGION
Content by: Katja Vintar Mally
Map by: Tanja Koželj
© 2016, UL FF Department for Geography
Source: The Surveying and Mapping Authority of the Republic of Slovenia, 2015
0
30
60 km
Scale 1 : 1,370,000

whereas it continues to lag behind greatly in the social area, which raises considerable concern. For now, the environmental conditions are favorable in all three regions, but they run the risk that by continuing their predominant development practices they might try to accelerate their economy by degrading the environment. Central Slovenia and Upper Carniola were ranked among the type of regions with good development opportunities. They have a distinctly positive ISRD value, which is, however, largely due to above-average socioeconomic scores (Central Slovenia has the highest economic indicator score and Upper Carniola has the highest social indicator score). At the same time, their environmental scores are negative, which suggests that the current progress is largely being achieved to the detriment of the environment, which has a negative impact on their long-term development opportunities.

The opportunities for achieving sustainable development are very good in the Southeast Slovenia, Gorizia, and Coastal–Karst regions, which have a positive ISRD value and positive average scores in all the development areas studied. A minor exception can only be observed with the Gorizia region, which achieved a slightly below-average environmental indicator score only in the last period studied.

Several studies of Slovenian regions have been conducted in the past that used various sets of indicators and evaluated their development potentials from various angles, such as the state of environmental quality in relation to the GDP (Plut 2005), development factors of a knowledge society (Ravbar and Kozina 2012), or vulnerability to future development challenges (Kušar 2015). The government uses the development risk index to monitor regional development (Pravilnik o razvrstitvi … 2014). Even though these studies differ from one another in terms of methodology and the topics covered, the comparison of their findings shows that they all established differences between regions. As a rule, the regions in western Slovenia are ranked higher, and most often the leading role (i.e., the best point of departure) is assumed by Central Slovenia and the Mura region is in last place. The regions' rankings according to the ISRD and the development risk index match considerably, with the majority of regions differing by only one or two places. However, because the environmental aspects in the ISRD have significantly greater weight compared to the development risk index, the Gorizia and Inner Carniola–Karst regions are ranked four places higher according to the ISRD.

4.2 (Non-)sustainable development of Slovenia and Europe

Many authors and international organizations draw attention to both global and regional non-sustainable trends, which are reflected in exceeded carrying capacity of the planet and its regions (Millennium Ecosystem … 2005; Hoekstra and Wiedmann 2014; Shaker 2015; The European environment … 2015; Steffen et al. 2015). Thus in the light of global processes it is necessary, regardless of everything described above on Slovenian regions, to draw attention to the fact that for now redirecting to a sustainable development path is successful neither in Slovenia nor in Europe or elsewhere around the globe.

The study of over one hundred sustainable development indicators officially selected by the EU (Sustainable development … 2015) shows only partial success in the member states; positive changes can be observed especially with regard to economic and social issues (with the exception of exposure to poverty and social exclusion), whereas environmental trends prove to be unfavorable in the long term, especially due to the unsustainable use of energy and natural resources, and traffic pressures. Similarly, the calculations of the international sustainable society index (de Kerk, Manuel and Kleinjans 2014), which include twenty-one social, economic, and environmental indicators, point to opposing trends of human wellbeing and environmental wellbeing: while the former increases, the latter decreases. According to this index, among the 151 countries included, Slovenia was ranked tenth in 2014 in terms of economic wellbeing and fifteenth in terms of human wellbeing. However, in terms of environmental wellbeing it only placed ninety-third. The comparatively low values of the wellbeing of the Slovenian environment (and other economically developed countries) are primarily due to the great weight ascribed in the calculations to indicators referring to the use of energy and related environmental pressures (de Kerk and Manuel 2008; de Kerk, Manuel and Kleinjans 2014).

The calculations of the ecological footprint also illustratively draw attention to the exceeded carrying capacities or biocapacity caused by the human demand for natural resources (Kissinger, Rees and Timmer 2011; Shaker 2015; Galli et al. 2016). According to calculations by the Global Footprint Network (2016), in 2012 the ecological footprint per capita in the EU amounted to 4.8 global hectares (gha), exceeding the planet's biocapacity (1.7 gha per capita) by a factor of 2.8. At 5.8 gha per capita, Slovenia's ecological footprint

exceeded the national biocapacity (2.4 gha per capita) by a factor of 2.4 and the global biocapacity by a factor of 3.4. Among all of the EU member states, the average Slovenian resident had the ninth-largest ecological footprint (after Luxembourg, Belgium, Sweden, Estonia, Latvia, Austria, Finland, and Lithuania). Over the past two decades, Slovenia's ecological footprint has nearly doubled and its continual growth in recent years has been (probably only temporarily and in part) interrupted by the effects of the global financial crisis. This crisis was also reflected in the stagnation or exceptionally slow growth of the human development index as an aggregate indicator of the general socioeconomic conditions in the country. According to this index, Slovenia was twenty-fifth (0.880) in the world and twelfth in the EU in 2014 (Human development … 2015). Alongside a smaller ecological footprint, many European countries thus displayed better economic and social conditions (e.g., Denmark, the Netherlands, Germany, and the UK). Studies carried out as part of calculating the environmental performance index (Hsu et al. 2016), according to which Slovenia has the fifth–most favorable index in the world (after Finland, Iceland, Sweden, and Denmark), also confirm a comparatively extremely high consumption of natural resources (especially fuels) in Slovenia and its regions, whereas the state of its environment is still relatively good. This index combines more than twenty different indicators referring to the ecosystem and human health (Hsu, Lloyd and Emerson 2013; Hsu et al. 2016) and, at least from the viewpoint of Slovenian environmental protection efforts, its results are encouraging.

5 Conclusion

The economic, social, and environmental analysis of the development pattern from the viewpoint of sustainable development requirements revealed many advantages as well as weaknesses of Slovenian regions, providing valuable information required for transforming or shaping sectoral and horizontal policies at the regional and national levels. The finding that the great differences between regions continue to divide the country into the more successful western part and the eastern part, which lags behind, is especially important. In addition, comparisons of the relative positions of regions in individual periods from the beginning of the twenty-first century show great variability in the inter-regional ratios from the environmental viewpoint, whereas they seem to be fixed the most and most difficult to influence from the economic and social viewpoints. The average scores for individual development areas confirm the validity of the hypothesis that the differences between Slovenian regions continue to be the greatest with regard to economic issues and the smallest with regard to environmental issues. The starting point for evaluating the long-term sustainable development opportunities of individual regions and Slovenia and other (European) countries is the thesis about the unacceptability of a development pattern that achieves economic progress by depleting the environmental and social capital, which especially the economically weakest areas will have to pay attention to in the future. In this regard, the trend of Slovenia's increasing environmental pressures (e.g., its ecological footprint) and its disproportionately high interference with the planet's carrying capacities or its disproportionate use of natural resources compared to Europe and the rest of the world are distinctly unfavorable. Despite improvements made to material and social wellbeing, the unfavorable environmental trends mean that Slovenia and other EU countries are drifting further away from the objectives of sustainable development. However, Slovenia has the advantage of an environment that is still relatively well preserved.

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Acta geographica Slovenica, 58-2, 2018, 47–61

FORMS, AREAS, AND SPATIAL CHARACTERISTICS OF INTERMUNICIPAL COOPERATION IN THE LJUBLJANA URBAN REGION

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ALEŠ SMREKAR

LjubIjana Marsh Nature Park extends across seven municipalities and promotes their cooperation.

DOI: https://doi.org/10.3986/AGS.4830
UDC: 913:352(497.451)
COBISS: 1.01

Forms, areas, and spatial characteristics of intermunicipal cooperation in the Ljubljana Urban Region

ABSTRACT: This article studies the strength, forms, and areas of intermunicipal cooperation, and their advantages, disadvantages, and spatial characteristics based on the example of the Ljubljana urban region. Surveys, interviews, data analysis of joint administration and joint companies, and analysis of joint development projects show that cooperation in joint municipal administration is limited to parking authorities and the intermunicipal inspectorate, joint companies dealing with communal infrastructure and traffic, and joint projects mainly focusing on economic infrastructure, tourism, mobility, spatial and development planning, and applying for EU projects. The areas of former municipalities, the municipalities in Ljubljana Marsh Nature Park, and the municipalities that are part of the Development Partnership of the Center of Slovenia connect more often than other areas. The advantages of cooperation include better opportunities for EU funding, economizing, and joint representation of municipal interests, whereas disadvantages include problems with coordinating funding and a lengthy coordination period, which is additionally hindered by unsuitable legislation and a lack of financial incentives, human resources, time, and ideas.

KEY WORDS: geography, local government, functional region, intermunicipal cooperation, joint municipal administration, Ljubljana urban region, Slovenia

Oblike, področja in prostorske značilnosti medobčinskega sodelovanja v Ljubljanski urbani regiji

POVZETEK: Namen prispevka je na primeru Ljubljanske urbane regije preučiti jakost, oblike in področja medobčinskega sodelovanja ter njegove prednosti, pomanjkljivosti in prostorske značilnosti. Sodelovanje v skupnih občinskih upravah je omejeno na področje redarstva in medobčinske inšpekcije. To smo ugotovili z anketami, intervjuji, analizo podatkov o skupnih občinskih upravah in skupnih podjetjih ter analizo skupnih razvojnih projektov. Skupna podjetja opravljajo naloge s področja komunale in prometa, do projektnega sodelovanja pa prihaja na področjih gospodarske infrastrukture, turizma, mobilnosti, prostorskega in razvojnega načrtovanja ter prijav na evropske projekte. Povezujejo se zlasti območja nekdanjih občin, občine v Krajinskem parku Ljubljansko Barje in občine, ki tvorijo Razvojno partnerstvo središča Slovenije. Prednosti sodelovanja so večja možnost kandidiranja za evropska sredstva, racionalizacija stroškov in skupno zastopanje občinskih interesov, slabosti pa težave pri usklajevanju financiranja in dolgotrajnost usklajevanja, kar dodatno ovirajo neustrezna zakonodaja ter pomanjkanje finančnih spodbud, kadrov, časa in idej.

KLJUČNE BESEDE: geografija, lokalna samouprava, funkcijska regija, medobčinsko sodelovanje, skupna občinska uprava, Ljubljanska urbana regija, Slovenija

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The paper was submitted for publication on January 3rd, 2016.
Uredništvo je prejelo prispevek 3. januarja 2016.

1 Introduction

Various development processes (Figure 1) are transforming territory into increasingly more complex and dynamic spatial units that are not limited to a specific area, but connect or divide the space of flows into logical, functionally connected units (Tomaney and Ward 2000) known as functional areas. These often extend across multiple administrative areas, such as municipalities, regions, and countries, which leads to tension and problems in planning their development (Karlsson and Olsson 2006). In order to solve these problems, the administrative areas need to cooperate because only then can a new and efficient form of governance be established – one that ensures social ties and reduces economic disparities and social ostracism (Drobne, Konjar and Lisec 2011).

The cooperation of administrative areas is especially important at the local level because various functions (e.g., labor, supply, and residence) demand different functional areas (Kokole 1971) that transcend administrative borders. In the past twenty years, there has been significant improvement in the development of various forms of cooperation that have contributed to more efficient public services and solutions, especially at the local level (Hulst et al. 2009). In Europe, predominantly four different strategies are used to deal with pressures on municipalities that are the consequence of development, increased production, social and economic processes, and the impact of markets (Hulst and Van Montfort 2007):

- Territorial reform: merging municipalities into larger local administrative units (e.g., in the UK, Germany, Austria, Switzerland, and Sweden);
- Operational and autonomous restrictions imposed on municipalities or reallocation of responsibility among different levels of administration (e.g., in France and the Netherlands);
- The inclusion of private and public organizations in carrying out public tasks;
- Intermunicipal cooperation that includes arrangements between municipalities, groups of municipalities and municipal bodies, and agencies at different levels of government as well as the municipalities and the private sector.

There are several forms of intermunicipal cooperation, such as cooperation with one joint task, multipurpose cooperation, joint consultation, joint intermunicipal agencies, or cooperation between a smaller

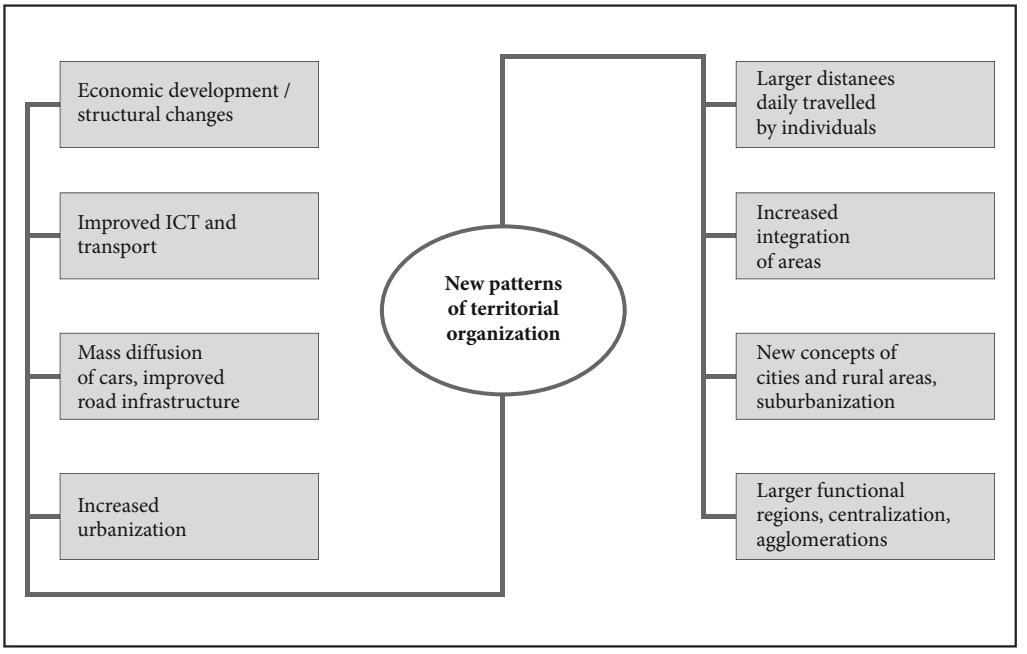


Figure 1: Processes impacting spatial transformation in recent decades (Veneri 2013).

number of municipalities, a larger number of municipalities, different territorial levels, the private sector, and upper levels of authorities. Cooperation may be statutory or informal, but always with the purpose of addressing the challenges that surpass the borders of municipalities, while remaining within their responsibility and controlling the policies and tasks. European governments encourage intermunicipal cooperation because it combines two important values of European government systems: local self-government and rational governance (Hulst and Van Montfort 2007).

Three main intermunicipal cooperation models have been developed in European countries: a highly formalized model with a clear formal legal structure, a flexible model with pragmatic connections between autonomous municipalities, and a combined model, which is common in the majority of the countries with established intermunicipal cooperation (Žohar 2010).

Governance of functionally connected areas in Slovenia is especially challenging because regional government has not been established. Regional development is therefore the responsibility of the national and local levels; the council for regional development is responsible for the program level, decisions are made by the mayors from all the municipalities of the region on the regional council, and regional development agencies are responsible for carrying out regional development programs. Even though these institutions should act as coordinators of regional interests, in the past the decisions were often influenced by the mayors' considerable influence and were thus based on local interests (Nared 2004, 2007).

Examples from abroad (Hophmayer-Tokich and Kliot 2008; Romanczyk 2015; Ioan-Franc, Ristea and Popescu 2015; Põldnurk 2015; Pérez-López et al. 2016) and from Slovenia (Marot 2010) show that the governance of functionally connected areas is more successful when there is cooperation between authorities. This is especially true for Slovenia because of its small size and its human resources and financial limitations, which could be solved through various forms of intermunicipal cooperation. This article studies the Ljubljana urban region and establishes how municipalities are connected. It focuses on finding answers to the following research questions:

- How is intermunicipal cooperation organized?
- What are the areas of intermunicipal cooperation?
- What are the advantages and disadvantages of cooperation?
- Which Ljubljana urban region areas stand out in intermunicipal cooperation?

There are twenty-six municipalities in the Ljubljana urban region. It is an extremely centralized and attractive environment for investment and development (Ravbar 2009, 2011). Ljubljana's rapid development, which is reflected in investments, the labor market, and residents' mobility (Ravbar 2009; Bole 2011; Bole et al. 2012; Gabrovec and Razpotnik Visković 2012), was followed by suburbanization (Nared 2007; Nared et al. 2012). This creates new challenges mainly for sustainable spatial planning because the region is increasingly functionally connected.

The research was conducted at the municipal level. The term »functional area« is used for municipalities that form connections based on common goals and challenges.

2 Methods

Analysis of intermunicipal cooperation in the Ljubljana urban region was conducted with a survey, interviews, project proposal analysis, and analysis of the joint municipal administrations and companies (Table 1). Joint companies are public companies with joint management authority owned by municipalities, and public or private companies that cooperate with several municipalities.

Table 1: Methods used by research question

Research question	Survey	Interview	Project proposal analysis	Institution analysis
How is intermunicipal cooperation organized?	x	x		x
Which are the areas of intermunicipal cooperation?	x	x	x	x
What are the advantages and disadvantages of cooperation?	x	x		
Which Ljubljana urban region areas stand out in intermunicipal cooperation?	x	x	x	x

2.1 Survey and interviews

In the first half of 2014, a survey on intermunicipal cooperation was conducted in the municipalities of Ljubljana urban region, followed by interviews with municipal officials in May 2015. Seventeen electronically completed survey forms (corresponding to 65% of municipalities) were received from municipal officials (i.e., mayors, directors of municipal authorities, and advisors). Because of the low number of forms completed, twenty additional interviews (corresponding to 77% of municipalities) were conducted with mainly mayors and directors of municipal authorities to complement the data. It was decided to conduct interviews because of the scale and complexity of the functional areas, and to efficiently complement the survey data.

2.2 Project proposal analysis

The priority projects described in three regional development programs of the Ljubljana urban region (Regionalni … 2002; Regionalni … 2007; Regionalni … 2015; Izvedbeni … 2007; Izvedbeni … 2011; Izvedbeni … 2012; Izvedbeni … 2014) also indicate intermunicipal cooperation. All of the project proposals that involve more than one municipality and clearly define the municipalities involved (111 projects) were included. For analyzing the cooperation area, twenty-seven projects were included (regional projects that involve all municipalities were excluded from this).

2.3 Joint municipal administration and joint company analysis

The joint municipal administration analysis was conducted based on the list of joint municipal administrations for 2016, published on the Ministry of Public Administration website, providing all data about the head municipality, founding municipalities, goals, and areas of work by joint municipal authorities (Skupne … 2016). Information on the characteristics of joint companies, the municipal bodies, and the area was collected from their webpages (Internet 1–12).

3 Results

3.1 Organizational forms of intermunicipal cooperation

The joint governance of municipal tasks that by their nature surpass the municipality's borders can be informal, contractual, or institutionalized; in Slovenia, this encompasses joint municipal authority bodies, bodies of joint management of public institutes, public companies, public funds and public agencies, and interested municipal associations (Zakon … 2007).

Twenty-one municipalities are connected in six joint intermunicipal administrations in the Ljubljana urban region. Five larger municipalities – Ljubljana, Kamnik, Domžale, Medvode, and Logatec – are not connected to any joint intermunicipal administration as they have sufficient funding and staff to manage municipal tasks independently, or they outsource certain tasks; for example, to public companies. The municipalities of Ivančna Gorica and Grosuplje are connected into two joint municipal administrations because, in addition to the existing intermunicipal inspectorate and parking authorities, the Grosuplje, Ivančna Gorica, and Trebnje Intermunicipal Development Center was established in 2016. Its task is to monitor calls for tenders, spatial maintenance, environment preservation, and preparing projects for applying for EU and other funds.

The key flaw of joint municipal administrations in the Ljubljana urban region is that they are limited only to an intermunicipal inspectorate and parking authorities, with the exception of the Grosuplje Intermunicipal Development Center. Elsewhere in Slovenia, they are also active in the environment and road maintenance, spatial planning, environmental conservation, applying for projects for Slovenian or EU funding, financial and accounting services, civil protection, and fire safety.

Figure 2: Joint municipal administration in the Ljubljana urban region. ► p. 52
Figure 3: Municipalities connected in communal services. ► p. 53

Joint municipal administrations in the Ljubljana urban region

- Grosuplje Intermunicipal Inspectorate and Parking Authorities
- Litija Intermunicipal Inspectorate and Parking Authorities
- Ribnica Intermunicipal Inspectorate and Parking Authorities
- Trzin Intermunicipal Inspectorate and Parking Authorities
- Vrhnika Intermunicipal Inspectorate and Parking Authorities
- Grosuplje Intermunicipal Development Center
- Ljubljana urban region

Content by: Petra Rus
Map by: Petra Rus
Source: Skupne občinske uprave 2016

0 5 10 15 20 km

Public communal services in the Ljubljana urban region

- Grosuplje Public Communal Service
- Prodnik Public Communal Service
- Ljubljana Public Heating Service
- Ljubljana Public Water Service
- Kamnik Public Communal Service
- Logatec Public Communal Service
- Vrhnika Public Communal Service
- Litija Public Communal And Housing Service
- Snaga Public Waste Disposal Service
- Ljubljana urban region

Content by: Petra Rus
Map by: Petra Rus
Source: Internet 1–10

0 5 10 15 20 km

The Ljubljana urban region's municipalities are also connected through joint companies. They cooperate especially closely in communal services (there are eight companies serving twenty-five municipalities), and these companies share municipalities that were formerly part of the same municipality before the local government reform (Figure 3).

Examples of such intermunicipal cooperation operating in an area wider than that of the former municipality are the Ljubljana Public Transport company (LPP), which provides public transport in the municipality of Ljubljana and sixteen suburban municipalities, and the Ljubljana Regional Waste Management Center (RCERO), the largest environmental cohesion project in the country, processing waste for one-third of the Slovenia (including thirty-seven municipalities).

The municipalities are satisfied with the work of joint municipal administrations, and they also support other intermunicipal organizations such as local action groups, the regional tourism organization, joint projects, and informal meetings. All but one of the municipalities support voluntary intermunicipal cooperation based on their wishes and needs, and they do not want their cooperation to be defined by law.

3.2 Areas of intermunicipal cooperation

When considering all of the proposed projects in the three regional development programs in the Ljubljana urban region, the cooperation between the municipalities in the Ljubljana urban region is the closest in entrepreneurship (e.g., an entrepreneurship training program, access points for business registration and taxation, and a regional scholarship scheme) and economic infrastructure, where the number of such projects increased especially after 2014 (five for 2002–2006, seven for 2007–2013, and fourteen for 2014–2020). Next are sustainable mobility (seventeen), communal infrastructure (fifteen), spatial planning (seven), and promoting regional cooperation (six).

The respondents emphasized tourism as important part of intermunicipal cooperation. For example, the municipalities and the public company Ljubljana Tourism cooperated to prepare Slovenian tourism development and a marketing strategy for the Central Slovenia region for 2012–2016 (Strategija … 2011). The benefits of municipalities' cooperation with the capital was emphasized in the strategy. In tourism, the local action group for the Ljubljana Marsh and surroundings, which includes the municipalities of Borovnica, Brezovica, Dobrova–Polhov Gradec, Horjul, Log–Dragomer, and Vrhnika, was mentioned because of the tourism potential due to the proximity to the capital and interesting geographical features (i.e., the Ljubljana Marsh and Ljubljanica River). The respondents also emphasized communal services and traffic. In the future, they would like to see more cooperation in spatial management, tourism, an intermunicipal public defender's office, waste management, traffic, watercourse management, elementary and preschool education, and applying for projects and EU funding.

3.3 Advantages and disadvantages of intermunicipal cooperation

The main advantages of intermunicipal cooperation are forming a larger functional area and better opportunities for EU funding, economizing, and the opportunity to present a unified front in municipal interests. Among the disadvantages, the respondents emphasized problems with funding coordination, completing the more complex goals and problems with human resources, and a long period needed to complete the tasks. As the most significant obstacle to more efficient intermunicipal cooperation, the municipalities cite a lack of financial incentives, unsuitable legislation, and lack of human resources, time, and ideas.

Regarding funding for intermunicipal cooperation, the largest amount of funding is provided by the municipalities involved. EU funding, however, is much more important than Slovenian funding.

The smaller and more recently created municipalities are fighting for their independence and against an unequal position compared to larger municipalities. Even though they are aware of the importance of cooperation, they want to prove their ability to be independent and thus justify their existence (e.g., Šmartno pri Litiji, Horjul, Borovnica, and Log–Dragomer). The larger municipalities could increase their cooperation with the smaller municipalities. The belief that a municipality can best take care of itself is still prevalent. The mayor's party affiliation is still an important factor in intermunicipal cooperation.

3.4 Areas of more significant intermunicipal cooperation

Functionally connected areas were classified according to whether they participated in the proposed projects (Figure 4). The municipalities in the southwest part of the Ljubljana urban region (Borovnica, Brezovica, Vrhnika, and Ig) are the most closely connected. Regarding the frequency of participating in the proposed projects, on a slightly smaller scale, Ljubljana and Škofljica participate as well. Close cooperation is also noted in the northern part of the region, expanding across the municipalities of Kamnik, Domžale, and Trzin. These municipalities also cooperate with the municipality of Litija and the municipalities in between. The municipalities of Horjul and Dobrova–Polhov Gradec cooperate with Brezovica, Ig, and Borovnica in the southeast and with Vodice and Medvode in the north. In the southeast, the municipalities of Grosuplje and Ivančna Gorica cooperate in five joint projects. Ljubljana also participates in the proposed projects; it most often cooperates with the municipalities of Borovnica, Vrhnika, Brezovica, and Kamnik.

4 Discussion

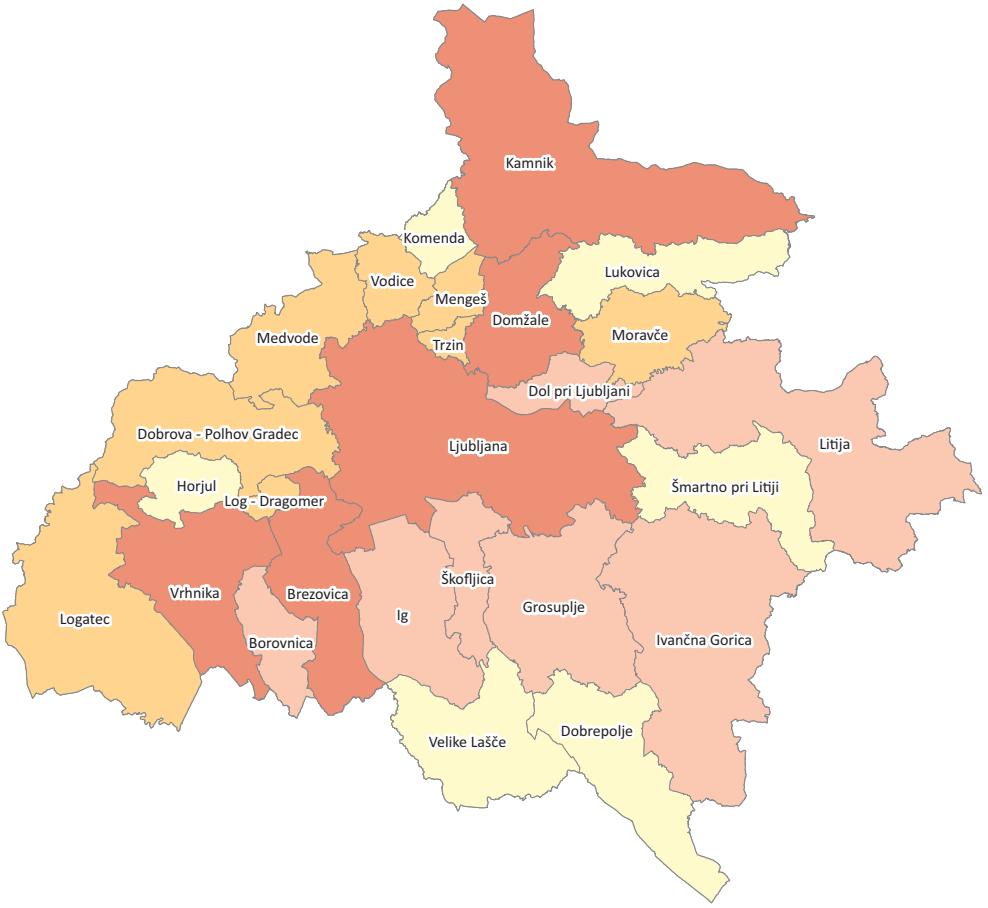
Even though willingness has been expressed to establish regions in Slovenia and to decrease the number of municipalities, they still remain the only level of local government. Because the municipalities are mainly small and scattered, and lack finances and human resources (Nared 2004; Benkovič Krašovec 2006), they find it difficult to independently solve problems that functionally surpass their administrative borders. Therefore, it is necessary to establish different forms of intermunicipal cooperation to ensure efficient problem-solving at the supra-municipal and intermunicipal levels (examples from Finland, Sweden, Austria). Cooperation might lead to a merger of knowledge and skills, more efficient governance of interdependencies, joining of similar activities, economy of scale, acquiring more funding, and regularly addressing complex problems (Provan and Kenis 2008).

Intermunicipal cooperation could partially replace regions; however, it is a governance instrument that is not used often enough due to problems with financing joint tasks, the complexity and the amount of time needed for coordination, and the fear of losing autonomy. The municipalities could actually use intermunicipal cooperation for more efficient strategic development, project implementation, networking, and presenting a unified front. Although the majority of such networks do not have executive powers, they can still influence policies by offering suggestions, lobbying, and preparing research and programs. Their power lies in coordinating resources and goals, which leads to knowledge, interdependence, and understanding of common goals; their main disadvantage is a lack of resources and political ties (ESPON … 2005).

Even though the municipalities in the Ljubljana urban region are aware of the necessity for coordination and cooperation (Bole et al. 2012; Gabrovec and Razpotnik Visković 2012; Nared et al. 2012; Nared and Razpotnik Visković 2012), the intermunicipal cooperation is weak and fragmented. The municipalities mainly connect with neighboring municipalities and with those they shared a municipality with in the past and have a joint administrative unit today. They also form connections based on common geographic characteristics and challenges that come with them, such as the Ljubljana Marsh or watercourses; for example, in the project *Čista Ljubljanica* (A Clean Ljubljanica River). Regarding the three major European models of intermunicipal cooperation (Žohar 2010), the formalized model of intermunicipal cooperation in the Ljubljana urban region exists in the form of joint municipal administration, that, except for one, work together only in a municipal inspectorate and as parking authorities. The flexible model exists in the form of municipal bodies that manage public undertakings together, mainly public utilities. The municipalities informally cooperate within projects and groups funded by the EU (e.g., within local action groups, cohesion projects, or the regional tourism organization).

The municipalities are not yet sufficiently aware that they could effectively decrease deficits in human resources and finances, meet challenges that surpass their borders, and coordinate plans (Rus, Razpotnik Visković and Nared 2013), and they still mostly rely on themselves due to their deep-rooted lack of trust. In this, Slovenia and its most developed region lag behind more-developed European regions that are already

Figure 4: Frequency of including municipalities in intermunicipal cooperation. ► p. 56
Figure 5: Number of joint projects among municipalities by selected proposed projects for the regional development program of the Ljubljana urban region between 2002 and 2016. ► p. 57

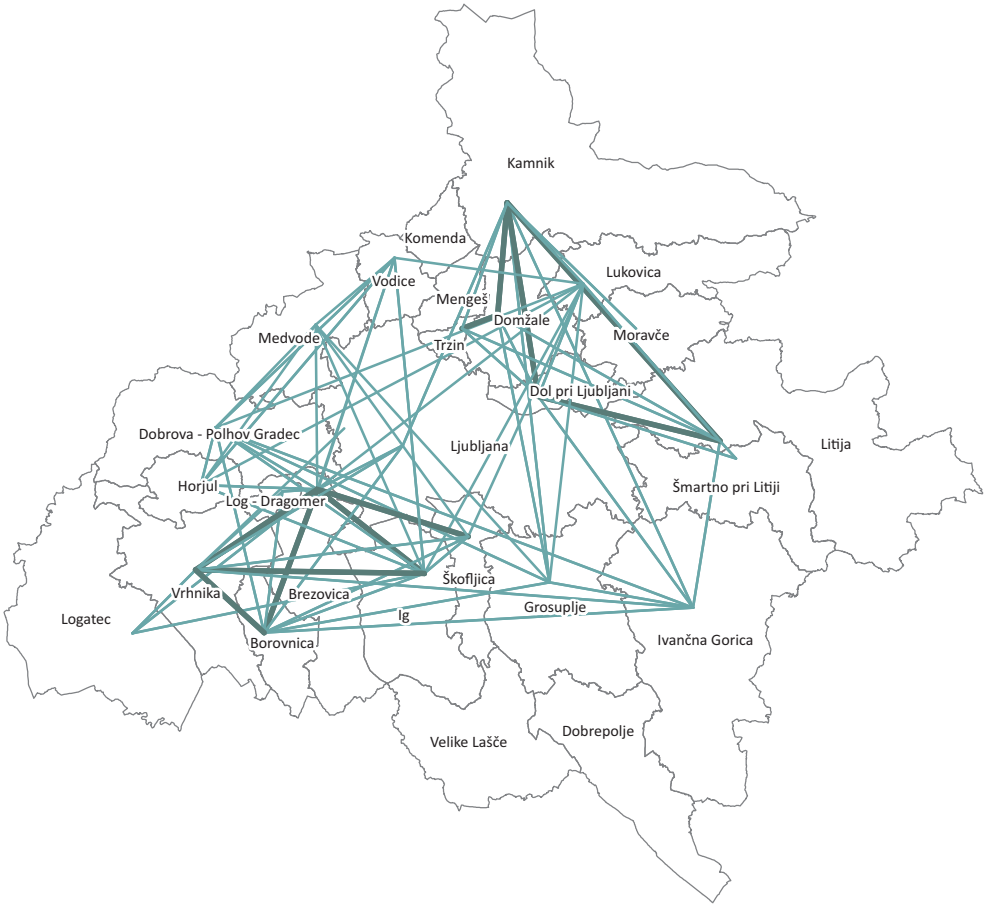


Number of proposed regional development projects for the Ljubljana urban region by municipality from 2002 to 2016

- Up to 4
- 5 or 6
- 7 or 8
- 9 or more
- Municipal border

Content by: Petra Rus
Map by: Petra Rus
Source: Regionalni ... 2002, 2007, 2015; Izvedbeni ... 2007, 2011, 2012, 2014

0 5 10 15 20 km



Number of intermunicipal cooperations by selected proposed regional development projects for the Ljubljana urban region from 2002 to 2016

4 to 5

6 to 8

Municipal border

Content by: Petra Rus
Map by: Petra Rus
Source: Regionalni ... 2002, 2007, 2015; Izvedbeni ... 2007, 2011, 2012, 2014

0 5 10 15 20 km

aware of the benefits of synergetic effects and have been developing various forms of cooperation and networking. This can be seen in Finland, where there is also a two-tiered public administration; however, the missing regional level has been replaced by voluntary intermunicipal cooperation. This is the part of formal joint municipal administrations that has proved to be the most efficient and economically sensible functional approach to municipal tasks (Hämäläinen and Moisio 2015) or other forms of cooperation in the local communities such as joint municipal offices. In this case, the cooperation is organized according to the client–producer model, in which one municipality manages certain tasks for another municipality. This form is called the host municipality arrangement, whereby the clients are municipal administrations and the producers are the host municipalities (Moisio, Loikkanen and Oulasvirta 2010). The municipality also has an option to buy a certain service from the private sector. When providing services and functions, the local municipal bodies increasingly often cooperate contractually, mainly in waste management, water supply, rescue services, building inspection, consumer and debt advising, and education (Moisio, Loikkanen and Oulasvirta 2010). Similar solutions in intermunicipal cooperation are also characteristic for Sweden (Nared and Razpotnik Visković 2012).

The formal model of cooperation in the Ljubljana urban region is limited to joint parking authorities and an inspectorate, apart from one case in which municipalities also cooperate in following calls for tenders, spatial management, environment protection, and preparing projects to apply for funding. With joint companies and through projects, the municipalities cooperate in communal services, business and economic infrastructure, mobility, and spatial and development planning. In addition to the established areas, there are several other areas where cooperation would be beneficial, such as spatial management, tourism, an intermunicipal public defender's office, waste management, traffic, watercourse management, elementary education and preschool, project application, and obtaining EU funding. Although there is variation in the duties of municipal authorities in different countries, international researchers have also noticed closer intermunicipal cooperation, especially in communal services (Hophmayer-Tokich and Kliot 2008; Põldnurk 2015; Pérez-López et al. 2016) and joint spatial and development planning (Ioan-Franc, Ristea and Popescu 2015; Romanczyk 2015).

The areas of closer cooperation show the importance of institutionalizing cooperation (Kušar 2010, 2011), which has become apparent in the closer cooperation of the municipalities in Ljubljana Marsh Nature Park and the Development Partnership of the Center of Slovenia, and also partially in the path-dependent development (Martin and Sunley 2006; Bristow and Healy 2014) that is seen in the closer cooperation of those municipalities that were formerly in the same municipality.

5 Conclusion

This article studied the strength and forms of intermunicipal cooperation, areas of intermunicipal cooperation, and their advantages, disadvantages, and spatial characteristics based on the example of the Ljubljana urban region.

The surveys, interviews, analysis of available data for joint municipal administration and joint companies, and analysis of joint proposed development projects show that intermunicipal cooperation in the Ljubljana urban region is still weak. The municipalities mainly cooperate in their parking authorities and intermunicipal inspectorate, communal infrastructure, business and economic infrastructure, tourism, and mobility, and to some extent in spatial and development planning. Joint applications for European projects are also an important aspect of intermunicipal cooperation.

The areas of intermunicipal cooperation indicate the importance of institutional connections because intermunicipal cooperation is the closest in the area of Ljubljana Marsh Nature Park and in the municipalities connected by the Development Partnership of the Center of Slovenia. Another important aspect of cooperation is its path-dependent character, which is apparent from the closer cooperation of the municipalities that once belonged to the same municipality.

It seems it is unlikely that the municipalities will join and form regions, and therefore intermunicipal cooperation is an important instrument that could be better used in the future. Its importance is indicated by spatial legislation reform (Zakon … 2016) and the target research project Model of Joint Physical and Development Planning at the Regional Level (Model … 2016). Slovenia will have to reevaluate the municipalities' tasks and organizational forms of intermunicipal cooperation, and also consider defining these by law, especially in cases when intermunicipal cooperation is necessary for solving shared problems.

The combination of municipal services, joint intermunicipal tasks and contractual/project work could provide municipalities with an opportunity to find a solution for economy of scale and services that surpass administrative borders, and thus add to more flexible and cost efficient governance. These can be further improved and encouraged by suitable legislation and financial incentives that will make the current advantages of intermunicipal cooperation even more convincing.

ACKNOWLEDGEMENT: Sincere thanks to all respondents from the municipalities of the Ljubljana urban region.

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Acta geographica Slovenica, 58-2, 2018, 63–72

SUBURBANIZATION AND MIGRATION IN POLISH METROPOLITAN AREAS DURING POLITICAL TRANSITION

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Suburbanization in the Kraków Metropolitan Area.

DOI: https://doi.org/10.3986/AGS.2256
UDC: 911.375.635(438)"1995/2012"
COBISS: 1.01

Suburbanization and migration in Polish metropolitan areas during political transition

ABSTRACT: This article presents the development of suburbanization processes that occurred in Polish metropolitan areas during the political transition from communism. We analyze data on population and migration for municipalities in seven metropolitan areas from 1995 to 2012. Our results show that the suburban development phase was strongly associated with cities' size and level of economic development. The article concludes that the outflow of the urban population to the suburbs started earliest in centers that had successfully undergone the transition period.

KEY WORDS: suburbanization, population migration, metropolitan areas, internal migration, Poland

Suburbanizacija in migracije na poljskih metropolitanskih območjih med politično tranzicijo

POVZETEK: V članku avtorici obravnavata razvoj suburbanizacijskih procesov na poljskih metropolitanskih območjih med politično tranzicijo iz komunizma. Analizirata podatke o prebivalstvu in migracijah v občinah na sedmih metropolitanskih območjih med letoma 1995 in 2012. Rezultati kažejo, da je bila faza razvoja predmestij močno povezana z velikostjo mest in stopnjo njihovega gospodarskega razvoja. Avtorici ugotavljata, da se je odseljevanje mestnega prebivalstva v predmestja najprej začelo v središčih, ki so uspešno prestala obdobje politične tranzicije.

KLJUČNE BESEDE: suburbanizacija, preseljevanje prebivalstva, metropolitanska območja, notranje migracije, Poljska

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This paper was submitted for publication on June 12th, 2016.
Uredništvo je prejelo prispevek 12. junija 2016

1 Introduction

The political transition from communism that started in 1989 contributed to demographic and economic changes in Poland. Cities, which at that time became a less attractive destination for the rural population, were the main area of these changes. The demographic changes that occurred in Polish cities were mostly caused by suburbanization (Zborowski, Soja and Łobodzińska 2012; Szajewska 2013). Thus, we sought to better understand the role of the suburbanization process in these changes in all metropolitan areas in Poland. We wished to determine whether all Polish metropolitan areas suffered from an outflow of population, or whether there are differences in the spatial development of the suburbanization process in metropolitan areas.

Previous research has shown that, as in the case of western Europe and the United States, the early beginnings of suburbanization in post-communist countries can be traced back to the interwar period. The first suburban communities emerged on the outskirts of Tallinn, Prague, and Warsaw (Tammaru 2001; Sýkora and Ouředníček 2007; Lisowski and Grochowski 2008). The key driver of suburban development at the time was the expansion of railway infrastructure, which made the suburbs more accessible. Suburbanization virtually came to a halt during the postwar communist era in most countries of central Europe. There were some exceptions; for example, in Slovenia suburbanization was most pronounced in the 1970s and 1980s. This was an effect of polycentric development processes, which were supported by the political elites in 1960s and set the path for accelerated suburbanization in Slovenia at that time (Uršič 2004; Uršič 2012; Pichler-Milanović 2014). In other Eastern Bloc countries, communist governments began to control internal migration via limits on the number of residential registration permits issued for cities as well as by constructing large new housing complexes on the outskirts of cities (Enyedi 1998). Suburbanization only began to take root in post-communist countries during the transition period in the early 1990s (Tammaru 2001). The rate of suburbanization increased substantially during the second half of the 1990s.

Suburbanization is rapidly taking place in large urban centers such as Prague and Brno in the Czech Republic (Sýkora 1999; Ouředníček 2007), Tallinn, Estonia (Tammaru 2005; Borén and Gentile 2007; Leetmaa and Tammaru 2007), and Budapest, Hungary (Kok and Kovács 1999; Brown et al. 2005; Nagy 2005). Cities in the former East Germany show signs of population shifts to the suburban zone, which is one of the reasons for the depopulation of central cities (Lötscher 2005; Kujath 2005).

Previous Polish research indicates that the transition influenced suburban development in Poland. The process initially started in large cities: Gdańsk, Warsaw, and Poznań (Gałka and Warych-Juras 2011). The literature contains few comparative studies that could show stages of suburbanization in all metropolitan areas. There is also lack of studies to show what the role of suburbanization is in demographic changes in Polish metropolitan areas during the transition.

This article presents the development of suburbanization in Polish metropolitan areas during the political transition (i.e., 1990 to 2012). It first analyses the level of demographic changes in Polish metropolitan areas from 1995 to 2012. It then shows the level of advancement of suburbanization in Polish metropolitan areas in 1995 and then in 2012. The conclusions are presented in the last part of the article.

2 Methods

The basis for the analysis is statistical data from the Central Statistical Office of Poland. We analyze data on population and migration for urban and rural municipalities in seven metropolitan areas delimited by Gorzelak, Jałowiecki and Smetkowski (2009; Figure 1) from 1995 to 2012. The data provided information mainly on directions of internal population flows (from urban to rural areas, etc.). As a measurement of the scale of suburbanization, the following indices were used: population dynamics, inflow of urban population per 1,000 inhabitants, and net migration per 1,000 inhabitants in 1995 and 2012.

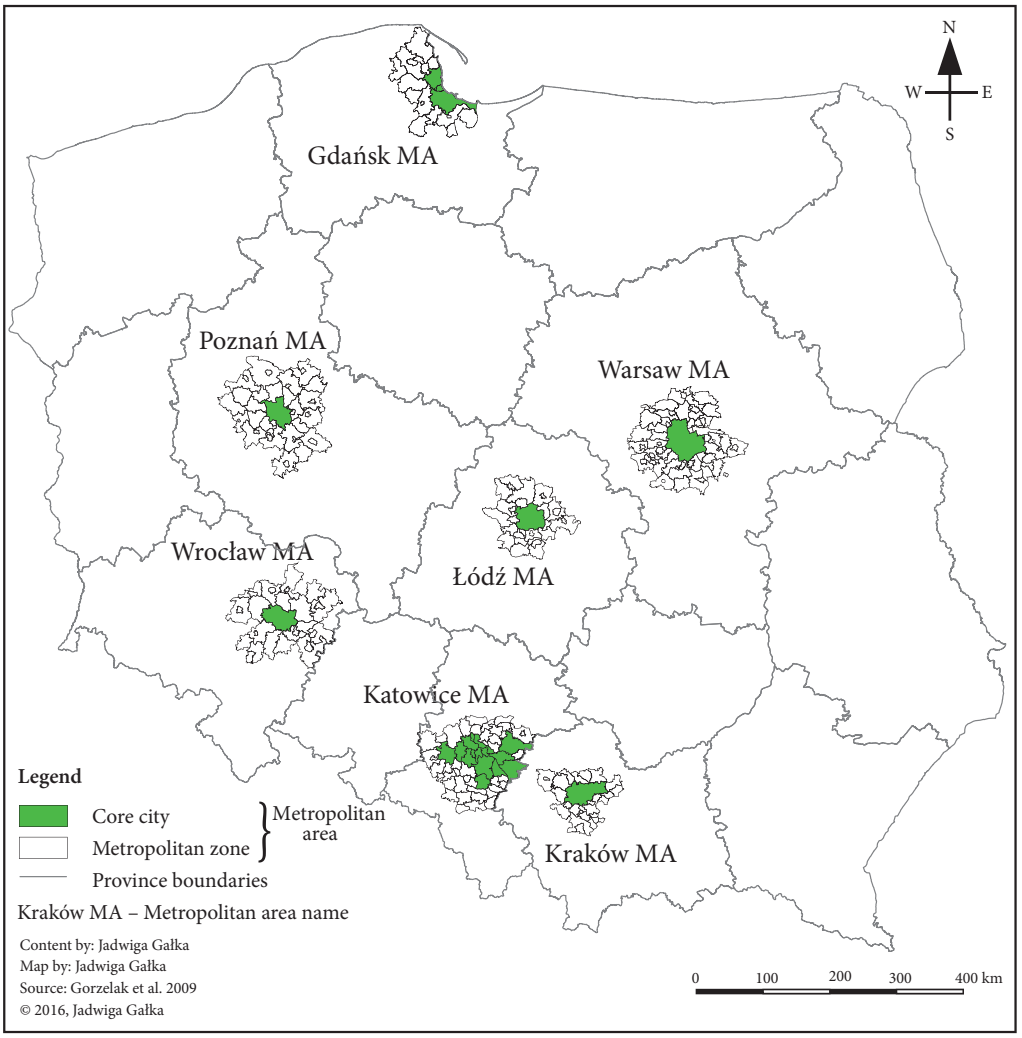

Figure 1: Polish metropolitan areas (based on Gorzelak Jałowiecki and Smetkowski 2009).

3 Results and discussion

3.1 Demographic changes in Polish metropolitan areas from 1995 to 2012

Differences in the suburbanization rate in Poland are usually associated with the history of the development of a given city or group of cities. Population dynamics from 1995 to 2012 varied substantially among regions (Figure 2). Suburban zones systematically gained population at the expense of central cities. There were, however, two exceptions: Warsaw and Kraków. Although suburbanization processes did take place in both metropolitan areas, the population of each urban center still managed to grow from 1995 to 2012.

Warsaw's continuing demographic growth is a byproduct of the city's substantial economic potential. The city has a higher-order service sector that helps it function as a capital city. Warsaw's many educational and research institutions drive the city's potential for innovation and stimulate a job market that attracts people from across Poland, including a number of companies with foreign capital and business

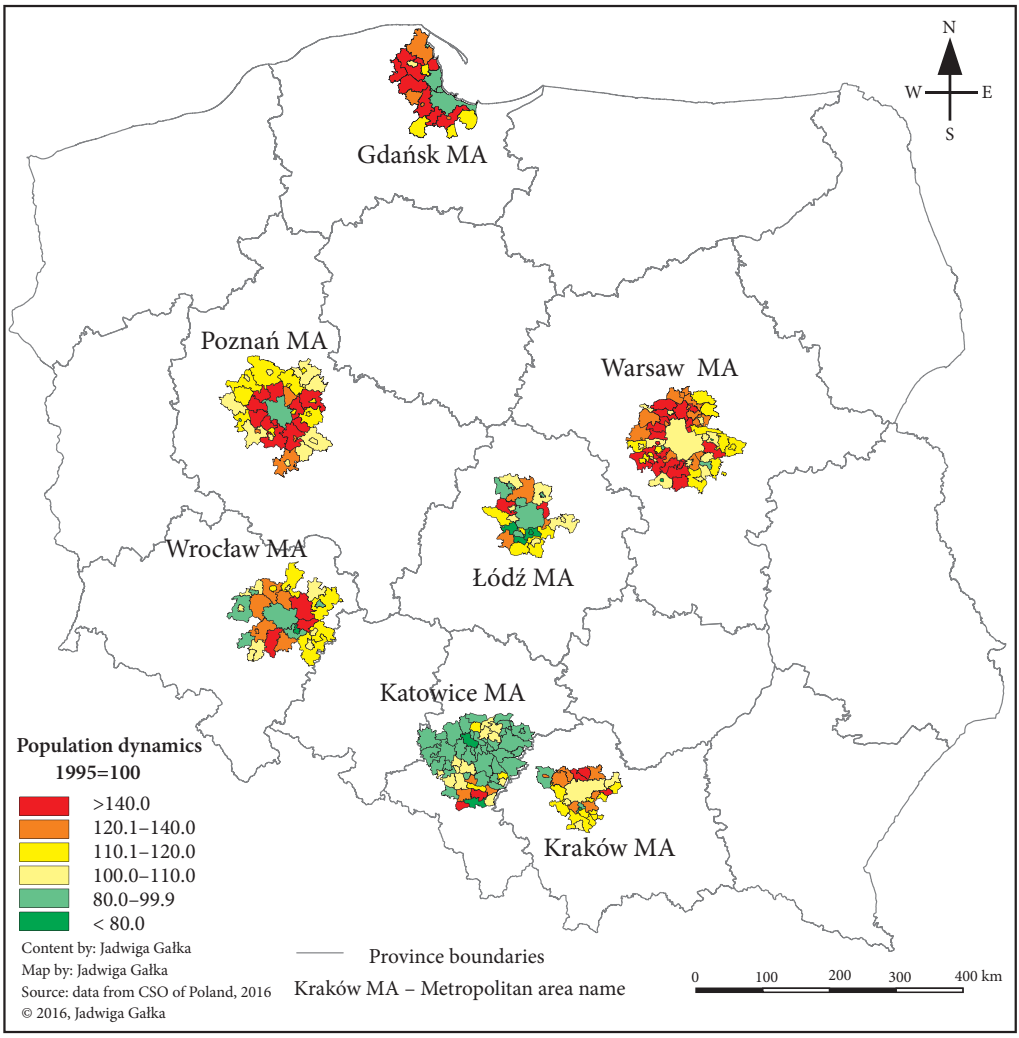

Figure 2: Population dynamics in Polish metropolitan areas from 1995 to 2012 (Source: Central Statistical Office of Poland).

services centers (Markowski and Marszał 2006). The population of Warsaw increased by 75,000 from 1995 to 2012. Kraków, on the other hand, gained only 1,000 new inhabitants despite being an important center of learning and research as well as a major tourist center. Creative occupations, which tend to concentrate in city centers, have helped Kraków create more attractive jobs and have helped attract new inhabitants to Kraków (Warych-Juras and Gałka 2008).

3.2 Regional differences in suburbanization processes in Polish metropolitan areas

Suburbanization in various Polish metropolitan areas exhibits a number of similar characteristics. Suburban areas change in terms of their physical appearance, function, and social structure. New manufacturing and service industries emerge. New types of architecture and street patterns can be observed. Affluent enclaves form amid low-income population groups. Such enclaves usually consist of single-family homes, duplexes, and row houses (Lisowski and Grochowski 2008).

New social and economic trends became clearly apparent during the second half of the 1990s in Poland. Suburbanization accelerated in three Polish metropolitan areas in particular: Warsaw, Poznań, and Gdańsk (Figure 3a). The influx of population to municipalities adjacent to the three cities often exceeded 20‰. In the case of other metropolitan areas, the rate of migration from core cities to their suburban zones was decidedly smaller and did not exceed 15‰.

In terms of economic development, Warsaw, Poznań, and Gdańsk already outperformed other central cities in Poland in 1995. The influx of foreign investment to the three cities further exacerbated the growing divide between Poland's top economic performers and bottom economic performers. Furthermore, other metropolitan areas began to experience serious problems with unemployment associated with the decline of heavy industry (in the Silesian Metropolitan Area; Runge and Runge 2006) as well as light industry (in the Łódź Metropolitan Area).

The first stage of suburbanization, which occurred in the mid-1990s, was primarily based on the flow of population from central cities to municipalities adjacent to central cities. The choice of migration destination was based on good transportation networks and attractive natural environments (e.g., the municipalities of Nadarzyn, Milanówek, Piaseczno, and Łomianki near Warsaw). This trend can be observed in various western, central, and eastern European cities (White 1981; Mieszkowski and Mills 1993; Grochowski , Pieniążek and Wilk 2005; Solarek 2005; Mantey 2013; Mihai, Nistor and Simion 2015) In the »Tri-City« (Gdańsk, Sopot, and Gdynia), population flows from the urban core were directed toward selected municipalities (e.g., Pruszcz Gdański). The rate of population exchange between the three cities was rather low because of the unique nature of the region (Parysek 2005).

Weak suburbanization processes were also observed in the Kraków and Wrocław metropolitan areas (Figure 3a). The economies of the two cities were less robust, which naturally translated into lower incomes for their inhabitants. The municipalities of choice for new suburbanites were usually those with good transportation networks and a robust home construction sector.

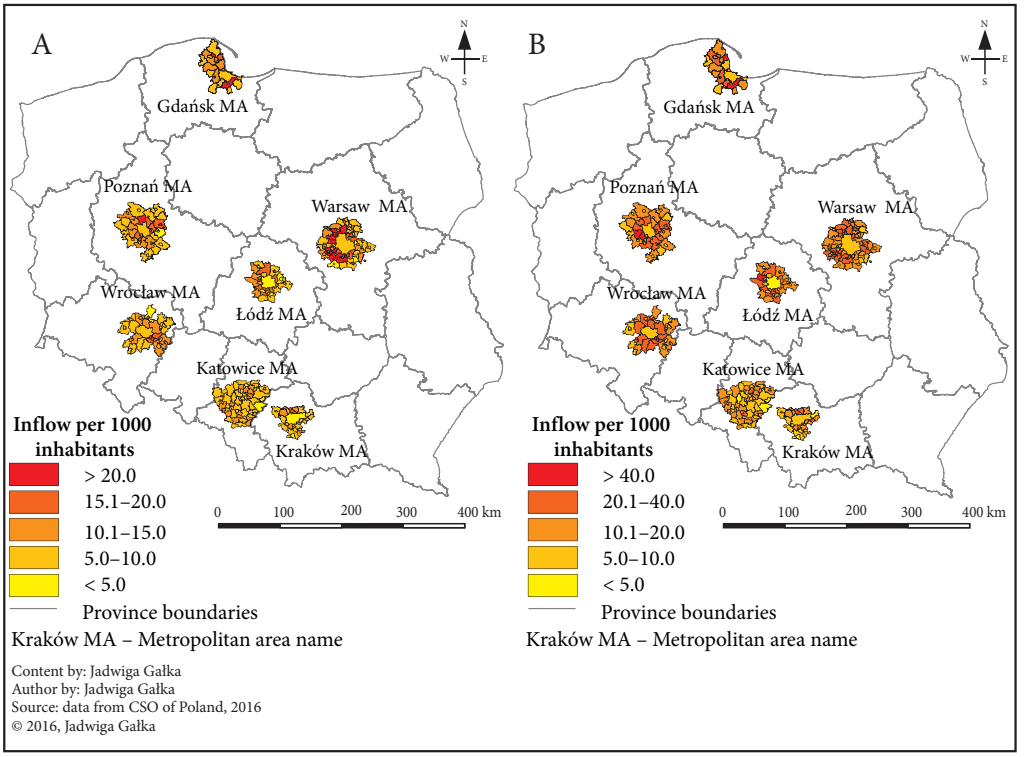

Figure 3: Inflow of urban population in Polish metropolitan areas a) 1995, b) 2012 (data from the Central Statistical Office of Poland).

The first stage of suburbanization in Poland was characterized by central cities with positive net population inflows (Figure 4a).

Table 1. Population migration in Polish metropolitan areas in 1995 and 2012 (data from the Central Statistical Office of Poland).

Metropolitan areas	Inflow (per 1,000 inhabitants)		Inflow from other cities (per 1,000 inhabitants)		Net migration (per 1,000 inhabitants)		Population dynamics
	1995	2012	1995	2012	1995	2012	1995–2012
Łódź	4.9	5.2	2.8	3.2	0.2	−2.1	87.6
Łódź suburban zone	14.2	15.1	9.6	12.2	2.9	5.1	98.9
Warsaw	7.1	11.4	4.7	8.0	1.3	3.2	105.1
Warsaw suburban zone	19.7	23.1	14.1	17.4	7.1	10.6	123.6
Kraków	7.2	8.9	3.8	5.6	1.5	0.6	102.1
Kraków suburban zone	11.7	16.8	7.5	13.1	3.7	9.5	115.0
Poznań	8.3	9.5	5.7	6.1	1.2	−4.3	94.8
Poznań suburban zone	15.9	23.7	10.1	18.1	3.3	11.8	128.2
Katowice	8.9	7.8	6.3	6.6	0.7	−2.8	88.1
Katowice suburban zone	11.3	13.0	8.1	10.8	2.2	2.0	100.1
Wrocław	8.5	10.6	5.5	7.2	2.2	1.0	98.4
Wrocław suburban zone	13.4	22.2	8.2	17.1	0.2	11.2	110.8
Gdańsk	13.6	10.1	11.6	7.5	0	−0.8	98.6
Gdańsk suburban zone	14.5	24.7	10.0	19.5	4.1	13.0	134.4

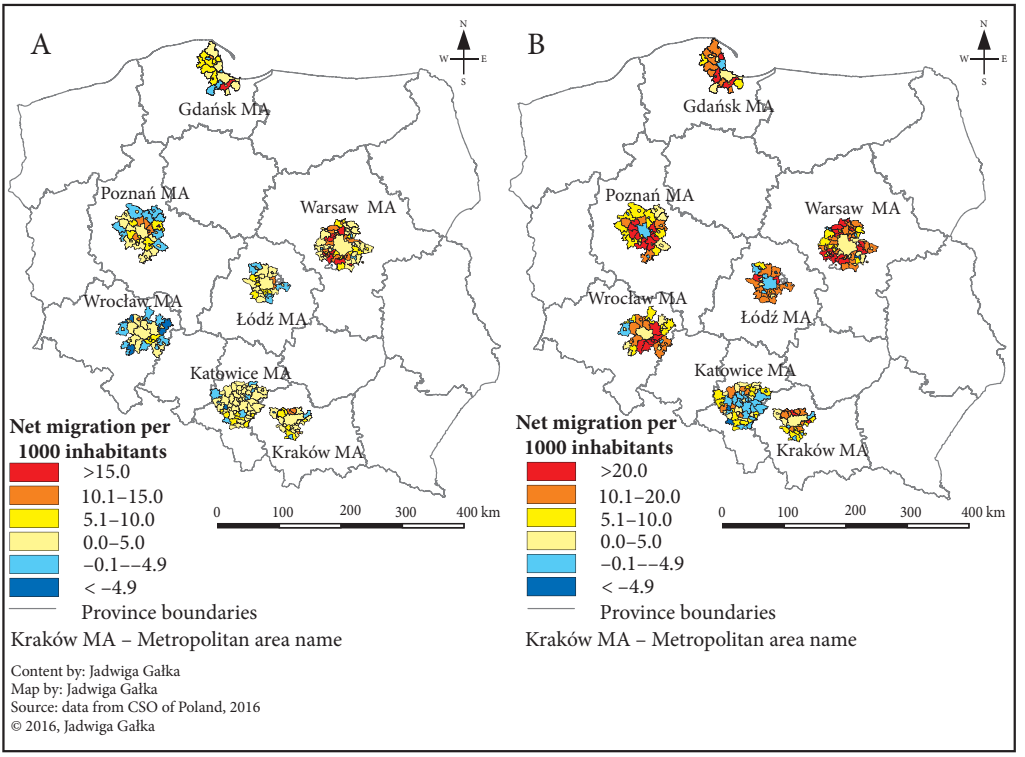

Figure 4: Net migration in Polish metropolitan areas: a) 1995, b) 2012 (data from the Central Statistical Office of Poland).

In 2012, suburbanization was not as dynamic as in 2007. The rate of inflow into the suburban zones of all metropolitan areas analyzed was lower (Table 1). The most severe decrease in population inflow was observed in centers where suburbanization started to develop earliest: the Łódź, Warsaw, and Poznań metropolitan areas. On the other hand, the Gdańsk, Wrocław, and Katowice metropolitan areas, despite the decrease in intensity of urban population inflow by 2.5 to 2.7 per mille points, still had high values of the ratio: above 15‰. In the case of the Kraków Metropolitan Area, the ratio of urban population inflow remained at a level of approximately 13‰. It is worth noting that the process of urban population inflow occurred in the first and second ring of municipalities surrounding the centers of Warsaw, Poznań, and Kraków (Figures 3b, 4b). These residents were also moving to municipalities less attractive in terms of natural values or transport accessibility. The slight weakening of suburbanization processes in Polish metropolitan areas noted in 2012 could be the result of the economic crisis that started at the end of 2008. The impact of the crisis was observed particularly in the construction industry, and not only in Poland but also in other central and eastern European countries; for example, Bulgaria, the Czech Republic, Estonia, Hungary, and Slovenia (Stanilov and Sýkora 2014). Difficulties in obtaining housing loans caused the decrease in sales of newly built dwellings. Furthermore, anxiety about job loss prevented some people from buying their own apartment and moving to a suburban zone (Tworek and Valouch 2011). However, a revival of the real estate market and internal migration might be expected within the next few years, when the economic situation becomes more stable.

Poland is unique in that its suburbanization processes are taking place alongside urbanization processes that continue to enhance the demographic and economic base of large cities. This point is clearly demonstrated by the net population change for Warsaw (+3.2‰), Kraków (+0.6‰), and Wrocław (1‰). Other major cities in Poland have lost population to their suburban zones (Table 1).

4 Conclusion

The dynamic development of suburban zones initiated by the transition in Poland is one of the stages of urban development. Today, suburbanization is the dominant force at work in Polish metropolitan areas, with each area developing at its own pace. The observed outflow of population from central cities to suburban zones took place most rapidly in urban centers that made a successful transition from a communist economy to a market-based economy. This was especially true of Warsaw, Poznań, and the »Tri-City« (Gdańsk, Sopot, and Gdynia). The Silesian Metropolitan Area, on the other hand, began to lose population following the transition both from its core cities and its suburban zones. In terms of the urban cycle model, it can be argued that the Silesian Metropolitan Area is currently in a deurbanization and deconcentration stage as a result of its sudden loss of population.

The main conclusion is that further suburban development in Polish metropolitan areas will depend on a variety of factors, not only on individual preferences of inhabitants, but also on real estate prices in cities and suburban zones, as well as availability of housing loans. Following the economic crisis in 2008, the banks adopted stricter criteria for providing housing loans, which made them accessible to only a limited number of people.

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Acta geographica Slovenica, 58-2, 2018, 73–85

WHAT IS THE TOURIST LANDSCAPE? ASPECTS AND FEATURES OF THE CONCEPT

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DOI: https://doi.org/10.3986/AGS.3311
UDC: 911.5:338.48
COBISS: 1.01

What is the tourist landscape? Aspects and features of the concept

ABSTRACT: This paper will present a systematic review of the main publications for landscape and tourism research in Scopus and polish language databases. These were used to identify papers on landscape and tourism published from January 2003 to September 2013. A total of 382 articles and 37 other sources were identified, but 116 analysed. The analysis, focusing on the explicated relation between landscape and tourism, shows that it is a new but growing concern for geographers, ecologists, and landscape architects contributing to the debate. The result is a veritable smorgasbord of definitions and approaches. The objective of this paper is to systematise the current knowledge on tourism and landscape, review the existing definitions of the term »tourist landscape«, and determine its aspects and components in the context of functions of regions. The paper concludes with a tentative definition of a tourist landscape and proposals for further scholarly research and some policy advice.

KEY WORDS: sustainable development, literature review, definitions of landscape, landscape structure, features of tourist landscape, tourism space, landscape perception

Kaj je turistična pokrajina? Vidiki in značilnosti pojma

POVZETEK: Članek vsebuje sistematičen pregled glavnih del s področja raziskav pokrajine in turizma, vključenih v bibliografsko zbirko Scopus in poljske podatkovne zbirke. V teh podatkovnih zbirkah so avtorji iskali članke na temo pokrajine in turizma, objavljene med januarjem 2003 in septembrom 2013. Skupno so našli 382 člankov in 37 drugih virov, od katerih so jih analizirali 116. Analiza, pri kateri so se osredotočili na razmerje med pokrajino in turizmom, je pokazala, da je to novo, a vse pomembnejše področje za geografe, ekologe in krajinske arhitekte, posledica česar je široka paleta definicij in pristopov. Cilj tega članka je sistematično urediti trenutno znanje o turizmu in pokrajini, pregledati obstoječe definicije pojma »turistična pokrajina« ter ugotoviti njegove vidike in sestavine v kontekstu funkcij regij. Avtorji članek zaokrožijo z okvirno definicijo turistične pokrajine, predlogi za nadaljnje raziskave in nasveti za politiko obravnavanega področja.

KLJUČNE BESEDE: trajnostni razvoj, pregled literature, definicije pokrajine, zgradba pokrajine, značilnosti turistične pokrajine, turistični prostor, dojemanje pokrajine

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The paper was submitted for publication on November 13th, 2015.
Uredništvo je prejelo prispevek 13. novembra 2015.

1 Introduction

Social awareness of the importance and function of landscape has been increasing in recent years. It is commonly considered as the primary element of European heritage, and as an important factor affecting the quality of life of people (Costanza et al. 1997, De Groot, Wilson and Bouman 2002; Millennium Ecosystem Assessment 2005; Wylie 2007; Gkoltsiou and Terkenli 2012). The establishment of the European Landscape Convention (ELC) in 2000 aptly demonstrates this importance and demonstrates landscape's social, economic, cultural, and ecological role, as well as contribution to society's wealth (European Landscape Convention 2000). Because landscape is a »common resource«, and its state is subject to continuous changes, it requires continuous assessment, protection, management, and planning. Proper functioning of landscape is supported by development based on long term and mutually sustainable relations between social needs, economic activity, and the environment (Nučič 2012).

Tourism, as a currently important area of the economy, also benefits from landscape, leading to its positive and negative transformations (Millenium Ecosystem Assessment 2005; Zaręba 2010). Supporting sustainable development of tourism in relation to landscapes requires treating it as a necessary factor in finding the balance between the maintenance of natural and cultural heritage and social needs and regional economy (Briassoullis 2002). Following the aims of developing sustainable tourism requires paying close attention to the description and evolution of landscape, and ways of managing its resources (Bole, Pipan and Komac 2013).

A review of the available literature referring to the relationship between landscape and tourism shows that it is a new but growing concern amongst geographers, ecologists, and landscape architects. Moreover, a detailed analysis of this literature revealed the appearance of a new term, namely »tourist landscape«, reflecting some evolution in outlining the relationship between the two. However direct descriptions and definitions of the term appear only in a handful of current publications. It is most commonly used in titles of papers without a clear definition (Skowronek, Jóźwik and Tucki 2013).

This paper attempts to present a conceptual framework for tourist landscapes and provides an analysis of the structure of tourist landscapes based on existing literature.

The analysis of the literature described in this paper represents an attempt to provide answers to the following questions:

- In what context are the relations between tourism and landscape presented?
- How has tourist landscape been defined so far?
- What are aspects and detailed elements of tourist landscape?

The determination and understanding of the essence of the tourist landscape is an important component of understanding the geography of any place. Tourist landscape is a resource, permitting the development of various functions, among others social-economic and cultural, including tourism. As emphasised by among others Zaręba (2010) and Kulczyk (2013), any activities aimed at the use of tourist landscape should consider maintenance of the harmony between the natural and cultural environment and social-economic activity. The maintenance of the balance of the aforementioned components contributes to the preservation of spatial order, and permits the development of regions in the long run. It is a very important task for communities and local authorities. It generates the necessity of investigation and determination of components of tourist landscape important from the point of view of its users (tourists and residents) for the purpose of its proper planning and management, as also emphasised by the European Landscape Convention.

2 Material and methods

The objectives of this paper were approached through a content analysis of the literature. Content analysis is a method for an objective, systematic, quantitative, and reliable study of published information and is extensively used as a method for literature reviews.

The content of Polish and international literature focusing on »tourism/tourist« and »landscape(s)« was performed. Among Polish journals, we selected the longest standing scientific journal concerning the theory of tourism (Turyzm), and journals dedicated to landscape and its transformations: Problemy Ekologii

Krajobrazu (issued by Polska Asocjacja Ekologii Krajobrazu – Polish Association for Landscape Ecology) and Prace Komisji Krajobrazu Kulturowego (Polskie Towarzystwo Geograficzne – Polish Geographical Society). Moreover, we considered the most important papers and publications cited by the authors of articles in the above journals, referring to the issue of tourism and landscape.

The analysis covered volumes of journals and publications issued in the years 2003–2013, with titles including key words tourism and landscape, recreational landscape, and tourist space. Initially 362 scientific articles were reviewed, 59 of which were selected for further analysis. Moreover, 19 books and textbooks were collected and used.

The review of articles by international authors was performed based on available papers published in the citation database of Scopus. The search criteria included again the following key words: tourist/tourism, landscape/landscapes. A total of 20 articles were collected, published in 11 journals in the years 1977–2012,

Table 1: Identified papers in literature review

Polish sources		
Journals	Number of papers	Papers included in the analysis
Problemy Ekologii Krajobrazu	228	38
Prace Komisji Krajobrazu Kulturowego	27	8
Turyzm	103	9
Other journals	4	4
Total	**362**	**59**
Books		Included in the analysis
Books		12
Chapters in books		7
Total		**19**
International sources		
Journals		Papers included in the analysis
An International Multidisciplinary Journal of Tourism		1
Annales de Géographie		1
Annals of Tourism Research		5
Environmental Management		1
Human Geographies		1
International Journal of Energy and Environment		1
Journal of Cultural Heritage		1
Landscape and Urban Planning		3
Tourism Geographies		4
Tourism Management		1
Tourism Review		1
Total		**20**
Books		Included in the analysis
Books		13
Total		**13**
Other sources		Included in the analysis
Other sources		5
Total		**5**
Total number of books and papers included in the analysis		
Total papers included in the analysis		79
Total books/chapters included in the analysis		32
Other sources included in the analysis		5
Total		**116**

and 13 books published in the years 1982–2011. Moreover, five conference speeches and presentations related to the issue available on the internet were identified and reviewed. An overview of the publications covered by the analysis is presented in table 1.

At the next stage of the research, a detailed analysis of the content of the 116 scientific papers demonstrating actual engagement and/or use of the term tourist landscape was performed. As a result, the collected sources were divided into groups in terms of the presented relations between tourism and landscape (Table 2). Next, specific papers including definitions of tourism landscape were identified and their definitions scrutinised (Table 3). It turned out that among all of the publications, only 14 scientific papers included such a definition, representing only 12% of the total presented literature on the subject.

The collected and chronologically listed definitions were used for the identification of aspects, components of tourist landscape, and for the development of its proposed definition in this paper.

3 Tourist landscape in the literature

Defining the tourist landscapes is a demanding task. The term *landscape* itself has multiple aspects, dimensions and meanings depending on the disciplinary context in which it is deployed (Wojciechowski 1986; Terkenli 2001; Ostaszewska 2002; Andrejczuk 2010). In tourism, activities are considered in spatial terms covering also the adaptation of space and its management aimed at satisfying tourist needs (Richling 2010). Landscape is, therefore, a crucial aspect of tourist space (Terkenli 2000; 2002; 2006; 2011; Włodarczyk 2009b). Consequently, landscape is an important object of research for tourism, as one to be manipulated, shaped and managed (Pietrzak 2010). The research problems addressed in works pertaining to the relations between tourism and landscape dealing with delimitation and the analysis of its structure and functioning are summarised in table 2.

Referring to the term tourist landscape and its meaning one should be aware that only some recent scientific publications refer to it directly or try to define it. The first works containing the term »tourism/tourist landscape(s)« were published in 1970's, including Ferrario (1978) »The tourist landscape: a method of evaluating tourist potential and its application to South Africa«. Closer to the turn of the Millennium publications such as Healy (1994) »The »common pool« problem in tourist landscapes«, Dietvorst (1998) »Tourist landscapes: Accelerating transformations« and Aitchison, MacLeod and Shaw (2000) »Leisure and Tourism Landscapes« emerged. The works by Terkenli (2000, 2002, 2006, 2011) and Gkoltsiou and Terkenli (2008), focus on tourist landscapes analysing its geographic and cultural components. Papers by Pritchard and Morgan (2000a, 2000b), Rickly-Boyd and Metro-Roland (2010), consider the term in relation to tourist marketing and the evaluation of attractiveness of tourist destinations. The concept of *resortscapes* was introduced by Lu (2011) while analysing the changes in rural landscape structure and local residents' attitude to mass tourism development.

It should be emphasised that in most cases *tourist landscape* is analysed for specifically defined research objectives, without providing or building on a more general definition (see e.g. Chronis and Hampton 2008; Fyhri 2009; Chrenka and Ira 2011; Kulczyk 2013; Xiaobo 2010). However some of the authors did define the term »tourist landscape« in their works. These include Gunn (1979), Wall (in: Jafari 1982), Lozato-Giotart (1993), Dietvorst (1998), Terkenli (2001; 2002), van der Duim (2007), Włodarczyk (2009a; 2009b; 2011), Kowalczyk and Derek (2010), Richling (2010) and Myga-Piątek (2012). Table 3 presents the definitions that can be encountered in their work in chronological order.

The first definitions contained many different wordings. Their common feature, however, was to highlight the touristic function of a landscape as well as its key purpose of meeting the tourists' needs.

At the turn of the Millennium and the years to follow definitions considered the internal consistency (system), the genesis of the landscape, which was the result of environmental changes caused by tourism and the potential of the landscape, which over time can become a tourist landscape.

Table 3 highlights the diversity of the attempts to construct the term »tourist landscape«. They result from authors' research attitude and specifications. Moreover, they are brought about by the lack of scientific discussion of the term in the publications on the topic, where the problem fails to win researchers' attention.

Table 2: The relations between landscape and tourism, a review of research.

Framing of landscapes	Sources
Landscape as a value of tourism development	Scraton (1998) Aitchison, MacLeod and Shaw (2000) Briassoulis and van der Straaten, J. (ed.) (2000) Knudsen et al. (2008) Rickly-Boyd and Metro-Roland (2010) Kulczyk (2013) Pietrzak, M (2003) Wołoszyn, W. (2006) Balon, J. and Jodłowski, M. (2009) Piechota, S. (2009) Richling, A. (2010) Kistowski, M. (2012) Turyzm (2005); 15/1-2, 16/2 (2006), 17/1-2(2007), 19/1-2(2009) Prace Komisji Krajobrazu Kulturowego 14 (2010)
Practical aspect of using landscape for tourism product development	Pritchard and Morgan (2000a; 2000b) Terkenli (2002; 2011) Périgord and Donadieu (2007) Clivaz (2008) Franch et al. (2008) Glińska (2010) Kaczmarek, Stasiak and Włodarczyk (2010) Dudek-Mańkowska (2011)
Landscape as an important link in theoretical discussions on the functioning and development of recreational areas	Kostrowicki (1975) Krzymowska-Kostrowicka (1980)
The role of landscape in visual aesthetic evaluation of natural environment and its influence on tourist and recreational use of the areas	Wojciechowski (1986) Krzymowska-Kostrowicka (1999a; 1999b) Bezkowska (2005)
Landscape perception by tourists	Kowalczyk (1992a; 1992b) Eleftheriadis, Tsalikidis and Manos (1990) Hunziker (1995) Piechota (2006) Jacobsen (2007) Parzych (2009) Fyhri, Jacobsen and Tømmervik (2009)
Landscape as an element of tourist attractiveness of the area	Bezkowska (2003) Kowalczyk (2007) Meyer (2008) Gkoltsiou and Terkenli (2008) Cracolici and Nijkamp (2008) Iatu and Bulai (2011)
4L tourism (Landscape, Leisure, Learning and Limit)	Franch et al. (2008)
Place and significance of landscape in using natural heritage for tourist purposes	Howard and Pinder (2003) Przybyś (2008)
Forming the attitudes towards specific forms of landscape, including tourist landscape	Miossec (1977) Wojciechowski (1986) Dann (1999)
Harmony and authenticity of landscape in tourist destinations	MacCannell (2005) Urry (2002) Chylińska (2008) Suchodolski (2008) Chronis and Hampton (2008) Terkenli (2000; 2002)
Negative influence of tourism on landscape – »landscape depletion«	Zaręba (2010) Chrenka and Ira (2011)

Table 3: Chronological review of the definitions of tourist landscape.

author	year	definition
Gunn	1979	The tourist landscape – total physical and visual environment utilized by all tourism activities, including the whole context and infrastructure of tourism development, such as transportation, services, information, direction and, generally speaking, all such developments that attract people to a destination.
Wall	(in Jafari 1982)	The tourist landscapes are both natural and human-made, designed to serve – or products that emerge from – the accommodation of all needs of tourism development.
Lozato-Giotart	1993	The tourist landscape is a type of cultural landscape, which is reconstructed both in its functional and symbolic structure, from the phenomenon of tourism.
Dietvorst	1998	A tourist landscape can be described as constructed through a myriad of symbolic and material transformations of an original physical and/or socioeconomic landscape in order to serve the interests of tourists and the tourist industry.
Krzymowska-Kostrowicka	1999a	Tourist and recreational landscape is the physiognomy of geographic environment and subjective world of values perceived by a tourist in accordance with a given cultural model it is a natural or urbanised area, where tourism plays at least temporarily a predominant role
Terkenli	2001	The tourist landscape . . . a social interface where local and global perspectives, the sides of supply and demand, production and consumption etc. come together in the ready construction and consumption of place identity.
Terkenli	2002	The tourist landscape emerges as the product of tourism activities, which tend to dominate an area and »infect« its appearance.
van der Duim	2007	»tourismscape« – hidden network of agents/actors and the relations between them which constitute a tourist space, what is consequently called »*tourist landscape*« (as in Włodarczyk 2009b, 96). Significant features of »*tourist landscape*« include network links (internal and external) and its internal coherence (complementarity of facilities and services) (as in Kowalczyk, Derek 2010).
Włodarczyk	2009a, 124; 2009b 90-92; 2011, 268	»*. . . tourist landscape is a physiognomy of tourist space synthesising natural and cultural elements and the effects of man's tourist activeness in space* . . . [. . .] *it can also be defined as a peculiar third dimension of tourist space*« [. . .] »*it is a specific kind or a part of broadly understood cultural landscape*.«
Kowalczyk, Derek	2010, 131-132	»*Tourist landscape is a type of cultural landscape that can be shortly defined as a natural landscape that was modified by tourist and leisure activities of men,* [. . .] *it concerns the areas that were modified by tourism to such an extent that they have their own specificity which makes them different from other of types landscape*.«
A. Richli Richling	2010, 343	»*Tourist landscape* [. . .] *can be defined* [. . .] *as a natural or natural-anthropogenic system which triggers, or can potentially trigger temporary population dislocations away from their place of residence* [. . .] *it is a landscape featuring a potency (non necessarily used) to have tourist functions or a system which is dominated by tourism or in which tourism plays an important role*.«
Myga-Piątek	2012, 151	Tourism landscape is a prototype of cultural landscape, which forms as a result of tourism development, with its predominant function of serving incoming tourists. Tourist type of landscape is primarily determined by not only potential values or dominating functions, but by material elements of tourist infrastructure, which clearly define the space and make it different from other functional types of landscape.

4 The concept of the term

The analysis of the definitions collected in table 3 allows us to distinguish numerous, diverse conceptual approaches to tourist landscapes (see Figure 1). For some authors »tourist landscape« is a particular physiognomy of a geographic environment or tourist space (e.g. Krzymowska-Kostrowicka 1999a; Włodarczyk 2009a; 2009b). Others consider it as the area with its own characteristics resulting from the function (tourism), which distinguishes them from other types of landscape (Kowalczyk and Derek 2010; Myga-Piątek 2012). Yet, for others it is a consequence of the transformation of cultural landscapes resulting from the constant development of tourism (Dietvorst 1998; Kowalczyk and Derek 2010; Lozato-Giotart 1993; Myga-Piątek 2012). Moreover, »tourist landscape« is seen as:

- natural or natural-anthropogenic system with appropriate potential to have a tourist function, which generates or can generate tourism movement (Wall in Jafari 1982; Richling 2010),
- the area where tourism has, at least temporarily, a predominant role (Krzymowska-Kostrowicka 1999a; Richling 2010),
- the area where tourism development constitutes an important component of the landscape (Kowalczyk and Derek 2010; Richling 2010).

Slightly different approach is presented by van der Duim (2007), who sees the landscape as a network of agents, human and non-human, internally and externally connected, and by Krzymowska-Kostrowicka (1999) for whom it is tourist's subjective world of values and interpretations.

Having analysed the definitions presented in table 3, the authors suggest emphasising the following aspects and features of a tourist landscape:

Genetic aspect – in this approach »tourist landscape« is a form of cultural landscape. It is a consequence of landscape changes resulting from the development of tourist functions. It is a consecutive »layer of cultural landscape«, which can be homogeneous or heterogeneous (coexistence of different types of landscapes attractive for tourism in a given destination). It can be featured with different levels of authenticity.

Physiognomic aspect – tourist landscape reflects tourism development which is aimed at meeting tourists' expectations and the requirements of the tourist economy. It is a particular physiognomy of tourist space, which links natural and cultural elements with the effects of tourism activity, which differs fundamentally from other types of landscape.

Functional aspect – tourist landscape has a potential (not necessarily used) to have tourist functions. It is an area where tourism can have, at least temporarily, a predominant role. Each stage of development of tourist function is accompanied by different stages of development whereby tourist and para-tourist facilities are built.

Interrelated network aspect – tourist landscape is composed of various network connections (internal and external), characterising internal coherence which consists of complementary facilities and services.

Social aspect – tourist landscape is closely connected with the presence of tourists, it is the object of tourists' interest and can potentially generate tourist movement. It is made to meet tourists' expectations and build a tourist economy. It is selected and used by tourists according to the preferred form of action.

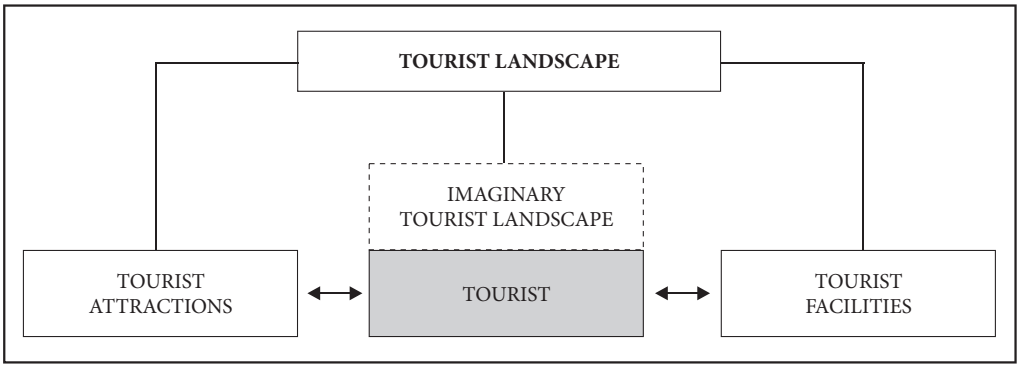

Figure 1: The components of the tourist landscape.

Tourist landscape is the object of subjective evaluation and confrontation by tourists having their expectations. It is taken into considerations in plans and implementation schedules.

The above five points demonstrate the complexity of the term and imply the necessity to conduct multidirectional research to operationalise the tourist landscape for purposes of analysis. Therefore a particularly significant issue in constructing a definition of tourist landscape is the selection of the main elements that constitute the term. Only one study (Gkoltsiou and Terkenli 2012) attempted that. On the basis of tables 2 and 3 we focus on the three components depicted in figure 1, in relation to the immaterial elements of tourists, perceptions and expectations.

The following three components entail attractions, facilities and presence.

Tourist attractions – in tourist landscape there are specific features and elements of natural or cultural environment which are the subject of tourists' interests, meet their preferences and expectations and attract them to a given destination.

Tourist facilities – tourist function of the area is conditioned by the presence of tourist facilities and services that are connected by their functions and complementarities, which were designed to make attractions available and accessible for tourists, and which serve the purpose of satisfying touristic and recreational needs (as in Kowalczyk and Derek 2010).

Tourists – the presence of tourists and tourist movement, resulting from the interest in a given landscape, make the previous natural or cultural landscape have a new function – a tourist one, which becomes equivalent or predominant to a previous one.

Imaginary tourist landscape – underpins the three components of the tourist landscape. This is the immaterial elements directly related to a tourist. They are made of expectations, feelings and emotions, established before, during and after a trip by any tourist. Tourists choose the destinations according to preferred form of activities and interests. Then, during the stay in the landscape encountered at a destination these activities are contrasted with expectations that have been shaped by social environments and the media. The landscape of a destination is perceived with senses and emotions. All the above mentioned elements constitute a physiognomy of tourist landscape, which make it different from other types of landscape, e.g. urban, industrial or rural.

5 Definition of tourist landscape

On the basis of the provided comprehensive literature review we suggest that a tourist landscape is a significant type of landscape, functionally related to tourists and tourism activity. It's an integrated and complementary whole meeting the needs of tourists and tourism through its operationalising of natural and cultural elements. A tourist landscape is characterised by the dominant presence of tourists, tourist attractions and tourist facilities. Tourist landscape is not uniform (there are different types and variations thereof). It is characterized by subjective evaluation and a confrontation by tourists, in connection with their perceptions and expectations, which affect its continuous transformation.

Based on these considerations we identify tourist landscape as an area, peculiar in its physiognomy and structure, differing from other landscape types. It is recognizable and accepted by its users, created to meet their touristic and recreational needs and expectations.

6 Conclusion

Landscape is currently one of the most important resources for the development of tourism. This area of the economy has a multidimensional effect on the geographic environment. The effects are both positive (e.g. economic growth of regions, protection and promotion of the natural and cultural heritage) as well as negative – through appropriation of resources used for various purposes, increased pollution, and loss of the authentic character and harmony of places. Krippendorf (1975, see also: Jędrzejczyk 2000) described the tourist economy as the »devourer of landscape«, emphasising the ever growing tourism demand globally and how this leads to places being irreversibly transformed for tourism purposes. Following Krippendorf's provocation the analysis of the relations between tourism and landscape grew, reflected in the number of scientific publications referring to the issue, increasing over recent decades.

The objective of this paper was to systematise the current knowledge on tourism and landscape, review the existing definitions of the term »tourist landscape«, and determine its aspects and components in the context of the functioning of regions.

The literature review presented above shows that the analysed subject is valid and increasingly present in research papers by representatives of various scientific disciplines (among others geography, landscape ecology, sociology, and economy). By referring to the relations between tourism and landscape, the authors emphasise their mutual relations, varied interdependencies, use of landscape by tourism, and effect of tourism on landscape, resulting in its transformations. The direct effect of tourism on landscape, resulting from meeting various types of human needs, is its specific form and physiognomy described as »tourist landscape«. In prior research however, definitions of the term lack the rigour here presented as they suffer from the specificity of the research interests of the authors, and particularly from the lack of scientific discussion concerning the term in the literature on the subject. The diversity of approaches presented above, and the specified aspects and features of tourist landscape demonstrate the challenges of defining the concept and underline the necessity of performing multidirectional research on its essence. Our proposed definition of the »tourist landscape« should contribute to ordering knowledge resources and better understanding the essence of the term, and therefore help determine the conditions and desired directions of use of its resources and values.

Our tentative definition of the term tourist landscapes will permit the identification of spatial structures with specific features and parameters for tourism, determine functionality (preferences of various groups of recipients), sustainability (environmental capacity, preferred forms of tourism), and provide for measurability (price of the tourist offer, level of development of tourism in the region). This is in accordance with the guidelines of the European Landscape Convention in the scope of assessment, management, planning, and landscape protection and sustainable tourism.

Moreover, the results of the performed study suggest the appearance of another research problem, not considered in the paper's objectives, i.e. developing a tourist landscape typology. Lack of such detailed classifications is emphasised among others by economists dealing with the assessment of landscape capital for the purposes of tourism development (Panfiluk 2013).

The discussion included in this paper, and proposal of the definition and further research on the typology, constitute the authors' modest contribution to the scientific discussion. The explanation and specification of the term »tourist landscape« obviously requires further research and work. The literature review was performed based on online data sources available to the authors. Studies considering all possible sources could reveal a somewhat different image of the analysed phenomenon.

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Acta geographica Slovenica, 58-2, 2018, 87–100

THE ENHANCEMENT OF CULTURAL LANDSCAPES IN MOUNTAIN ENVIRONMENTS: AN ARTIFICIAL CHANNEL HISTORY (TORRENT-NEUF, CANTON VALAIS, SWITZERLAND) AND THE ROLE OF TREES AS NATURAL ARCHIVES OF WATER FLOW CHANGES

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The Torrent Neuf artificial channel in the section excavated in the argilloschists. Specimens of *Picea abies* (L.) H. Karst., on which dendrochronological analysis was performed, are distributed along the channel.

DOI: https://doi.org/10.3986/AGS.4137
UDC: 911.53:582.091(494)
COBISS: 1.01

The enhancement of cultural landscapes in mountain environments: An artificial channel history (Torrent-Neuf, Canton Valais, Switzerland) and the role of trees as natural archives of water flow changes

ABSTRACT: Cultural landscapes represent one of the best examples of the interaction between human and natural environment and cultural trails are an effective way for their valorization. The Torrent-Neuf (Canton Valais, Switzerland) is a cultural trail realized in 2009 along one of the artificial channels used in the region since Medieval times to move water resources from tributary valleys to irrigated lands. Slope instability processes and high maintenance costs provoked the abandonment of the artificial channel in 1934. In 2005 water flow was restored in it. Dendrochronological analyses, carried out on trees growing along the artificial channel banks, allowed collecting information about natural and man-induced hydrological changes, contributing to increase the global value of the whole area.

KEY WORDS: cultural landscape, tree rings, geomorphological processes, *Bisses* (artificial channels), cultural trails, Swiss Alps

Povečanje vrednosti kulturnih pokrajin na gorskih območjih: zgodovina namakalnega kanala Torrent-Neuf v švicarskem kantonu Valais in vloga dreves kot naravnih arhivov sprememb v vodnem pretoku

POVZETEK: Kulturne pokrajine so eden najboljših primerov interakcije med človeškim in naravnim okoljem, kulturne poti pa so učinkovit način njihovega vrednotenja. Kulturno pot Torrent-Neuf v švicarskem kantonu Valais so odprli leta 2009. Poteka ob enem izmed namakalnih kanalov, ki so jih na tem območju vse od srednega veka uporabljali za to, da so vodo iz rečnih dolin speljali na namakalna zemljišča. Zaradi pobočnih procesov in visokih vzdrževalnih stroškov so kanal leta 1934 opustili, leta 2005 pa vanj znova napeljali vodo. Z dendrokronološkimi analizami dreves, ki rastejo na njegovih bregovih, so bili zbrani podatki o naravnih in antropogenih hidroloških spremembah, kar je prispevalo k povečanju splošne vrednosti celotnega območja.

KLJUČNE BESEDE: kulturna pokrajina, drevesne letnice, geomorfološki procesi, umetni kanali, kulturne poti, švicarske Alpe

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The paper was submitted for publication on February 2nd, 2016.
Uredništvo je prejelo prispevek 2. februarja 2016.

1 Introduction

Within the European Landscape Convention, landscape is defined as »*an area, as perceived by people, whose character is the result of the action and interaction of natural and/or human factors*« (Niță et al. 2015). Landscape may assume different values in relation to human perception (Panizza and Piacente 2003). The relationship between human communities and the natural environment is close and may change during time mainly as a consequence of climate change influencing geomorphological processes (e.g., Evans and Clague 1994), of land use (e.g., Serra, Pons and Saurí 2008) and of economic and cultural factors (e.g., Fan et al. 2014).

Vice versa, human activities influence and affect landscape evolution itself (e.g. Goudie 2013).

The combination of natural modeling of a territory and human action gives origin to cultural landscapes that are more precisely defined by UNESCO (2012) as »*cultural properties* [that] *represent the combined works of nature and of man*.« Examples of human artifacts contributing to the delineation of cultural landscapes are present in very different morphoclimatic and morphogenetic environments. »The dying town« of Civita di Bagnoregio (Central Italian Apennines) (Figure 1) is one of the most exemplar cases for the troubled human-nature relationship due to the strict interaction between active badlands shaped on clays (i.e., geological heritage) and the town (i.e., cultural heritage). The village, built on a residual mesa using blocks from the more resistant volcanoclastic deposits, is »dying« as a consequence of the lowering of the shale topographic level and the contemporary retreat of volcanoclastic cliffs due to rockfalls (Gregori 2011).

Human-induced changes may be more or less persistent depending on the local environmental characteristics, as explained by Latocha (2015) about a National Park of Ireland, where old anthropogenic landforms persist despite strong depopulation after the middle nineteenth century. Such signs of the long-lasting human–environmental interaction may become meaningful educational opportunities (Latocha 2015). This is also the case of the remnants of the 1st World War conserved inside glaciers and in some high mountain sites, as in the Alps (Ortles-Cevedale Group; Diolaiuti and Smiraglia 2010). High mountain environments represent in particular key areas to observe the ongoing rapid changes in natural biotic (e.g. tree line shifting; Leonelli, Pelfini and Morra Di Cella 2009; or colonization of deglaciated areas by vegetation; Garbarino et al. 2010) and abiotic systems (e.g., glacier fluctuations; Diolaiuti and Smiraglia 2010) also in relation with human activities (e.g., impact of tourism on erosion rates along mountain trails; Pelfini and Santilli 2006). More in detail, at higher altitudes glacier advances and retreats conditioned hydrological availability

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Figure 1: Civita di Bagnoregio (Central Italian Apennine), the »dying town«, is a cultural landscape, where the nature-man interaction is particularly meaningful. The town is a candidate for the insertion in the UNESCO World Heritage List. The access to the town is granted by an artificial viaduct due to erosional lowering of the topographic surface that connects Civita to the main Bagnoregio town.

(Barnett, Adam and Lettenmaier 2005), travelling possibilities in the past and economic activities as summer skiing in more recent times (e.g., Diolaiuti et al. 2006). As a cascade effects, at lower altitudes, cultivated areas changed in their location according with stream activities and modifications (e.g., Piao et al. 2010).

In recent times cultural and thematic paths have been proposed to promote natural and cultural landscapes accompanied by guides and/or panels, helpful for acquiring knowledge about the changing landscapes under changing climate conditions (Garavaglia and Pelfini 2011) or human activities. Changes in landscape features, such as the aesthetic attributes (Smrekar, Polajnar Horvat and Erhartič 2016), influence the landscape perception by local populations, visitors and tourists (Garavaglia et al. 2012; Schirpke et al. 2013) as well as socio-economic changes can impact on the immaterial cultural heritage (Hidalgo, Borsdorf and San Martín 2014). In the particular case of mountain landscapes, many human activities were abandoned during the past decades, with serious consequence on the loose of cultural traditions (Benayas et al. 2007) and territory maintenance, as it is the case of slope terraces (Tarolli, Preti and Romano 2014). An example of ancient abandoned activities interacting with natural components (i.e., water, geomorphological processes and vegetation) is represented by the network of artificial channels that have been used since Medieval times to irrigate agricultural land in the Rhone River watershed (Canton Valais, Switzerland) (Lehmann 1913; Mariétan 1948; Bratt 1995; Papilloud 1999; Reynard 2008). They are called *Bisses* in the French speaking part of the canton and *Suonen* or *Wasserleite* in the German speaking area. The unstable conditions provoked by active geomorphic processes on the mountain slopes (Michelet 1998), along which some of the suspended channels were built, were responsible for the very high maintenance costs, inducing their abandonment. It is the case of the Torrent-Neuf (translation: »new channel«; TN) (see Figure 2a), a channel located in the Savièse municipality was built between 1430 and 1448 AD. The TN was partly abandoned and replaced by an underground tunnel between 1934 and 1935 (Mariétan 1934; Schweizer and Reynard 2011). An interesting project of restoration, started in 2001, was addressed to the creation of a cultural trail to enhance the channel building techniques and the relations with the natural environment (Figure 2), especially with the geomorphological processes active along the trail itself.

The restoration was aimed at recovering an important cultural component of the landscape (Hauge 1988) to favor inhabitants and tourists' behavior towards environmental conservation (Zhang et al. 2015).

In the cultural landscape evaluation, multidisciplinary approaches to investigate interaction between biological and abiological components of the environment are growing in importance (Büntgen et al. 2006; McEwan and Mc Carthy 2008; Leonelli, Pelfini and Morra Di Cella 2009; Bollati et al. 2016). Among them, dendrochronological analyses are considered precious source for environmental and climatic information (Fritts 1976) as well as human impact (Röpke et al. 2011; Leonelli et al. 2012) and evolution rates (Bollati et al. 2012; Stara, Tsiakiris and Wong 2015) as trees record them in the annual rings characteristics.

Figure 2: Building techniques used for the TN, from less resistant lithotypes on the left to more resistant lithotypes on the right: a) normal cross section of the channel; excavation in the more erodible lithotypes (photo by Bollati Irene); b) channel cut into the rock (photo by Cagnin Davide); c) hanging channel; especially used for more resistant lithotypes (photo by Reynard Emmanuel). Sketches by Schmid (1935): in white, soft rocks (see section a); in grey, hard rock, in section b and c.

Dendrochronological analyses have been recently performed to investigate the evolution rate of cultural landscapes (Bollati et al. 2012; Stara et al. 2015).

The aim of this work is: i) to analyze the role of trees bordering the TN banks as a natural archive of natural and man-induced hydrological changes; ii) to assess the educational value of tree rings as a source of information about drainage changes, possibly adding value to the cultural landscape; iii) to improve the global value of the trail in relation with its historical, geomorphological, natural and emotional components.

2 Study area

The TN runs along the left side of the Morge River, a right tributary of the Rhone River (Fig. 3b). In this part of the Rhone River watershed, climate is continental, characterized by low mean annual rainfall (600 mm/y as recorded at Sion meteorological station (SMS) 500 m a.s.l., 4 km away from the study area; data: Meteoswiss … 2016), high mean annual temperature, relatively to the geographical position of the site within the Alps (9.6°C in Sion) and a strong daily and annual thermal excursion (Reynard 1995). Annual rainfall altitudinal gradient is estimated to be 35 mm/100 m below 1500 m a.s.l. Therefore, the mean annual rainfall in the studied area (1150 m, Figure 3a) is about 830 mm/y. Mean annual temperature is about 7.1°C.

The Morge River valley is eroded by fluvial and glacial processes in sedimentary rocks of the Helvetic domain (Masson, Herb and Steck 1980), owing to the Sublage nappe. In the middle part of the valley concerned by this research, limestone alternates with schist levels. Due to the nappe configuration and the general dipping of rock strata towards South-East, the transverse profile of the Morge River valley is very asymmetric: the left side of the valley – the sector occupied by the investigated artificial channel – is very steep, whereas the right side presents more gentle slopes. On the left side, the most frequent slope processes are rock falls, debris flows and debris and snow avalanches that frequently damaged the TN (Michelet 1998). Along the TN, the alternation of lithologies, characterized by different resistance to erosion, geotechnical stability and permeability properties, induced the use of different techniques suitable for the different rock typologies (Mariétan 1961; Reynard et al. 2012) (Figure 4). Where calcareous lithotypes are more abundant, the suspended channel techniques (Figure 2c) were preferred to the excavation (Figures 2a; 2b) that is more suitable for the argilloschists outcrops and it is the most used in the entire Canton of Valais.

Due to the slope processes affecting especially the upper part of the TN, the open-air tunnel was replaced by an underground tunnel in 1934–1935 (Mariétan 1934; Schweizer and Reynard 2011). Water flow was reactivated in some sections of the TN only in 2001. In 2008, within the framework of a cantonal trend of revaluation of artificial channels, the Association pour la Sauvegarde du Torrent-Neuf (Internet 1) and the municipality of Savièse started the refurbishment of the TN path aimed to tourist use. In 2009 the TN was first re-opened to public after being equipped with informative panels about the history and building techniques (Reynard et al. 2012). Moreover, according to the analysis of geomorphic processes insisting on the trail (Michelet 1998), infrastructures that combine safety conditions and adrenaline experience for the users were designed along the trail (i.e., Tibetan bridges) (Figures 4a, 4b). The banks of the TN are characterized, especially in the excavated final reach where argilloschists outcrop, by abundant vegetation among which Norway spruce (*Picea abies L. Karst. – PaK*) is dominant.

3 Methods

Dendrochronological investigations were conducted on trees growing on the TN banks in the portion where argilloschists mainly outcrop, and in the surrounding area. As reported in literature, tree rings allow detection of natural water scarcity with a response that differs according to the species (Abrams, Ruffner and Morgan 1998) and climate context (Mediterranean climate; Battipaglia et al. 2009). The response of *PaK* to climate variations depends also on the altitude of the specimens (Modrzynski and Eriksson 2002). In various study cases *PaK* demonstrated to be sensitive to drought stress (Burczyk and Giertych 1991) as for the Northern forest ecosystems (Aakala and Kuuluvainen 2011), also in sites with similar mean climate conditions as those of the study area (Gryc et al. 2012). Severe droughts may even lead to suffering as far as mortality of trees (e.g., Ogle, Whitham and Cobb 2000), especially when associated with rocky or stony substrate (Mäkinen, Nöjd and Mielikäinen 2001) or other severe disturbances (i.e., fire, human activity, insects; Liang et al. 2003).

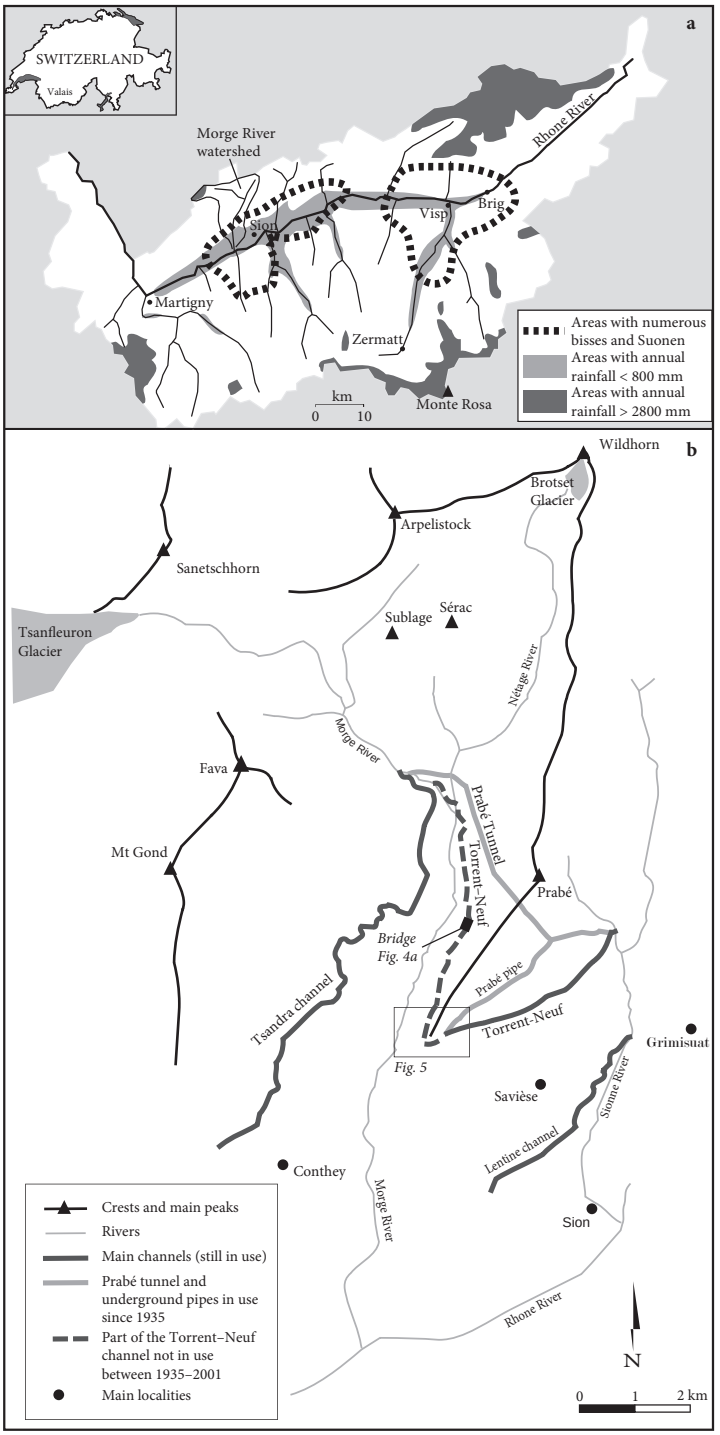

Figure 3: Geographic location and climatic setting of the study area: a) Map of Valais with position of the Morge River watershed; b) Map of the Morge River watershed with the main hydrographic and irrigation features and location of Figure 5.

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Figure 4: Different views of the TN cultural trail: a) one of the Tibetan bridges as visible from the road running on the opposite side of the Morge valley, in 2010; b) the same bridge taken from the trail in 2010; c) the forest and the TN in 2011, in the area where dendrochronological sampling (series D) was performed in 2010.

Rigling et al. (2003) investigated, in a similar physiographic area as that of the TN, by means of dendrochronological analyses the response of *Pinus sylvestris L.* to artificial hydrological changes. They found out that irrigation mitigates the negative effect of climate on the trees and the correlation between radial growth and the summer temperature changes is positive. They registered in addition a radial growth breakdown due to the cessation of irrigation and a period of 6 years necessary for a complete recovering.

In the present work, the analyses were focused on *PaK* and the attention was mainly addressed towards the time interval of water flow interruption (1934/1935–2001/2005). The sampling of *PaK* was performed during summer 2010, focusing on three main clusters of trees along the TN banks (Figure 5):

- 16 trees in the portion of the TN that was completely closed to water flow during the time interval 1934/1935–2001/2005 (D);
- 14 trees in the down valley portion of the TN that was always in use (I);
- 15 trees in the stand uphill to the TN, where the TN influence is considered to be totally absent. This group is considered as the reference site (R).

Two cores for each tree were taken using an increment borer, at the standard height of 1.30 m. Tree-rings width was measured (accurate to 0.01 mm) using the LINTAB and TSAP systems (Rinn 1996), and image analysis was made with WinDENDRO software (Regent Instruments Inc. 2001). The cross-dating of the dendrochronological series was processed visually, considering the coefficients GLK (Gleichläufigkeit;

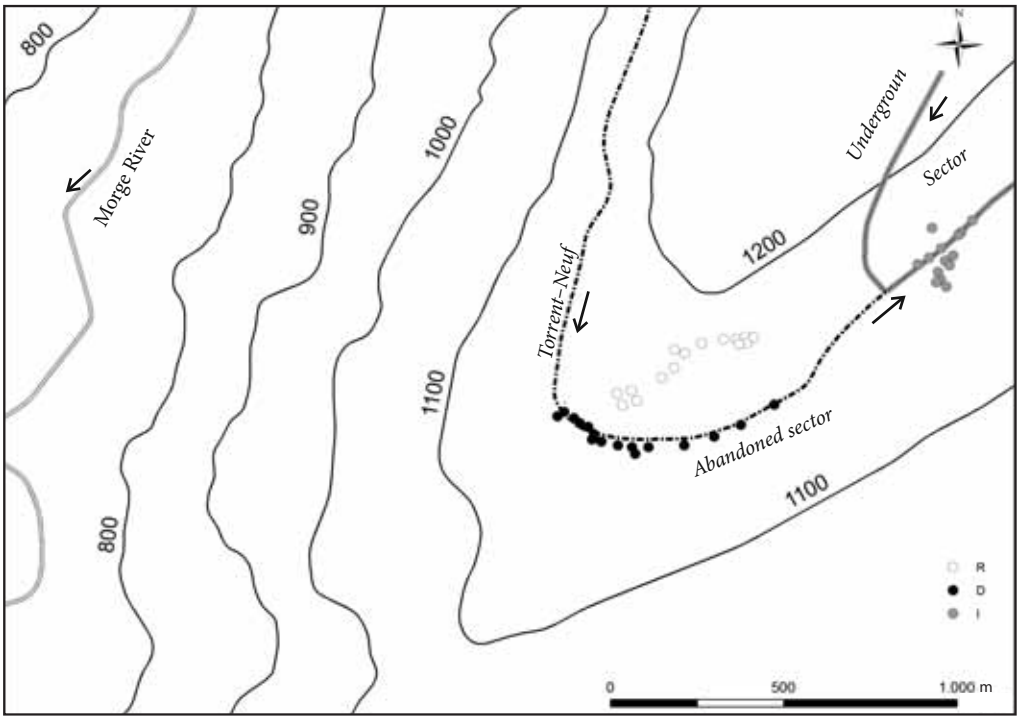


Figure 5: Sampling clusters of *PaK* along the TN: D, portion of the TN that was closed to water flow during the time interval 1934/1935–2001/2005; I, down valley portion of the TN that has been always in use; R, stand uphill to the TN, not in direct contact with the TN, considered as reference site.

Eckstein and Bauch 1969) and the Cross Date Index – CDI (Schmidt 1987), and then statistically using the COFECHA program (Correlation Coefficient, C; Holmes, Adams and Fritts 1986). Mean chronologies were built from single growth curves and then the growth trend responsible of masking growth anomalies were removed using Arstan software (Cook 1985) through the application of an individual spline.

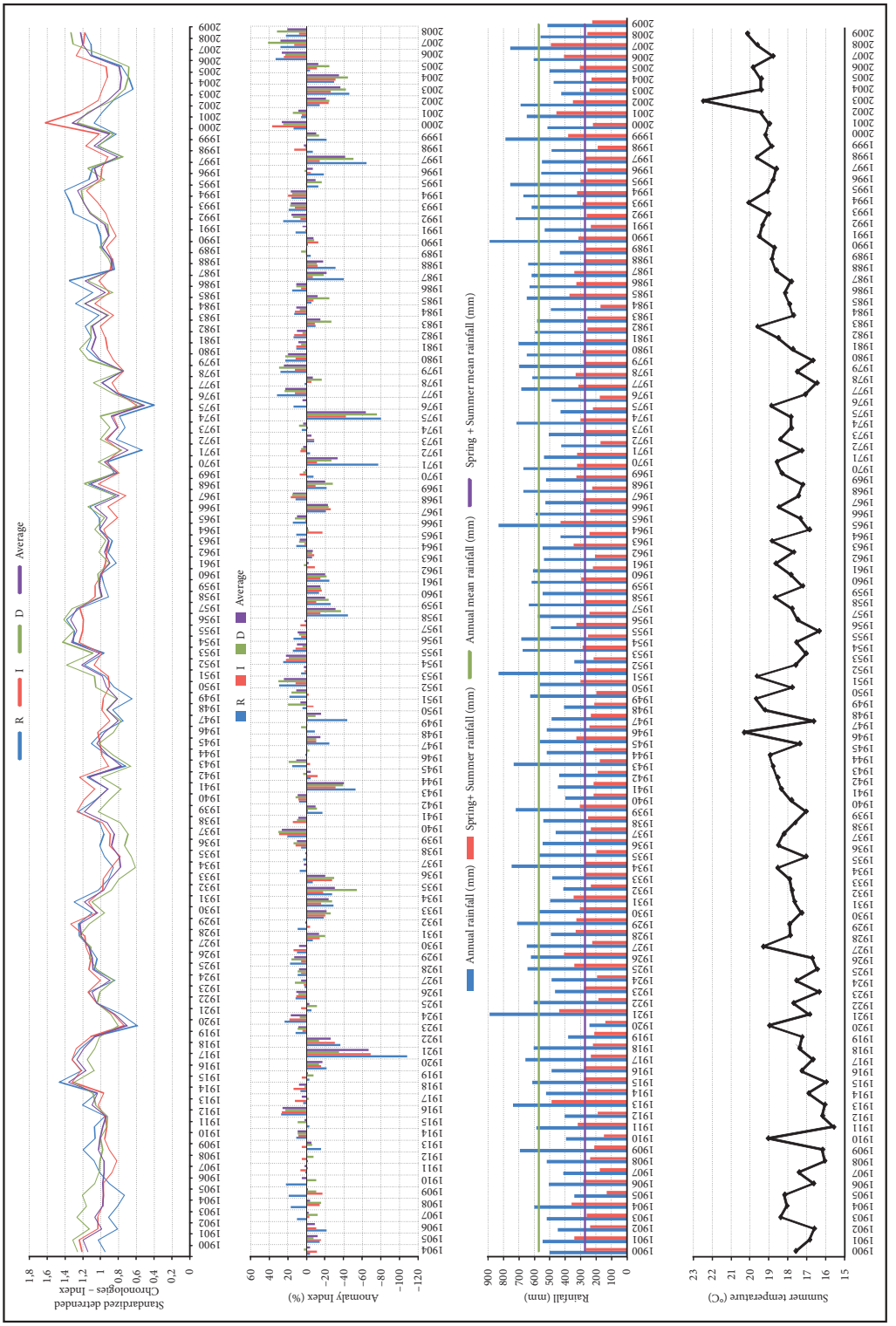
The anomaly index, based on the yearly percentage growth variation (positive and negative) with respect to the mean of the four previous years, with threshold values at 40%, 55% and 70%, was considered for investigating abrupt growth changes (e.g., Bollati et al. 2012). This index is usually an indicator of the suffering of trees and, in the specific case, the correlation with the natural or artificial water privation was searched for. The comparison of abrupt growth changes in R, I and D series and with climatic data acquired at the SMS were used for discriminating the origin of the anomalies and for discussing the possible effects of the water diversion.

4 Results

The average indexed chronologies of the R, D, I clusters of trees of *PaK* for the time interval 1901–2009 are reported in Figure 6a. Anomaly indexes are reported in Figure 6b.

The quantitative parameters show good correlation values: GLK > 69, CDI > 70 and C = 0.399–0.645.

Figure 6: Comparison between results from dendrochronological analysis and climate records from SMS; data: Meteoswiss) for the time interval 1901–2009. a) Standardized tree ring chronologies in sites R, I, D, and Average; the stars indicate drought events that find correspondence in the growth rate; b) Anomaly index (%) for R, I, D, and Average chronologies for the time interval 1904–2009; c) Annual and Spring + Summer (March to August) rainfall depths. Representation of dry years when annual (black circle) and Spring + Summer (grey circle) or both (black dot) rainfall depths are below the average on the considered time interval (1901–2009); d) Mean Summer temperature. ►


Summer temperature (°C)
Rainfall (mm)
Annual rainfall (mm)
Spring+ Summer rainfall (mm)
Annual mean rainfall (mm)
Spring + Summer mean rainfall (mm)
Anomaly Index (%)
R
I
D
Average
Standardized detrended Chronologies – Index

Visually, no opposite growth trends were highlighted among the series, not even in the time intervals close to 1934/1935 and 2001/2005, when a different behavior could be expected at least between I and D series.

The comparison with climatologic data (Figure 6c, 6d) helped us in detecting which anomalies may be due to natural droughts, generally those present in all the chronologies, and which ones are instead related to artificial water suppression.

For what concerns the climatic record, an evident increase in summer temperatures was recorded in specific years (e.g., 1904, 1911, 1921, 1925, 1941–1943, 1949, 1962, 1964, 1976, 2003; Figure 6d). Analyzing the seasonal rainfall data in the time interval 1901–2009, dry years, in which the annual or spring-summer (March to August) rainfall depths are below the average for the period, could be detected. The drought events are distinguished with different symbols in Figure 6c.

Years characterized by rainfall scarcity are highlighted by the anomaly indexes (Figure 6b). The main negative growth anomalies correspond to the years 1920–1921, 1933–1934, 1972, 1975–1976, 1984, 1996, 1998, 2003. In some cases the negative anomaly continued also in the next years (i.e., 1933–1934, 2003). Moreover, the most negative values of the anomaly index were recorded when low rainfall depths were registered for consecutive years (e.g., 1920–1921, 1933–1934, 1972–1976, 1996–1998).

Tree rings series, before the TN deviation, show how drought events (i.e., 1920–1921) induced a more severe negative anomaly in the R series, the only one that could not benefit of the TN water supply.

In the tree ring chronologies, the 1934 year, when trees were water flow deprived, is in the framework of a general negative trend (Figure 6b) that had yet started in 1933 and would culminate in 1935 in all the D, I and R series (40–55% tree cores with negative anomaly). The starting of the negative anomaly, before the TN deviation, may suggest that the closure was not the cause of the abrupt growth reduction. Nevertheless, the D series recorded growth values below I and R series starting from the year 1934 until 1944. The D series shows a more difficult recovering after the low annual rainfall period started two years before. It suffered the water privation more deeply than R series because probably less accustomed to water scarcity. In fact the previous drought events were mitigated, for the trees of the D series, by the artificial water supply. In the same time interval, I series, on the contrary, look like to respond less severely to drought than the D and R series since the water was still provided abundantly along this reach of the TN. Hence, for this first event of water supply change, the only difference among the series that emerges from tree rings seems to consist in the magnitude of the negative growth change (Figure 6a, 6b) and the relative velocity in recovering positive growth values.

For what concerns the re-opening of the TN, in the time interval 2001–2005, an evident positive anomaly was recorded in all the three chronologies in 2001 (Figures 6a, 6b). The series directly involved in the activity of the TN (I and more D) present a greater positive peak in 2001 respect to R series and this behavior may be probably linked with the renewed water availability through the TN. A severe drought event in 2003, a year characterized by high temperature and low rainfall depths, once again provoked a tree suffering until 2007, as evidenced in all the series. This natural drought event was less suffered by the I series probably for the more constant water supply through time respect to D series and for the supplementary water contribution by TN respect to the R series.

5 Discussion and conclusion

The different phases of human interventions on the TN reflect the response to both human needs and natural conditions along the left side of the Morge River valley: 1) the building of the first TN track along the Mount Prabé flanks, due to the necessity of a supplementary water contribute due to the regional climatic conditions; 2) the artificial diversion of the TN inside the mountain due to the water driven and gravity processes interesting the mountain side, and the relative costs of maintenance; 3) the restoration of the original path as a cultural trail adopting special devices in order to guarantee the coexistence of tourism with geomorphic processes in safety conditions.

Along the cultural trail, following the ancient track of the TN, it is possible to make observations on the relationships between human and natural environment in terms of both impact and risk (Cendrero and Panizza 2009).

Dendrochronological investigations on *PaK* allowed us to make some interesting observations on the relationships between climate, vegetation and human activities (i.e., *impact*). The TN does not represent an environment so limited by climate to induce suffering or marked growth decrease in trees after water diversion. The analyzed *PaK* confirm anyway a sensitivity to rainfall regime by well recording the drought years. According to Rigling et al. (2003) man-induced hydrological change may mitigate or exasperate the negative effect of natural hydrological change on trees. Even if the water diversion along the TN did not heavily affected trees growth neither when the TN was closed nor when water started to flow again, the TN chronologies show: 1) how depletion in water availability may influence and slow down the recovery of a »normal growth« after drought years; 2) drought years less affect tree growth when the TN is active. Hence, trees growing on the TN banks recording the drainage changes and climate events, represent new opportunities to disseminate knowledge deciphered from natural archives (Garavaglia and Pelfini 2011; Bollati et al. 2011).

For what concerns the second aspect (i.e., *risk*), in the central portion of the trail, where Tibetan bridges allow the visitors to cross debris flow prone areas (Figures 4a, 4b), the effects of geomorphological processes inducing the channel abandonment are clearly observable in safety conditions. Here the emotional component of the landscape favors the knowledge of hazardous processes and increases the value of the cultural trail and landscape, offering possible applications in terms of hazard and risk education (Pelfini et al. 2009; Coratza and De Waele 2012).

Both the natural components considered in this research (i.e., trees as archives of hydrological, climatic and human related data and geomorphological features testifying hazards) increase the scientific and educational values of this cultural landscape, especially in relation with its historical and emotional components. These results can be proposed as a new way of »reading« the environmental history widening the potential public that is interested not only in the recovery of cultural traditions but also in the interactions between natural and cultural components of a dynamic landscape.

ACKNOWLEDGEMENT: We thank the Institute of Geography and Sustainability of the University of Lausanne for funding part of this research and Jean-Michel Fallot (University of Lausanne) for providing climatic data.

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Acta geographica Slovenica, 58-2, 2018, 101–110

EASTERN EUROPEAN CITIES AS COMMAND AND CONTROL CENTERS IN A TIME OF ECONOMIC CRISIS

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Warsaw CBD.

DOI: https://doi.org/10.3986/AGS.3124
UDC: 911.375:338(4-191.2)
COBISS: 1.01

Eastern European cities as command and control centers in a time of economic crisis

ABSTRACT: This article describes the command and control function of eastern European cities based on the financial performance of the largest corporations with headquarters in the region and the impact of selected sectors on this function. Research has shown that, despite the global economic crisis of 2008–2012, the revenue and net income of the companies studied have increased to some extent. Currently, the strongest »command and control cities« in eastern Europe are Warsaw and Prague. The sector that exerts the greatest influence on the regional command and control function in eastern Europe is the consumer business and transportation sector. The economic crisis has also produced a geographical pattern in eastern Europe that runs counter to current global trends: companies in the region currently tend to concentrate their headquarters in fewer cities, which is becoming common in other parts of the world. The article employs a standardization method based on the mean and standard deviation of financial values for each corporation studied.

KEY WORDS: economic geography, corporation, headquarters, command and control function, Deloitte, Eastern Europe

Vzhodnoevropska mesta kot središča vodenja in upravljanja med gospodarsko krizo

POVZETEK: V članku avtorji opisujejo funkcijo vodenja in upravljanja vzhodnoevropskih mest na podlagi finančne uspešnosti največjih gospodarskih družb, ki imajo sedež v tej regiji, ter vpliv izbranih sektorjev na to funkcijo. Raziskava je pokazala, da so se neto dohodki preučevanih podjetij kljub svetovni gospodarski krizi med letoma 2008 in 2012 še nekoliko povečali. Trenutno sta najmočnejši »središči vodenja in upravljanja« v Vzhodni Evropi Varšava in Praga. Sektorja, ki najmočneje vplivata na regionalno funkcijo vodenja in upravljanja v Vzhodni Evropi, sta prevozništvo in sektor izdelkov za široko rabo. Zaradi gospodarske krize se je v Vzhodni Evropi oblikoval tudi geografski vzorec, ki se ne ujema s trenutnimi svetovnimi trendi: težnja podjetij v tej regiji je, da trenutno svoje sedeže zgoščajo v manj mestih, kar postaja vse bolj značilno tudi drugod po svetu. Avtorji v članku za vsako preučevano gospodarsko družbo uporabljajo metodo standardizacije, ki temelji na povprečju in standardnem odklonu finančnih vrednosti.

KLJUČNE BESEDE: ekonomska geografija, gospodarska družba, sedež, funkcija vodenja in upravljanja, Deloitte, Vzhodna Evropa

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This paper was submitted for publication on October 6th, 2015.
Uredništvo je prejelo prispevek 6. oktobra 2015.

1 Introduction

The early 1990s in eastern Europe saw mass privatization of state-owned enterprises, which became the property of corporations headquartered outside of central Europe (Froot 1994). The region experienced massive investment (Ravbar 2009; Lorber 1999), much of which was foreign direct investment (FDI). The development of innovative sectors such as biotechnology that drive the competitiveness of a modern economy is also being spearheaded by western companies. This is the case with the growing economies of the former Eastern Europe, Asia, Africa, and South America (Dorocki and Boguś 2014; Wójtowicz and Dorocki 2014). The growing profitability of companies headquartered in central Europe as well as the »new« eastern Europe including former Soviet republics is helping these companies earn their way to the top in terms of global rankings (Raźniak, Winiarczyk-Raźniak and Nowotnik 2015).

Hall (1966) investigated the theoretical basis for the concept of a »world city«, and his analysis also mentioned the control function of cities in the economy. This function could be observed by looking at the number of large companies (i.e., those doing business on the international scene) present in each city studied as well as by looking at other key factors. The world city concept was later further developed by Friedmann (1986). Sassen (1991) argues that changes in the functioning of cities have had a positive effect on both international business activity and the urban form itself by controlling immense economic resources. At the same time, significant mobility of capital appears to be the most important element of globalization. In effect, an international economic system emerges in which cities are better interconnected with one another and acquire greater economic power as a result of this interconnectedness.

Starting in the 1970s, major corporations operating in the United States began to move their headquarters from large cities to smaller cities outside of large metropolitan areas due to lower living and operating costs and better infrastructure (Lyons and Salmon 1995). In addition, Sassen (2006) notes that many cities are slowly losing their significance as centers of highly specialized functioning. At the same time, advanced manufacturing services still remain in large cities, while command and control functions are moving away to regional and locally important smaller cities.

This concept is the key to understanding cities in the process of globalization. Research on the number of headquarters of world corporations reveals a specific strength of cities in the area of command and control. However, this is not the only measure of a city in the global scheme of cities (Taylor 2004). Csomós (2013) used the publicly available financial data for the largest corporations to calculate a Command and Control Index for the most important cities of the world, including Tokyo, New York, London, Beijing, and Paris.

The literature includes a number of articles on command and control functions for cities around the world (Friedmann and Wolff 1982; Alderson and Beckfield 2004; Taylor and Csomós 2012; Csomós and Derudder 2013). Countries in eastern Europe are characterized by greater growth in the number of corporate headquarters, corporate revenue, and corporate profit than countries in western Europe (Raźniak and Winiarczyk-Raźniak 2015). Hence, their command and control function in the world economy is increasing. The literature contains a number of studies of this function for selected countries in eastern Europe (Csomós 2015; Śleszyński 2007). However, there does not exist a comprehensive study of the magnitude (and changes therein) of the command and control function for the entire region of eastern Europe.

Hence, the purpose of this article is to identify the economic potential of cities in eastern Europe on the basis of financial data of large corporations with headquarters in the region. In addition, the regional command and control function is also assessed on the same basis for the most important urban centers of the region. The sector diversity of the top cities in the region was also assessed.

2 Data sources and research methods

The economic potential of cities in eastern Europe was analyzed using reports published by the Deloitte company (Deloitte … 2014) for eastern Europe for 2008 and 2012. Since 2008, Deloitte has been publishing a list of the top five hundred companies with headquarters in Albania, Bosnia and Hercegovina, Bulgaria, Croatia, the Czech Republic, Estonia, Hungary, Kosovo, Latvia, Lithuania, Macedonia, Moldova, Poland, Romania, Serbia, Slovakia, Slovenia, and Ukraine. Russia and Belarus were not included due to difficulties in acquiring data from these countries as well as certain doubts concerning the credibility of the data

available (Deloitte … 2014). Each company on the list must earn a certain amount of revenue each year and possess sales offices in at least three countries. This list does not include the banking and insurance sectors, which are covered on a separate list. Banking and insurance companies cannot be excluded from the analysis given their special significance in the international economy, especially in the context of the 2008 global financial crisis. In light of this consideration, fifty companies from the banking sector and fifty companies from the insurance sector were added to the list of the top five hundred most important companies in eastern Europe, resulting in a list of six hundred top companies in the region. The Deloitte company ranks countries and distinct political regions. The selected corporations were assigned to nine different sectors used by the Deloitte corporate ranking system: banking, consumer business and transportation, energy and resources, insurance, life sciences and healthcare, manufacturing, public sector, real estate, and technology media and telecommunications. The geographic location of companies was assigned using metropolitan areas home to their corporate headquarters. Metropolitan areas were also used to identify geographic location by researchers developing the currently established »world city« concept (Internet 1), »global city« concept (Sassen 1991), and Command and Control Index (Csomós 2013). These concepts use the word *city* whenever describing an entire metropolitan area; hence, the authors of this article use the same type of terminology in this article.

Taylor and Csomós (2012) argue that the command and control function in the world economy is performed by cities home to corporations on the Forbes Global 2000 list (Internet 2). This article assumes that the regional command and control function in eastern Europe is performed by cities home to corporations found on the Deloitte Central Europe 500 + 100 list (Internet 3). This is a customized list that also includes the top hundred banking and insurance companies.

This article assumes that the control function in the economy of eastern Europe is performed by cities home to at least three top corporate headquarters. The same minimum number for the Command and Control Index in the world economy was listed by Csomós and Derudder (2014). In this article, this yields an Eastern European Command and Control Index (EECCI). The EECCI employs a standardization method based on the mean and the standard deviation of financial values for each corporation studied used by Csomós (2013) to create the Command Control Index.

$$EECCI_{xy} = \sum_{i=1}^{n_{xy}} \frac{R_{ixy} + S_{ixy}}{2}$$

Where:
R_{ixy} = proportion of revenues from sales in the total dataset;
S_{ixy} = proportion of net income in the total dataset;
i = number of company headquarters per city in a given year ($i \geq 3$);
n = total number of companies headquartered in city x in year y.

The total of revenues from sales and the total of net income for each sector studied in each city studied were used to determine the significance of each sector in each city studied in eastern Europe. The resulting basic measure of cities' economic potential is called the Eastern Europe Sector Command and Control Index (EESCCI).

$$EESCCI_{xy} = \sum_{i=1}^{n_{xy}} R_{ixy} + S_{ixy}$$

Where:
R_{ixy} = proportion of revenues from sales in the total dataset for sector;
S_{ixy} = proportion of net income in the total dataset for sector;
i = number of company headquarters per city in a given sector;
n = total number of companies headquartered in city x in sector y.

3 Eastern European command and control centers

The six hundred eastern European corporations studied were located in 144 cities in 2008 and in 134 cities in 2012. This is the opposite pattern of what is observed in the global economy, where globalization processes

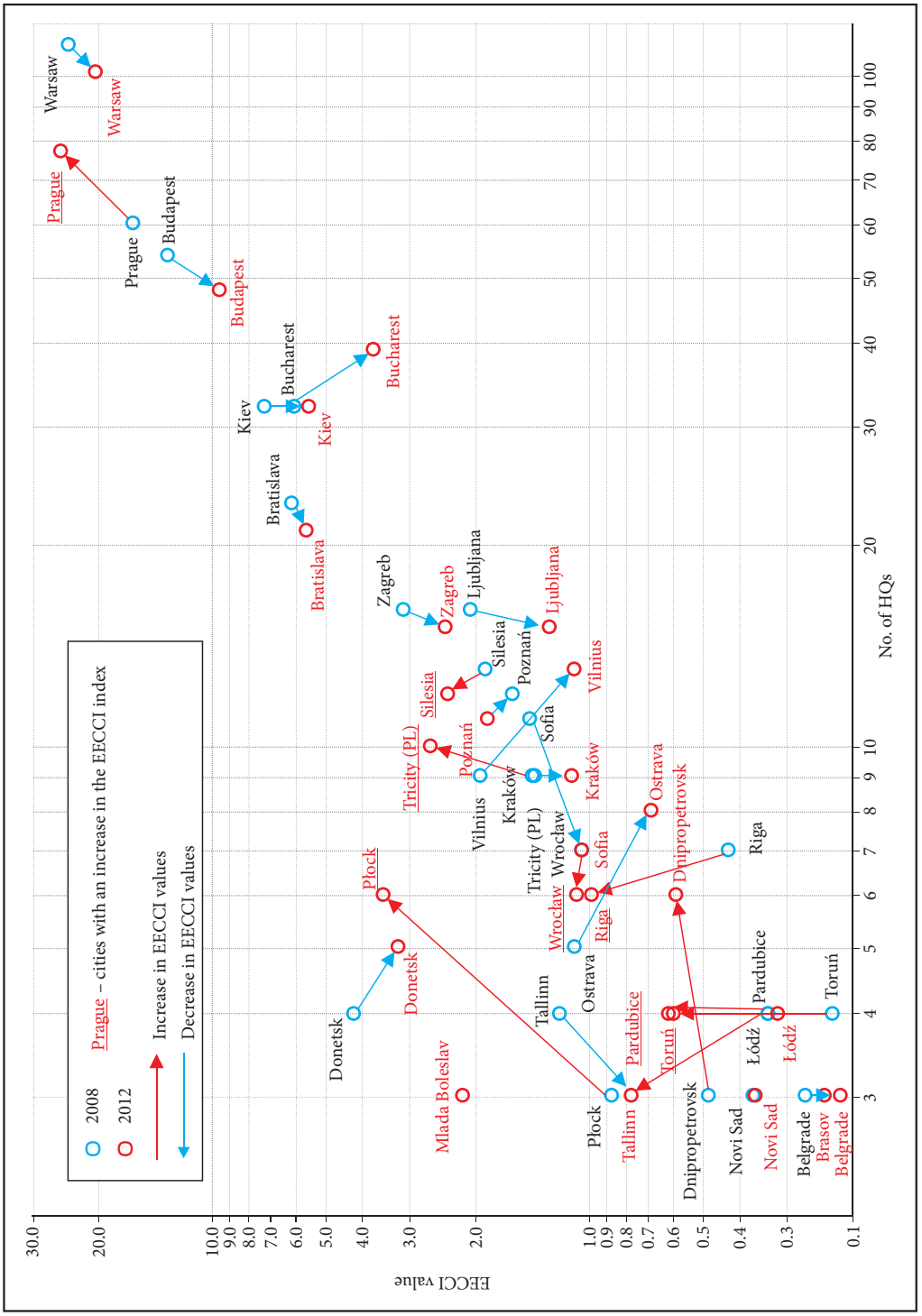

Figure 1: Eastern European Command and Control Index (EECCI) in 2008 and 2012.

continue to increase the number of cities home to the headquarters of top-ranked corporations (Raźniak and Winiarczyk-Raźniak 2015). They were also located in the more developed, western part of the region (Kincses, Nagy and Tóth 2013).

Figure 1 contains a list of cities home to more than three top-ranked corporations as well as corresponding EECCI index values. The largest number of corporate headquarters and the highest EECCI values for 2008 and 2012, which indicate the highest economic potential and the strongest command and control functions, were noted for the capital cities of the six largest countries in eastern Europe: Warsaw, Prague, Budapest, Kiev, Bucharest, and Bratislava. However, the corporate significance of this group of cities has been decreasing over time. Only Prague recorded a meaningful increase in the EECCI index value over the study period (59.3% relative to 2008). The number of corporate headquarters in Prague also increased over this time period. Other major cities in the region experienced a decline in EECCI: Bratislava (–5.4%), Warsaw (–14.2%), Kiev (–21.4%), and Budapest (–26.2%). Ten cities (including Prague) experienced an increase in EECCI values, and sixteen cities experienced a decrease in EECCI values.

The largest increases in EECCI values were noted for Polish cities: Płock (308.0%), Toruń (169.8%), TriCity (89.3%), Silesia (28.3%), Poznań (18.4%), and Wrocław (6.2%). The city of Płock is a special case; it is a city specializing in the oil refining industry. Its dominant company, PKN Orlen, had revenues of €28.7 billion in 2012. The city is also home to other companies linked with Orlen. This very high degree of specialization can lead to declines in profits when oil prices fall, as they did in 2014 and 2015. This type of decline can threaten the command and control function of a specialized city. High gains in EECCI value were also recorded for Riga (169.8%) and Pardubice (88.0%). On the other hand, the largest losses were noted for Belgrade (–63.3%) and Vilnius (–42.8%). Declines of more than 20% were also noted for Donetsk, Zagreb, Sofia, Tallinn, Ostrava, and Ljubljana. In the case of Bucharest, Vilnius, and Ostrava, the decline in EECCI value occurred despite a gain in the number of top-ranked corporate headquarters. At the other end of the spectrum, cities such as Riga, Poznań, and Wrocław and the urban region of Silesia experienced growth in EECCI values despite a loss of one corporate headquarters each during the study period.

A closer look at the Eastern Europe Sector Command and Control Index (EESCCI) for 2012 reveals that Warsaw dominates the region in terms of sector structure (EESCCI value of 395.7; Fig. 2). Prague is ranked second in terms of sector structure, with 165.1 points. These two are the only cities in the region home to corporations from all nine sectors studied. Third in line is Budapest, with an EESCII value of 102.2 based on companies from seven sectors. The remaining cities in this study do not exceed fifty EESCCI points and feature corporations representing fewer than seven sectors. The one exception is Ljubljana, with seven sectors and an EESCCI value of only 12.2. The case of Slovenia is unique because the country as a whole struggled with GDP decline and other national economic problems during the study period (Brozzi et al. 2015) Three middle-ranked cities are Kiev (45.1), Bratislava (37.2), and Bucharest (28.8). The lowest EESCCI values were noted for Zagreb, Dnipropetrovsk, Riga, and Sofia.

The sector structure of the cities studied varies substantially. Only two key sectors are present in the nineteen cities covered by this study: 1) consumer business and transportation, and 2) energy and resources. The next three most common sectors are manufacturing (eighteen cities), insurance (thirteen cities), and banking (twelve cities). On the other hand, sectors such as real estate and the public sector are found only in the largest cities in eastern Europe.

In large cities such as Warsaw and Prague, all of the sectors present are fairly equal in financial dominance. The lowest values of the index of variance of EESCCI are those of Prague, Bratislava, and Warsaw, following the subtraction of one sector from the local economy. In addition, key Polish cities and urban regions such as Silesia, Łódź, and Poznań feature sectors in relative equilibrium with one another. Cities characterized by strong sector specialization are Zagreb, Płock, Bucharest, Wrocław, and Vilnius.

Warsaw is the regional leader in terms of sector structure, with a focus on corporations with positive net income values. The EESCCI value for Warsaw increased 30.3% between 2008 and 2012, and the value for Prague increased 20.4%. Budapest experienced a decline of 32.5%. Warsaw's high rank is associated with a large number of top-ranked corporations present in the city: all nine sectors in 2008 and 2012. Prague acquired all nine sectors only in 2012, whereas Budapest lost three sectors over the same time period. Warsaw's high rank is also strongly linked with the public sector and the real estate sector. The city has experienced a strong decline in its life sciences and healthcare sectors, which is associated with constant changes in Polish law. At the same time, Prague experienced strong growth in its manufacturing and banking sectors, and strong decline in its real estate sector. Sector structure and changes therein suggest different

development patterns relative to locally dominant sectors and the onset of specialization of certain cities in eastern Europe.

The economy of eastern Europe relied heavily on mining, steel production, chemical manufacturing, and energy production until the 1990s (Rachwał and Boguś 2012). The transition from communism to capitalism also produced a shift towards more sophisticated industries in the region (Gierańczyk and Rachwał 2012). As a result, the employment structure of countries in eastern Europe and their manufactured products began to resemble those of more developed countries in western Europe (Rachwał 2011). The largest cities in present-day eastern Europe are characterized by sector differentiation, which could help them weather an economic crisis in one or more sectors of the local economy.

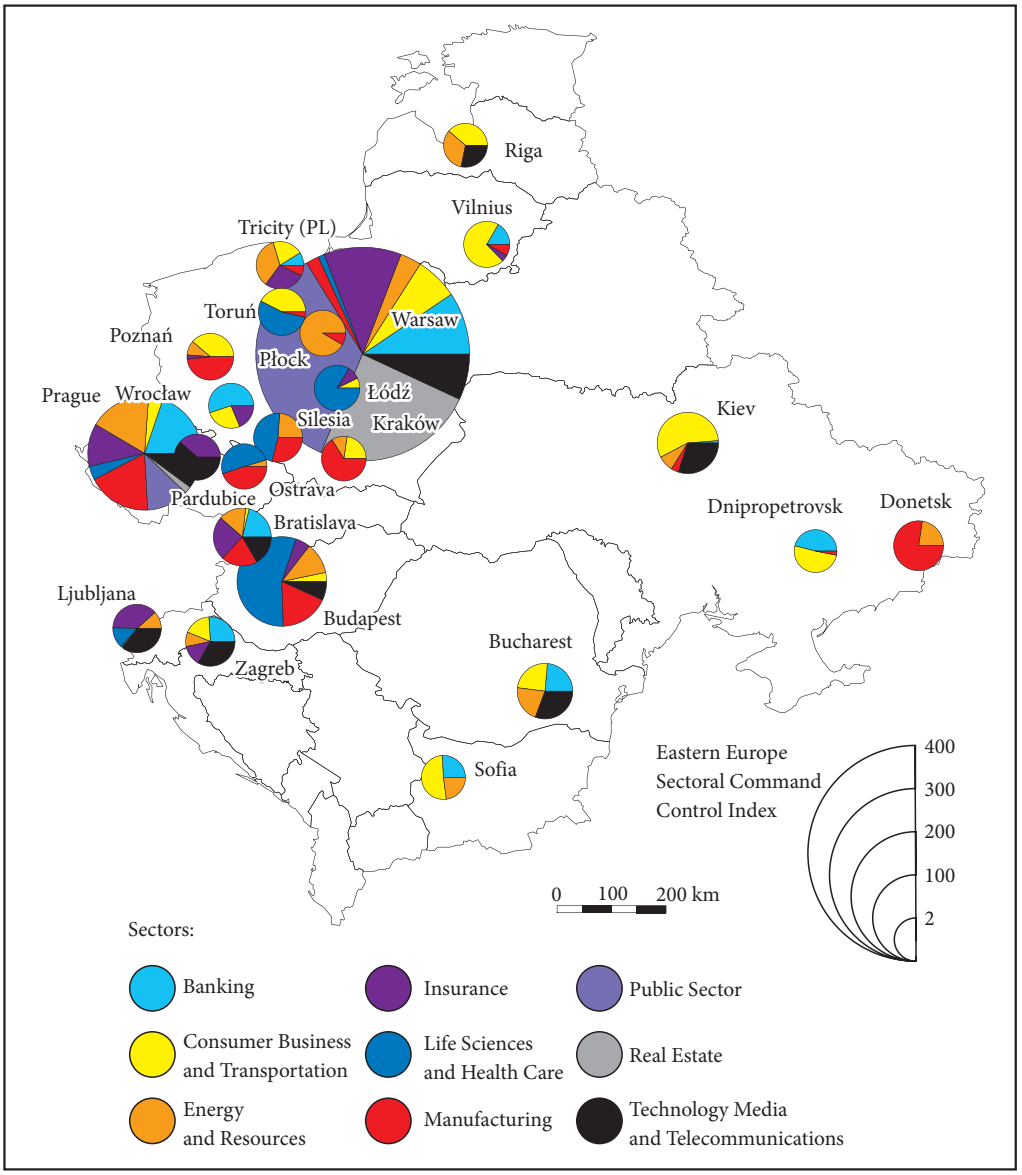

Figure 2: Eastern European Sector Command and Control Index (EESCCI) in 2012.

4 Discussion

Research on the potential of cities and large metropolitan areas in terms of the number of corporate headquarters and corporate financial performance is a growing area in the global literature. The fairly difficult history of eastern Europe has produced a somewhat different pathway for the region with respect to the command and control function of cities. Whereas most large corporations around the world are »dispersing« into a larger number of cities, quite the opposite trend has been observed in eastern Europe. One piece of good news for eastern European corporations is the slight increase in profitability for its major corporations during the global financial crisis, beginning in 2008. Revenues for the region's companies also increased during this time period. This suggests that the corporations are somewhat insulated from the effects of the most recent global financial crisis.

The largest number of headquarters of top-ranked corporations are located in Poland and the Czech Republic. The latter experienced a large increase in the number of top-ranked corporate headquarters during the study period, whereas the former experienced a decline. Most top-ranked corporations have established their headquarters in the western part of eastern Europe. At this point in time, Warsaw and Prague dominate the command and control function in eastern Europe. The global financial crisis of 2008 affected corporations in Warsaw to a greater extent than those in Prague. In 2008 Warsaw was the command and control leader in eastern Europe, and in 2012 the leader was Prague. Most capital cities in the region declined in terms of the strength of their command and control function, whereas secondary cities tended to gain strength in the area of command and control during the study period.

It is also quite reasonable to argue that a change in the number of top-ranked corporate headquarters does not lead to a corresponding change in the strength of the command and control function of a given city. For example, the command and control function of Bucharest, Vilnius, and Ostrava declined despite a larger number of corporations. The opposite trend was observed in the case of Riga, Silesia, Poznań, and Wrocław. Ultimately, there does not exist a single pattern of sector specialization for cities in eastern Europe regarding sector structure or the command and control function. The cities of the region – both those characterized by a highly developed command and control function and those characterized by a weaker function – are also characterized by substantial differences in terms of the dominant sector of the local economy.

An increasing number of corporations in a city usually leads to an increasing number of sectors of the local economy. However, increasing specialization is also an issue. Most of the cities studied experienced an increase in the number of corporations in sectors already in command of the local economy. Warsaw remains the sector diversity leader in eastern Europe, and Prague and Budapest are second and third in line. Both cities feature far fewer sectors in comparison with Warsaw.

On the other hand, Anttiroiko (2015) argues that cities that are not top ranked ought to develop a strong local brand that would differentiate them in the world. Examples include Zurich (banking) and Milan (fashion). In eastern Europe, only Warsaw and Prague are characterized by substantial international linkages. Other major cities in the region possess some or few linkages (Raźniak 2014), and would benefit from the development of a local brand that would be recognized on the world scene. However, it appears that such significant specialization would help make cities more recognizable in the world, but also substantially more susceptible to economic crisis in the event of a downturn in a dominant sector. Examples include the large Polish city of Łódź (Jakóbczyk-Gryszkiewicz 2011) and the American city of Pittsburgh (Duranton and Puga 2000), where the collapse of a dominant sector produced stagnation in most other sectors in the city. It appears that cities with several well-developed sectors fare better in the face of fluctuations in economic conditions than do cities based on a single dominant sector.

The same holds true of the location of corporate headquarters. Cities with an array of different corporate headquarters representing different sectors of the economy tend to weather economic crises better than cities dominated by a single major corporation. Hence, the major cities of eastern Europe ought to pursue the creation of strong, local, and globally recognized brands, which would help attract further business investment, without losing sight of the need to balance economic growth via the development of several different sectors.

5 Conclusions

Historical and political determinants have produced a somewhat different development pathway for the command and control function in cities in eastern Europe versus the rest of the developed world. Whereas the rest of the world is experiencing a spatial deconcentration of corporate headquarters (Csomós 2013), eastern Europe is experiencing the concentration of corporate headquarters in fewer cities. One positive outlook for the region between 2008 and 2012 was a slight increase in revenue and net income for major corporations in the region. It may be the case that the global economic crisis of 2008 did not produce a substantial negative impact on the cities of eastern Europe as measured by corporate financial performance. This type of outcome follows a global pattern of the largest corporations increasing their revenue and net income (Taylor and Csomós 2012).

The mining industry and heavy industry tended to dominate the economies of central Europe until the 1990s (Rachwał 2011). Today, most large cities in the region are dominated by the consumer business and transportation sectors. In the era of globalization, this type of change may prove to be disadvantageous because foreign corporations will find it much easier to shutter their country branches in the consumer business and transportation sector than would be possible in the case of manufacturing or assembly facilities. A given company's cost of shuttering a service business is simply much lower. This factor is important because globalization has accelerated in recent years even in central and eastern Europe.

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Acta geographica Slovenica, 58-2, 2018, 111–121

DEMOGRAPHIC CHARACTERISTICS OF CREATIVE WORKERS: UNDER-ACTIVATED DEVELOPMENT POTENTIALS IN SLOVENIA?

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ALEN TURKALJ

Creative viewpoint.

DOI: https://doi.org/10.3986/AGS.4602
UDC: 913:314:331.102.312(497.4)
314:331.102.312(497.4)
COBISS: 1.01

Demographic characteristics of creative workers: under-activated development potentials in Slovenia?

ABSTRACT: The purpose of the article is to present the key demographic characteristics of the creative labour force in Slovenia and bring attention to some opportunities for a more effective activation of the creative potential. We analysed data from the Statistical Register of Employment. The results indicate that creative workers in Slovenia are not only heterogeneous from the aspect of the employment structure, but that they also differ significantly in terms of gender, age, education, and ethnicity. Even though Slovenia can be compared to the most developed countries in the scope of the creative labour force, it will have to work on stimulating additional development potentials to make it to the top of the list. We conclude that, in the future, a more prominent role should be given to the female creative labour force, young bohemians, and foreign creative people.

KEY WORDS: human geography, creativity, creative professions, innovation, economic development, regional development, demographic change, labour force, Slovenia

Demografske značilnosti ustvarjalnih delavcev – premalo aktivirani razvojni potenciali Slovenije?

POVZETEK: Namen prispevka je predstaviti poglavitne demografske značilnosti ustvarjalnih delavcev v Sloveniji in opozoriti na nekatere priložnosti za učinkovitejše sproščanje ustvarjalnega potenciala. V ta namen sem analiziral podatke Statističnega registra delovno aktivnega prebivalstva. Rezultati prikazujejo, da ustvarjalni delavci v Sloveniji niso heterogeni samo z vidika poklicne sestave, ampak se močno razlikujejo tudi po spolu, starosti, izobrazbi in narodnosti. Čeprav se Slovenija po obsegu ustvarjalne delovne sile lahko primerja z najbolj razvitimi državami, bo morala za preboj med najboljše aktivirati dodatne razvojne potenciale. V sklepu nakazujem, da bi lahko v prihodnje večjo vlogo namenili ženski ustvarjalni delovni sili, mladim kulturnim ustvarjalcem in tujim ustvarjalnim delavcem.

KLJUČNE BESEDE: humana geografija, ustvarjalnost, ustvarjalni poklici, inovativnost, gospodarski razvoj, regionalni razvoj, demografske spremembe, delovna sila, Slovenija

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The paper was submitted for publication on June 22nd, 2016.
Uredništvo je prejelo prispevek 22. junija 2016.

1 Introduction

The geography of creative workers, especially their influence on urban and regional development, has been the subject of numerous discussions in the post-industrial period (Ravbar, Bole and Nared 2005; Clifton 2008; Hansen and Niedomysl 2009; Ravbar 2011; Uršič 2016). Even though psychologists have already developed the appropriate tools for measuring an individual's creativity (Kim 2006), urban and regional studies still find it very difficult to determine who a creative worker actually is because of a lack of this kind of psychological data on different spatial levels (Madanipour 2011). One of the more widely accepted definitions that cities and regions have focused on in their quest for economic development and regeneration strategies in the past fifteen years pertains to the theory of »the creative class« (Chapain, Clifton and Comunian 2013). Florida (2002) was the first to discuss it; he defined creative workers as an »economic«, not a »social« class. Their merging into a social group and creating a common identity is mostly founded on them performing an economic function: the occupation. Creative workers are people who have a creative occupation. They differ from other occupations in that their activities include detecting problems, looking for solutions, and taking existing findings and transforming them into new conclusions. The creative workers' main task is to think and invent and create innovation through their creativity. This is actually a manner of work that differs radically from the manufacturing of manual labour that once dominated the industrial society with its predetermined patterns.

While Florida's ideas (2002; 2005; 2008) on the theory of the creative class have permeated local and regional planning strategies, many authors have expressed doubt and hesitation about its validity (Glaeser 2005; Peck 2005; Boyle 2006; Markusen 2006; Rausch and Negray 2006; Scott 2006; Musterd and Gritsai 2012; Nathan 2015). Asheim and Hansen (2009) divide the critics into two groups. The first question the theoretical basis and the political recommendations, the other the insufficient soundness of the empirical data. With regard to the theoretical background, one of the more resounding doubts relates to the lack of conceptual clarity in the understanding of creativity, which is said to be caused by the insufficient delineation of heterogeneous occupational groups (Krätke 2010; Alfken, Broekel and Sternberg 2015). Some authors have proposed more precise definitions of creative occupations (e.g. McGranahan and Wojan 2007; Marrocu and Paci 2012); however, few have attempted to surpass the bare economic framework by studying their demographic and social characteristics (e.g. Cooke 2014; Eisler, Donnelly and Montuori 2016). Creative workers are not heterogeneous only from the aspect of the occupational structure, but they also differ according to age, gender, education, status, nationality, and others (Fritsch and Stützer 2007; Alfken, Broekel and Sternberg 2015). In addition to the occupational capabilities and experience, demographical characteristics also have an important influence on the representation of different knowledge in a certain regional or local context (Gülümser, Baycan-Levent and Nijkamp 2010). Not taking these demographic, cultural, and social characteristics differences within creative workers into account enough can lead to a diminished competitiveness of individual areas (Huggins and Clifton 2011); this creates a need for a more in-depth insight into the intricacies of the creative manners of work and the people performing them (McGranahan and Wojan 2007).

The purpose of the article is to present the main demographic characteristics of the creative workforce in Slovenia and raise attention to some of the crucial obstacles and opportunities for a more efficient release of the creative potential. The main research question is whether significant demographic differences can be detected among creative workers in Slovenia and how these differences can be translated into a developmental context. The hypothesis is that, similar to elsewhere, there are also differences in demographic characteristics and the social background of creative workers in Slovenia and taking these differences into account could have firmer and more positive developmental effects.

The article's specific goals are:

1) To analyse the main demographic characteristics of creative workers and their subgroups; the creative core, creative professionals, and bohemians with regards to the gender, age, education, and ethnic structure. The control groups were the general populations and the labour force.
2) To analyse the main demographic changes in creative workers and their subgroups compared to the control groups for the period 2000–2011.
3) To define some under-activated development potentials in Slovenia that can be deduced from the demographic characteristics of creative workers.

2 Methods

The definition of **creative workers** in terms of contents is adopted from the theory of the creative class (Florida 2002; 2005; 2008), which separates creative workers from others based on their occupation, while additionally differentiating between members of the creative core, creative professionals, and bohemians. In the technical sense, we used the example of the *Technology, Talent and Tolerance in European Cities: A Comparative Analysis* European research project's methodology (e.g. Andersen and Lorenzen 2005; Fritsch and Stützer 2007; Clifton 2008; Boschma and Fritsch 2009) and the Slovenian Standard Occupational Classification (SKP-V2), which is based on the International Standard Occupational Classification (ISCO-88). Here, we used data on the labour force from the Statistical Register of Employment, managed by the Statistical Office of the Republic of Slovenia.

Creative core (A) consists of workers who create new knowledge. These are mostly engineers of a technical profile, natural scientists, doctors, teachers, and researchers in the fields of economy, social sciences, and humanities. These highly creative social groups are said to run the social and economic development (SKP-V2 codes: 211–214, 221, 222, 231–235, 243, 244, 247, 344).

Creative professionals (B) are made up of experts in labour intense occupations. These are managers, high-ranking state officials, experts in various technical, educational, medical fields, lawyers, and other occupations that support the social and economic development (SKP-V2 codes: 1, 223, 241, 242, 31, 32, 341–343, 345, 346).

Bohemians (C) are creative workers in the narrowest sense of the word. These include musicians, publicists, writers, painters, sculptors, and others (SKP-V2 codes: 245, 347, 521).

3 Analysis of the demographic characteristics of creative workers

According to the latest available data, there were about 930,000 active inhabitants in Slovenia in late 2011, which is about half (45%) of the entire population. Among the active population, there were about 817,000 in the labour force and 113,000 unemployed. The level of registered unemployment was 12%. The largest share among the labour force was made up of people with occupations in the service sector (42%), a somewhat smaller share of people in creative professions (38%), while a much smaller share accounted for people in manufacturing (14%) or agricultural occupations (5%) (Kozina 2013). The scope of creative workers in Slovenia is comparable to the situations in countries in Northern and Western Europe (see Andersen and Lorenzen 2005; Fritsch and Stützer 2007; Clifton 2008; Boschma and Fritsch 2009). Florida (2002) concluded that the share of creatives in the economically most developed countries accounts for over a third. Among Slovenian creative workers in 2011, a third belonged to the creative core, a bit less than two thirds to the creative professionals, and only a scattering of bohemians, which is also comparable to the situations in other economically more developed European countries (Figure 1).

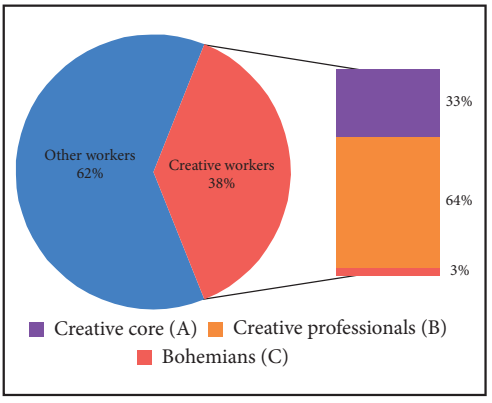


Figure 1: The structure of the labour force and the creative labour force in Slovenia in 2011 (Statistical Office of the Republic of Slovenia and our own calculations from the Statistical Register of Employment database).

3.1 Gender structure

There have been more women than men registered in all censuses in Slovenia. The smaller share of men is predominantly the consequence of world wars, in which the share of deaths of men was greater than women, and of their shorter life expectancies. In recent times, the differences in the gender structure have started to slightly level out (Perko 1998). This is most likely the result of the decreasing effect of both world wars, less physical demands for men's occupations, and improved hygienic and health conditions that prolong life expectancy. In 2011, there were about half women and half men, but accounting only for the labour force (not counting farmers), there were almost a tenth (9%) more men than women. It is interesting that the picture becomes almost reverse if we include only creative workers into the analysis. In this case, women exceed men in number, especially due to the creative core, where the difference amounts to 17%. The gender structure is nearly the same among creative professionals, while there were a few more men only in the group of bohemians (6%) (Table 1).

A comparison of the current state with the conditions from 2000 indicates that the gender structure of the labour force (not counting farmers) at the break of the millennium is similar to today. The differences that have appeared during this period are moving towards a slight increase of the share of women in creative occupations (2000; 50%) and a decrease in other occupations (2000; 44%). In Slovenian society, where the gender structure is generally quite balanced and men assume more employment positions, women are now reaching for the most demanding creative professions more and more.

Table 1: Gender structure of creative workers in Slovenia in 2011.

	Men (%)	Women (%)	Total (%)
Population	49.5	50.5	100.0
Labour force	54.7	45.3	100.0
Creative workers (A + B + C)	47.4	52.6	100.0
Creative core (A)	41.5	58.5	100.0
Creative professionals (B)	50.2	49.8	100.0
Bohemians (C)	53.0	47.0	100.0

Source: Statistical Office of the Republic of Slovenia and our own calculations from the Statistical Register of Employment database.

3.2 Age and education structure

An insight into the age structure reveals that creative workers are on average somewhat older than the rest of the labour force (table 2). The explanation for this can be found in their education structure (table 3). Creative workers on average are much more educated. This means that they enter the labour market later than others because of their prolonged education. Consequently, more than half creative workers have attained a tertiary education in 2011, while this share was almost half lower in the general labour force. Among the creative subgroups, the oldest and most educated members belong to the creative core, as would be expected.

The age structure reveals the young age of bohemians. A precise explanation for this is difficult to pinpoint. At this point, we can propose two hypotheses that should be empirically tested in the future. The first relates to the fact that bohemians are usually employed in cultural and creative industries (Kozina and Bole 2016), which have only recently been getting more attention as a form of economic activity (Bole 2008). This was strongly supported by the emergence of new forms of artistic creation and entertainment, especially in the area of computer industry, digital media, and the web (Montgomery 2007). It is likely that predominantly younger people occupy employment positions in these branches of the economy; they have spent their adolescence, education, and internship period to acquire the necessary knowledge to work in these areas, which has only begun to emerge a couple of decades ago due to the lack of (internet) technologies.

The second hypothesis that would account for the significantly lower average age of bohemians can be linked to the fact that occupants of such employment positions go through re-training periods to transfer

to other areas later in life. This can either be a sort of natural progression, when a writer becomes editor of the medium in time and performs more managerial duties instead of artistic-cultural creation for example, or people look for jobs in more interesting market-oriented or existentially more reliable branches. In this case, in terms of our predetermined groups, they transfer from bohemians into creative professionals or the creative core.

The education structure also reveals that, despite this relevant interconnection, a high education level is not the only precondition for becoming a creative worker. Only about half (55%) of creative workers have attained a tertiary education, while about four fifths (78%) of people with creative occupation have attained a tertiary education. This means someone with a lower education level can also be creative and vice versa. This confirms Florida's (2002) hypothesis that every individual can be creative. The only factor is whether or not they develop and capitalize on their potential.

Table 2: Age structure of creative workers in Slovenia in 2011.

	15–29 (%)	30–49 (%)	50–89 (%)	Total (%)
Labour force	12.7	62.4	24.9	100
Creative workers (A + B + C)	10.1	64.3	25.6	100
Creative core (A)	9.6	64.1	26.3	100
Creative professionals (B)	10.1	64.3	25.6	100
Bohemians (C)	14.3	66.9	18.8	100

Source: Own calculations from the Statistical Register of Employment database.

Table 3: Education structure of creative workers in Slovenia in 2011.

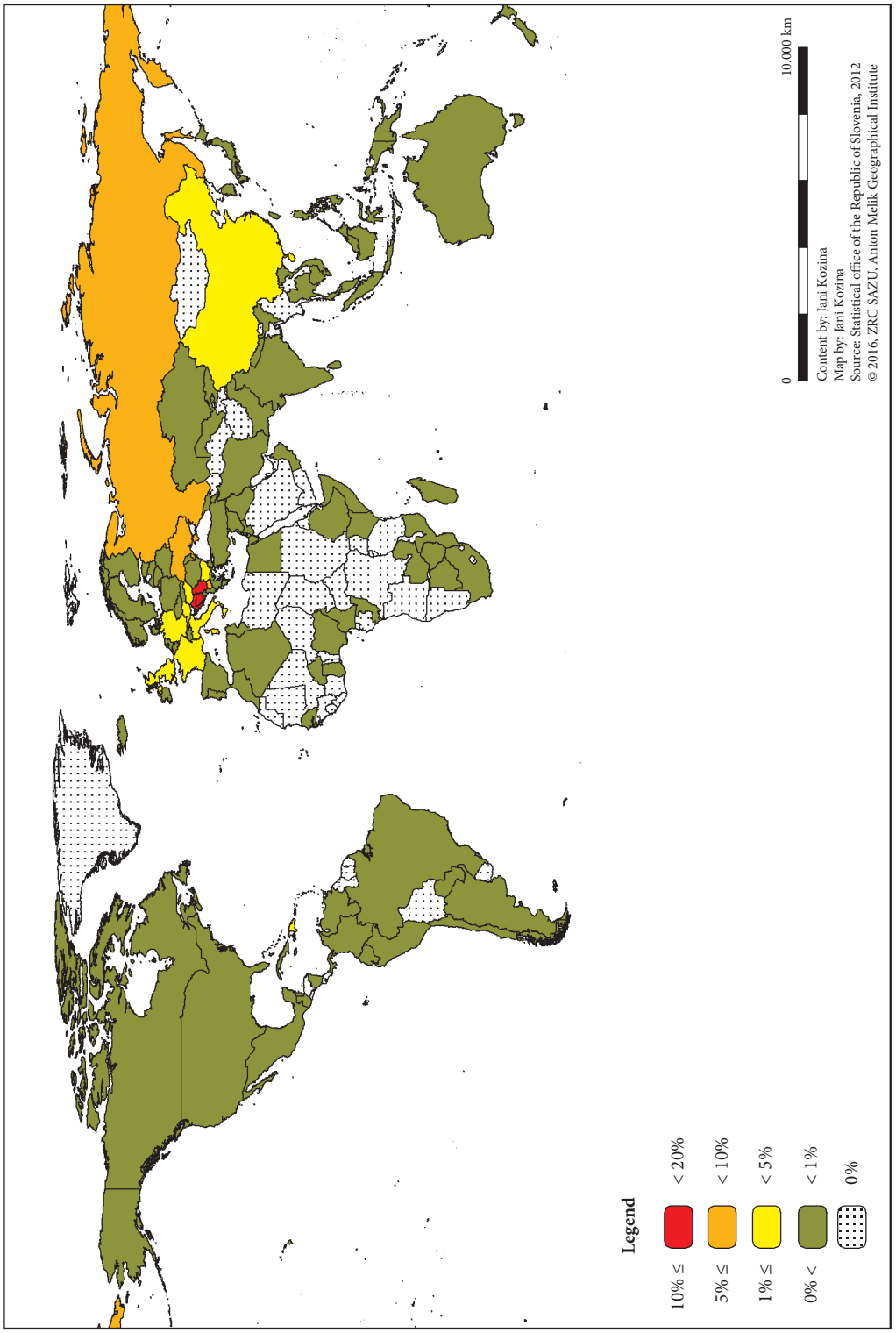
	Primary school or less (%)	Secondary school (%)	Tertiary (%)	No data (%)	Total (%)
Labour force	14.3	57.8	27.9	0.0	100
Creative workers (A + B + C)	1.2	32.1	54.9	11.8	100
Creative core (A)	0.0	7.0	80.9	12.1	100
Creative professionals (B)	1.5	44.8	42.1	11.5	100
Bohemians (C)	5.7	36.7	42.8	14.8	100

Source: Own calculations from the Statistical Register of Employment database.

3.3 Ethnic structure

In view of Florida's (2002) theoretical views on creative workers' free choice of residence and workplace, which spreads across national borders in this increasingly globalised world, it is interesting to study the countries of origin of creative workers in Slovenia. With regard to migrations, Slovenia was long the kind of country, from which people emigrated. In the 19th century and first half of the 20th century, people left for Argentina, Brazil, Egypt, Belgium, and some other developed European countries as economic emigrants. In the mid-1920s, a large amount of Slovenes fled from the region under Italian rule due to the increasing fascist pressure, mostly to Argentina. After World War II, an important wave of political refugees followed, who moved predominantly to Argentina, the US, Canada, and Australia after the establishment of Communism in the homeland. During different periods from the 60s to the 80s, a significant number of characteristic economic emigrants left for Germany, Sweden, Switzerland, France, Belgium, and some other countries (Žigon 2004).

Figure 2: The share of foreign creative workers in Slovenia according to their country of origin in 2011 (own calculations from the Statistical Register of Employment database). ►


Legend
10% ≤ < 20%
5% ≤ < 10%
1% ≤ < 5%
0% < < 1%
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0
10.000 km
Content by: Jani Kozina
Map by: Jani Kozina
Source: Statistical office of the Republic of Slovenia, 2012
© 2016, ZRC SAZU, Anton Melik Geographical Institute

Mass immigrations to Slovenia began only after World War II in the 1960s and lasted up to the mid-1980s. The country's relative development made Slovenia interesting to immigrants from other republics in the former Yugoslavia, who got employment mostly in manufacturing, coal-mining, and construction. There were very few immigrants from other countries. Immigrants most often settled in the former municipalities of the so-called »industrial crescent«; from the north-west towards the south-east (municipalities of Jesenice, Radovljica, Kranj, Škofja Loka) to the municipalities around Ljubljana, and reaching from there through Zasavje towards the north-east (Celje, Velenje, Maribor). Outside that crescent, a number of immigrants settled in the municipality of Nova Gorica and the coastal municipalities (Kuhar de Domizio 1998).

Soon after Slovenia's independence, the dynamics of transnational migrations settled down and was even negative between 1991 and 1992. After this period, immigration to Slovenia once again increased and surpassed emigration. Most of the immigrants were still from the countries of the former Yugoslavia, but there were also quite a few Slovenes returning home due to the new social and political situation up to 1999. The Argentinian economic crisis also triggered Argentinian Slovenes to return home. After 1999, more Slovenes were emigrating than immigrating again and that trend is still growing. Emigration was also prompted by the processes of Slovenia joining the European Union, which included Slovenia into the area of the free flow of people, capital, goods, and services. During this period, Slovenia started temporarily or permanently loosing young educated people at the peak of their creative powers when they emigrate (Lapuh 2011).

After 1999, the number of immigrations to Slovenia increased, because the country was internationally connected (European Union, Schengen area, OECD, NATO), economic conjuncture, and the need for certain, especially low-skilled workers. According to data from the Statistical Office of the Republic of Slovenia, around 31,000 people moved to Slovenia at the peak in 2008. Of these, almost 80% were citizens from former Yugoslav republics. Among the labour force, only 4% had attained a tertiary education, 45% a secondary school education, and 51% completed primary school or less. The world economic crisis caused less than half that amount of people to move to Slovenia in 2010.

In 2011, around 42,000 people with foreign citizenships were employed in Slovenia, which is about 5% of the entire labour force. The 2011 EUROSTAT report placed Slovenia at the bottom of European Union and EFTA members in this criterion (Migrants in Europe 2011). From the foreigners employed in Slovenia, about 7000 were occupying creative positions in 2011, which amounts to only 17% of the foreign labour force.

A regional overview of foreign creative people living in Slovenia shows that the greatest share (59%) falls to the countries of the Western Balkans (countries of the former Yugoslavia and Albania), 20% to the members of the European Union (EU-27) and the Schengen area, and 13% to the countries of Eastern Europe (Russia, Ukraine, Belarus, and Moldova). People from other continents constitute the minority (8%) and are limited to individual cases with regards to their countries of origin. The only non-European countries with more than one percent of the foreign creative workers in Slovenia are China and the Dominican Republic (figure 2).

4 Discussion

Based on the analysis of the Statistical Register of Employment, we may conclude that in accordance with the theory of the creative class (Florida 2002; 2005; 2008), creative workers in Slovenia express a fair amount of demographic diversity. This confirms the hypotheses of other authors that creative workers are not only heterogeneous with regards to the occupation structure, but that they also differ according to age, gender, education, status, nationality, and other (Fritsch and Stützer 2007; Alfken, Broekel and Sternberg 2015).

Even though the gender structure of Slovenes is balanced and men occupy more jobs, more and more women are assuming the most challenging creative professions. The results indicate that women in Slovenia could also assume greater roles in the most visible and responsible positions that require decision-making and a greater level of creative thinking; however, this is not yet so in different social and economic areas (Penner et al. 2012; Ule 2012). Data from other research reveal proportionately large inequalities in gender even after decades of ideological, legislative, and institutional support for economic gender equality in Slovenia and that these inequalities have become even greater in recent times (Penner et al. 2012). According to Humer and Roksandić (2013), measures to deal with the crisis failed to predict this kind of effects. The same authors propose the following possible solutions: a mandatory overview of the statistics according

to gender in all areas of life and regular statistical oversight of the social and social changes, such as the current crisis and measuring the consequences of the anti-crisis measures; a more meticulous and precise oversight of the influence and effects of fiscal consolidation to the welfare state and revenue; passing goal-oriented measures for vulnerable groups; ensuring effective operations of public institution for gender equality. Adam (2013) adds that there is a lack of training courses in Slovenia that would educate and groom women for leadership positions (in the industry and elsewhere), which is typical for Scandinavian countries that boast the greatest gender equality (The Global … 2014). The same author mentions that there are not enough awards, competitions, and festivals in Slovenia to support the entry and the existence of women in creative professions and industries (like the Marie Curie Foundation for women in science and the International Women Invention's Exhibition).

The age structure of creative workers indicates that they are somewhat older on average than the rest of the labour force, which is most likely the consequence of a belated entering the labour market due to the longer education period. However, this finding is accurate only for the subgroups of the creative core (A) and creative professionals (B), while bohemians (C) are, just the opposite, younger. The issue of this social group today lies in the increasing precarious self-employment and is widely discussed (Zhang and Pan 2012; Donald, Gertler and Tyler 2013; Fritsch, Kritikos and Sorgner 2015). In addition to their working in more market-volatile and existentially more sensitive branches, as young people, they are exposed to additional risks in the areas of the labour market and social security. More and more research raises attention to the fact that the current manner of state support to self-employed people in culture in Slovenia is no longer suitable. Change is necessary in recognizing more social rights, considering the specifics of the profession and the special work conditions of self-employed people in culture (Pernarčič 2012; Ograjenšek and Perviz 2015). Addressing the issues of this social group is also important because of the increasing tendencies for expanding self-employment to other disciplines (Pernarčič 2010).

The ethnic structure shows that the sparse foreign labour force still performs mentally less demanding tasks. Regardless of the manner of work, the countries of origin of immigrants are mostly in the Western Balkans and Eastern Europe. Therefore, Slovenia does not import creativity, but mostly exports it (Lapuh 2011), which can be quite a worrying fact in the long term. All these facts should also be reconsidered in light of the increasing »migrant crisis« in Europe.

5 Conclusion

The purpose of the article is to present the key demographic characteristics of the creative labour force in Slovenia and bring attention to some of the obstacles and opportunities for a more effective activation of the creative potential. The main research question is whether there are significant demographic differences among creative workers in Slovenia and how can these differences be transferred to a developmental context. The results of the analysis of the data from the Statistical Register of Employment confirmed that creative workers, in accordance with the theory of the creative class, exhibit a significant level of variety with regards to gender, age, education, and ethnicity. Additional analyses have revealed that Slovenia can be compared to other countries of the western and northern Europe in terms of its share of creative labour force, even though it does not measure up to them in terms of economic development. This economic lagging can partly be attributed to some under-activated development potentials that pertain to a high share of female creative labour force and their underrepresentation in decision-making processes (including the highest levels in politics, science, higher education, and other), to young bohemians and their increasing precariousness (especially among self-employed people), and to the creative labour force that Slovenia does not seem to know how to attract and retain.

ACKNOWLEDGEMENT: This study was partially supported by the Republic of Slovenia, Ministry of Education, Science and Sport as part of the Early Stage Researchers operation-2013-ZRC SAZU-712.

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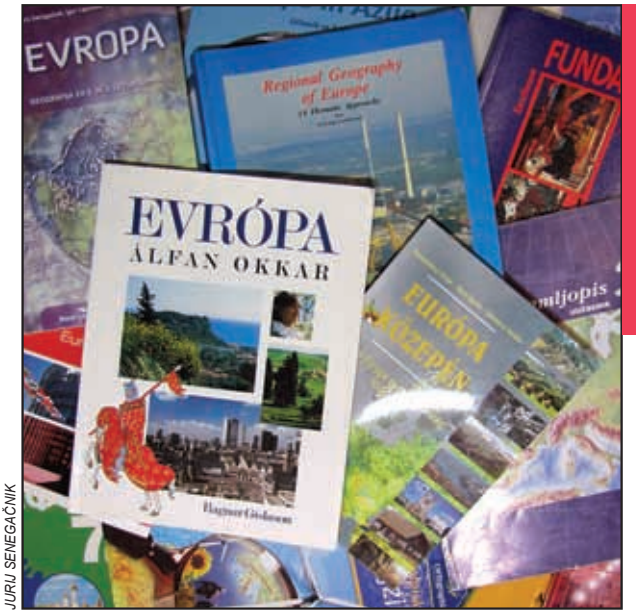
Acta geographica Slovenica, 58-2, 2018, 123–134

CLASSIFICATION OF REGIONAL AND THEMATIC APPROACHES IN SCHOOL TEXTBOOKS ON THE GEOGRAPHY OF EUROPE

Jurij Senegačnik



JURIJ SENEGAČNIK

School textbooks of the geography of Europe from different European countries.

DOI: https://doi.org/10.3986/AGS.3408
UDC: 91:37.091.64(4)
COBISS: 1.01

Classification of regional and thematic approaches in school textbooks on the geography of Europe

ABSTRACT: Regional and thematic approaches are two basic approaches in geography, and they are found in many combinations and variants in textbooks. An extensive analysis of textbook approaches showed that a detailed classification of these approaches does not currently exist. The main purpose of this study was to fill this gap with the first attempt at a detailed classification of all possible approaches in European textbooks devoted in part or in full to examining the geography of Europe. To this end, it was also necessary to review the terminology and redefine some concepts. The study is based on an analysis of 450 textbooks from twenty-eight European countries using the method of content analysis. It resulted in four classification schemes: a scheme for geography in textbooks in general, and schemes for three approaches used in exploring the regional geography of Europe. Any European textbook covering the geography of Europe can be classified using these schemes.

KEY WORDS: regional geography, thematic geography, regional approach, thematic approach, textbook approaches, geography education, textbook, Europe

Klasifikacija regionalnih in tematskih pristopov v šolskih učbenikih geografije Evrope

POVZETEK: Regionalni in tematski pristop sta dva temeljna pristopa, ki izhajata iz sistema geografske vede, v učbenikih pa sta prisotna v številnih kombinacijah in različicah. Pri obsežni analizi učbeniških pristopov se je pokazalo, da ne obstaja nobena podrobna klasifikacija teh pristopov. Namen raziskave je bil zapolniti to vrzel s prvim poskusom podrobne klasifikacije vseh možnih pristopov, in sicer v evropskih učbenikih, ki so v celoti ali vsaj v velikem delu namenjeni obravnavi geografije Evrope. V ta namen je bilo treba pregledati terminologijo in na novo opredeliti nekatere pojme. Raziskava temelji na analizi 450 učbenikov iz 28 evropskih držav, pri čemer je bila uporabljena metoda vsebinske analize. Rezultat so štiri sheme: shema geografije v učbenikih na splošno ter sheme treh pristopov v okviru regionalne geografije Evrope, v katere je možno uvrstiti kateri koli evropski učbenik z obravnavo geografije Evrope.

KLJUČNE BESEDE: regionalna geografija, tematska geografija, regionalni pristop, tematski pristop, učbeniški pristopi, didaktika geografije, učbenik, Evropa

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The paper was submitted for publication on September 1st, 2015.
Uredništvo je prejelo prispevek 1. septembra 2015.

1 Introduction

The system of the geographical sciences is evident from many geographical encyclopedias that divide geography into general and regional geography. General geography focuses on a general overview of individual elements and factors on the Earth's surface, and regional geography explores individual parts of the Earth's surface (i.e., regions) as a whole. According to the International Charter on Geographical Education (Resnik Planinc 1993), school geography distinguishes between two approaches based on this division: thematic and regional. The thematic approach has primarily become established in school geography and, especially among US geographers, it is also used as a synonym for the systematic or general geography approach (Steinberg, Walter and Sherman-Morris 2002).

The analysis of textbook approaches used in European countries for examining the geography of Europe (Senegačnik 2005) showed that it does not make sense to categorize these approaches only into regional and thematic ones because textbooks largely use various combinations of these two approaches. A review of a large number of textbooks revealed a significant gap in the findings to date because the analysis could not rely on any detailed classification of regional and thematic textbook approaches. Considering that teachers prefer clearly structured textbooks and that the majority of them favor the regional approach (Senegačnik 2007a), a need arose to prepare an article to fill in this gap. Hence, this article is the first attempt at a detailed classification of all possible regional and thematic textbook approaches, resulting in four classification schemes that teachers can use as an effective tool in assessing and selecting textbooks.

1.1 Terminology

The term »approach« itself has several meanings. In the sense of a work method or a path to achieving something, it is used here in connection with teaching, curricula, and textbooks, whenever there is reference to the regional and thematic approach. The approaches used in textbooks are referred to here as »textbook approaches.«

Even though general geography focuses on presenting all landscape elements and factors, in practice textbooks hardly ever cover all elements; instead, such a »classic« repertoire was gradually replaced by specialization in selected themes. According to Arnold Schultze (1970), textbooks focus only on certain key structures: natural structures, nature-human structures, functional structures, and sociocultural structures. Because these deviate from the classic general geography scheme, this approach later became known in Germany as the »thematic approach.« Although this term gradually also became used in other countries, the term »thematic geography« is still very rarely found in the literature today. Among the forty-one geographical dictionaries reviewed at the University of Ljubljana's Geography Department, this term can only be found in one (Lévy and Lussault 2003, 920).

Based on the development described above, the following definitions were established: »general geography« or the »general geography approach« refers to the systematic presentation of all elements and factors known from the »sections« of general geography and, following Arnold Schultze's theory of key structures (1970), »thematic geography« or the »thematic (geography) approach« is conceived as a non-systematic presentation of selected elements and factors.

Such a definition is deficient with regard to the term »geographical themes« because their selection in textbooks became increasingly diverse. This approach is usually primarily understood in the sense of examining themes from »non-systematic« or »extended« general geography and significantly less in the sense of examining themes in order to present specific regions, which is the focal point of regional geography or the regional approach.

It is impossible to draw a clear line between general and thematic geography in textbooks. The term »thematic geography« is not an entirely unambiguous and clearly definable category because it can be conceived either in a broader or narrower sense. »Thematic geography in the broadest sense« is composed of »general geography« and »thematic geography (in the narrower sense).« General geography is basically systematic thematic geography (a systematic presentation of more or less all general geography elements). It can also be referred to as »thematic geography in the broader sense« because it deals with themes just like thematic geography; the only difference is that it covers »all« general geography themes, not just selected ones. On the other hand, there is »thematic geography in the narrow sense,« which only examines selected themes - which at least in the initial stages of thematic geography proceeded from Schultze's key structures

- and can therefore be referred to as »non-systematic thematic geography.« Under »thematic geography« school geographers mostly understand only the latter. Unlike thematic geography, »regional geography« focuses on a complex presentation of a specific region. This definition still unambiguously applied to classic regional geography during Alfred Hettner's time, but later on, due to too much material involved in presenting regions as a »whole,« textbooks started increasingly limiting themselves to presenting selected key themes and, later on, central problems. Nonetheless, such geography continued to be referred to as »regional geography« because the region remained the basic subject of its presentation.

1.2 Historical development of approaches

Until the mid-twentieth century, the leading international school in geography was the German geographical school, which was distinctly oriented towards regional geography. One of its most important representatives was Alfred Hettner, and the main transmitter of his ideas to US geography was Richard Hartshorne (1939). During the 1950s, a conflict arose among US geographers - specifically, between the advocates of the traditional regional approach and the adherents of the »new« geography, which placed general geography at the forefront. The most important representative of the second group was Fred K. Schaefer (1953). The controversy between the two camps continued for several years, but in the US the breach between them was not as severe as later on in Germany. The majority of geographers thought of both approaches as complementary, which was later also reflected in the project of national geography education standards (Bednarz et al. 1994), which included both.

University textbooks for courses in world geography played an extremely important role in US geography (Muller 1995). Their authors combined both approaches, presenting the world by world regions (i.e., in line with regional geography) and then examining each region using the thematic approach (Steinberg, Walter and Sherman-Morris 2002). The system of the geographical sciences is still evident from these textbooks because it is a combination of both approaches. The best-known works include those by Harm de Blij and Peter Muller (2013), Lydia Mihelič Pulsipher and Alex Pulsipher (2013), Michael J. Bradshaw et al. (2012), and Lester Rowntree et al. (2013). Cadey Korson and Weronika Kusek (2015) report that as many as 75% of instructors teaching world geography at US universities use the regional approach, 20% use the thematic approach, and 12.5% use a combination of both.

In Germany, the breach between the proponents of regional and general geography at a congress in Kiel in 1969 was even more severe than it had been in the US. The main supporter of regional geography was Josef Birkenhauer (1970) and the main adherent of general geography was Arnold Schultze (1970). A few years later, an attempt at a compromise in the form of general geography in regional classification was made by Jürgen Newig, Karl Heinz Reinhardt, and Peter Fischer (1983). This breach, which has never really been entirely resolved, was also reflected in the school curricula (Brucker 2009). They sought to include elements of both approaches, but in some of them the framework of the system of the geographical sciences could hardly be discerned any more.

In Slovenia, the regional approach predominated in school geography. The advantages of the thematic approach were substantiated by Sabina Popit (2002) and the advantages of the regional approach were presented by Jurij Senegačnik (2003b; 2005; 2007a).

The Slovenian geographer Anton Melik (1935) first treated Slovenia as a whole by individual general geography sections, followed by Slovenian regions (Melik 1954, 1957; 1959; 1960). In two seminal works published after Slovenia's independence, geographers treated Slovenia both according to individual sections of general geography (Gams and Vrišer 1998) and by individual regions (Perko and Orožen Adamič 1998).

In this regard, the question arises whether all of these works on Slovenia involve regional geography or perhaps a different type of geography. Even the two works that examine Slovenia by individual sections of general geography (Melik 1935; Gams and Vrišer 1998) namely present a region: Slovenia. This means they are part of regional geography and can thus be referred to as regional geography works, even though they use a different approach than other works.

The approach used by Anton Melik (1935) and Ivan Gams and Igor Vrišer (1998) can be referred to as a »general geography« approach (the general geography of Slovenia), even though it examines geographical elements and factors only in one region (i.e., Slovenia) and not around the entire world. Hence, this involves a regional geography of Slovenia, even though the approach used is that of general geography. In this case, one can speak of a »general-geography regional geography« (of Slovenia).

Other works (Melik 1954; 1957; 1959; 1950; Perko and Orožen Adamič 1998) present Slovenian regions. They also involve a regional geography of Slovenia, but the approach they use differs significantly. Their purpose is not to examine elements and factors across all of Slovenia, but to present individual regions in a comprehensive manner. Because this approach focuses on individual regions rather than individual elements and factors (in Slovenia as a whole), it can be referred to as a »region-based approach.« In this case, one can talk about a »region-based regional geography (of Slovenia)« or a »regional geography of (Slovenian) regions.«

1.3 Using individual approaches in textbooks

Textbooks on the geography of Slovenia for primary schools are a combination of either a) a general-geography and region-based regional geography of Slovenia, or b) a general geography and region-based approach. They thus use a »combined (general-geography and region-based) approach.« Even though as much as half of a given textbook uses a general geography approach (i.e., it focuses on the general geography of Slovenia) and only half uses a region-based approach (i.e., it focuses on the regional geography of Slovenian regions), this is predominantly perceived as a regional approach.

The same parallels in Slovenian textbooks can also be found with regard to the presentation of the geography of Europe, where part of a textbook uses a general geography approach (the general geography of Europe) and part of it uses a region-based approach (the region-based geography of Europe or the geography of European regions).

Looking at how textbooks in other European countries cover Europe, whereby the entire textbook can be dedicated to Europe or only a larger or small part of it (which is mostly the case), many parallels can be drawn, but certain different approaches can be found as well. In these textbooks, the general geography part of examining Europe is largely replaced by the thematic geography approach because, as a rule, they stopped using the systematic approach of general geography and limited themselves to a non-systematic selection of specific themes. Thus the combined approaches largely no longer use a combination of the general geography and region-based regional geography, but a combination of a thematic (in the narrow sense) and region-based regional geography, or a »combined (thematic region-based) regional approach.«

There are also textbooks that use only the region-based approach (they examine Europe by regions) as well as textbooks that use an intermediate approach, which includes a non-systematic combination or mix of region-based and thematic regional geography.

Many geography textbooks contain a few paragraphs of text, maps, graphs, and figures that refer to a specific learning theme from the geography of Europe, but this does not mean they are dedicated to the regional geography of Europe. In order to establish whether a textbook is dedicated to the regional geography of Europe or not, its content must be examined because this can rarely be determined from its title alone. Among the 450 textbooks analyzed, only a third met the criterion that was set to prove that a textbook involved a regional geography of Europe. This included any examination of the geography of Europe, in which all of Europe or at least a major portion of it received special coverage in the form of a longer whole (a textbook as a whole or part of a textbook in the form of one or several conceptually complete chapters). The final criterion for the existence of such a »regional« geography of Europe in a textbook is that the title of a specific whole already indicates that the concrete region of Europe is at the forefront of the discussion, and not one or several themes from thematic or general geography. In this context, regional geography is naturally understood in its broadest possible theoretical sense.

For example, the Austrian textbook *Planquadrat Erde* (Klappacher, Fischer and Fischer 2002) explores a series of thematic sections titled »People and the Environment,« »Revaluation of Space,« »Good Old Europe,« and so on, in which only the last deals with Europe and combines several completely social themes. Thus, it discusses Europe as a »theme« and not as a »region.« Despite reservations, such a thematic section or such a chapter in the textbook was treated as a regional geography of Europe because it is clear that the main subject discussed is Europe (even though only through certain themes selected) rather than geographical themes in general.

This can also be viewed from a different perspective. If the determination of the »regional« or »thematic« character of textbooks is based on the reflections of the three German geographers mentioned above (Newig, Reinhardt and Fischer 1983), which proceed from strictly didactic premises, the chapter »Good Old Europe« merely involves a »thematic geography in a regional classification« or a »thematic geography

with a regionally defined title« rather than »proper« regional geography. According to the same logic, other titles, such as »People and the Environment« and »Revaluation of Space« represent »thematic geography in a thematic classification« or a »thematic geography with thematically defined titles.«

The overview of works on both approaches published to date shows that they primarily focused on the theoretical advantages of one or the other in geography in general, the frequency of their use at universities, and the inclusion of both in the curricula (Rinschede 2003). The authors mostly did use concrete empirical studies to support their opinions on the advantages of one or the other and merely based them on their own theoretical reflection. Because the majority of articles to date have not focused directly on the use of both approaches in school textbooks, this issue has remained fairly understudied.

Another problem arose while preparing the classification: the terminology used in this area to date has been very incomplete and vague. Therefore, the existing terminological concepts useful for this classification had to be collected from the literature and organized, after which appropriate new definitions had to be provided for the missing ones. With regard to this terminology, a great deal had previously been achieved by German educators (Köck 1986; Sperling 1990; Böhn 1999; Rinschede 2003; Böhn and Obermaier 2013), who named and defined various approaches; however, they only did that in the curricula and not in the textbooks as well. The German definitions were adapted to the Slovenian context by Senegačnik (2007b). This study therefore has a double goal: to prepare a new classification of the textbook approaches mentioned above and appropriate (and partly new) terminology.

2 Methods

The classification of approaches was made based on the analysis of school textbooks on the regional geography of Europe for all age levels from twenty-eight European countries. To this end, 450 textbooks, in which at least some of the content was connected with this continent, were reviewed. Only a third of the textbooks were exclusively dedicated to the regional geography of Europe. Detailed criteria for the selection of the textbooks are presented in Section 1.3. Work was carried out at the library of the *Georg Eckert Institute* in Braunschweig. This study can be ranked among non-experimental empirical educational studies. It used a descriptive method, which makes it possible to explore the educational field using the question of what something looks like and also how much of it there is (Sagadin 1993). According to Mužić (1982), the method applied can be defined as a comparative textbook analysis. The present study involves a horizontal analysis because it includes textbooks for the same school subject from different geographical areas. Textbook analysis developed into a special discipline called »textbook research« (Pingel 1999). Mikk (2000) defines textbook analysis as collecting data on the textbook characteristics that contribute to the realization of textbook functions. This study is a type of qualitative study (Montello and Sutton 2013; Remler and Ryzin 2015). It was carried out using the method of content analysis, which already began being established before the Second World War, especially in the social sciences (Hard 1978; Weinbrenner 1998; Neuendorf 2002; Mejovšek 2003; Senegačnik 2003a; Elo and Kyngäs 2008; Coolican 2014; Komac, Zorn and Ciglič 2011; Geršič 2014). These authors do not share exactly the same views on what can be classified under the content analysis method. Urbanc (2008) reports that this method is often confused with the grounded theory method.

Work proceeded as follows: with every textbook analyzed, it was first checked whether the entire textbook or only part of it was dedicated to the regional geography of Europe. After this, it was established whether the textbook used a thematic or regional approach or a combination of both. The textbook or the part covering Europe was divided into conceptually complete wholes in terms of whether these component parts examined Europe by themes or regions. The component parts that examined Europe by regions were logically divided into two parts: a thematic introduction to a specific region and the examination of its parts.

In the next research stage, all of the textbook component parts obtained were combined into more abstract categories, based on which individual approaches (i.e., regional or thematic) were defined. In this way, a classification of these approaches was gradually created and, as the number of textbooks analyzed grew, the classification was added to on an ongoing basis. With regard to regional approaches, three categories were isolated and divided into several subcategories of various levels according to the method of examining regions (by theme, country, case study, etc.). In the end, the study resulted in four approach schemes.

3 Results

Several schemes with a detailed classification of regional and thematic textbook approaches were created. The first scheme presents the scheme of geography (i.e., the system of the geographical sciences and its basic approaches) in European textbooks in general. This includes all textbooks with any content, not only those covering Europe. If several dozen randomly selected textbooks are examined, one can distinguish between three versions (Figure 1).

1) The first group includes »textbooks covering only thematic geography« (in its broadest sense). This means they deal with both systematic and non-systematic thematic geography, but they do not examine a specific region as a special »theme« because that would already imply regional geography. (From the educational perspective, this version involves thematic geography in a thematic classification.) These types of textbooks can examine »general geography« (systematic thematic geography or thematic geography in the broader sense) or »thematic geography« (non-systematic thematic geography or thematic geography in the narrow sense). In the first case, they use a »general geography approach« and in the second they use a »thematic geography approach.«

2) The second group includes textbooks that only cover »regional geography« (in the broadest sense). (From the educational perspective, this also includes thematic geography in a regional classification in addition to »proper« regional geography.) These types of textbooks can examine one or more regions or parts of the world (a home country, Europe, several continents). Regional geography in this case refers to the examination of those complete conceptual wholes, in which the titles already indicate that one or more regions are at the forefront of discussion rather than various geographical elements and factors. In principle, four approaches can be used for examining every region.

The first one is the »thematic or thematic geography approach« (as part of thematic regional geography). Every region (e.g., home country, Europe) is examined as a whole, but only by individual themes rather than smaller regions. The other three approaches labeled »regional (regional geography) approaches« examine every region also or exclusively by (smaller) regions. Among these, one can distinguish between the

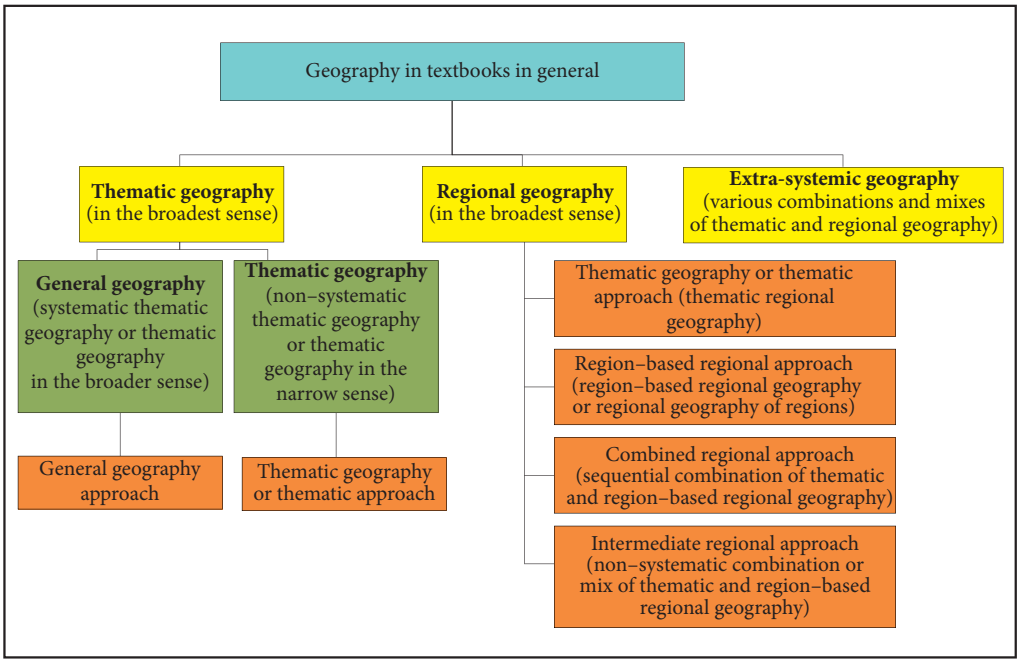

Figure 1: Geography or the system of the geographical sciences in terms of its regional or thematic approach in textbooks in general.

»region-based regional approach« (derived from the region-based regional geography or regional geography of regions), the »combined regional approach« (a sequential combination of thematic and region-based regional geography), and the »intermediate regional approach« (non-systematic combination or mix of thematic and region-based regional geography). This scheme is difficult to understand primarily because regional geography cannot be equated with the regional approach; instead, there is regional geography with a thematic approach on the one hand, and regional geography with various regional approaches on the other. 3) The third group includes textbooks from which the system of the geographical sciences is very difficult to determine or can no longer be clearly determined because they use »various combinations and mixes of thematic and regional geography.« Because such textbooks somehow extend beyond geography, this can be referred to as »extra-systemic geography.« Within its framework, the possible versions of approaches cannot be analyzed because they are simply outside the system studied.

The other three schemes present a detailed classification of approaches used in the textbooks of various European countries that cover the regional geography of Europe. In these schemes, various versions of the three approaches mentioned above (one thematic and two regional) were analyzed; for the third regional approach (i.e., the intermediate approach) the possible versions are not listed because there are too many.

The first one is the »thematic or thematic geography approach as part of the regional geography of Europe« (Figure 2). Even though it has the same name, it must not be confused with the thematic approach as part of thematic geography. The thematic approach as part of regional geography derives from thematic regional geography in the broadest sense. This is not a regional approach, even though it is being used in regional geography. It can be divided into the »general geography approach« (a systematic thematic approach or a thematic approach in the broader sense), which derives from general geography regional geography, and the »thematic geography or thematic approach« (a non-systematic thematic approach or a thematic approach in the narrow sense), which derives from thematic regional geography in the narrow sense.

This approach examines the learning material by smaller conceptual wholes, which can be referred to as »learning themes,« among which one can distinguish between more general or »common« themes, more »concrete« case studies, and combinations of a thematic »introduction« and one or more concrete case studies. It is very difficult or even impossible to draw a clear line between a »common« theme and a case study, and therefore it would make sense to further divide both approaches into approaches that examine material predominantly by themes and approaches that examine material predominantly by case studies.

The »region-based regional approach« (Figure 3) is the second possible approach in regional geography (of Europe) and at the same time the first of the three regional approaches. This approach is the most regional because it does not include a general or thematic introduction to Europe as a whole, but only examines its regions. It thus derives from region-based regional geography or the regional geography of regions. It can be divided into a »simple region-based approach« (without introductions to individual regions) and

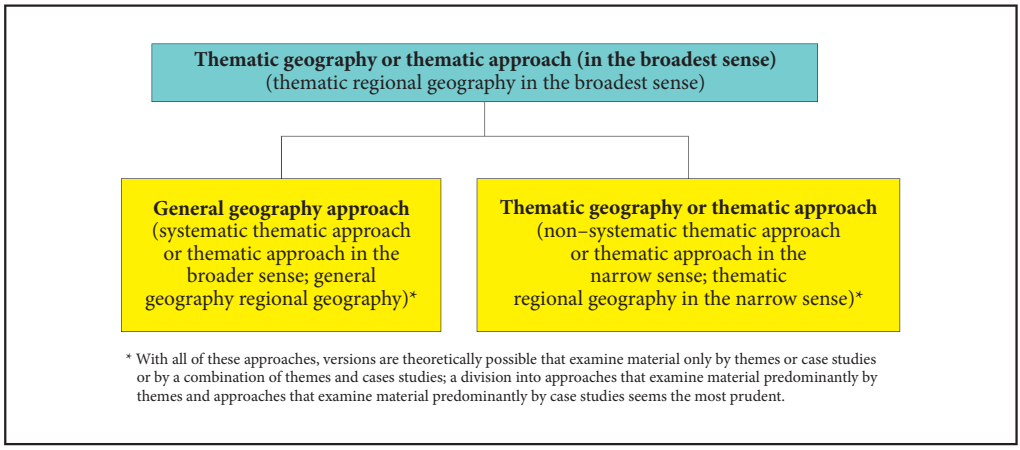

Figure 2: The thematic geography approach in the broadest sense as part of the regional geography of Europe.

a »combined region-based approach;« the latter can be further divided into a version with a non-systematic introduction and a version with a systematic introduction to an individual region. With both the simple and combined region-based approach and its two versions, one can distinguish between five versions of possible examination of European regions; they are numbered 1 to 5 in Figure 3.

The most complex and also the most frequently used approach is the »combined (thematic region-based) regional approach,« which allows a large number of different versions (Figure 4). It includes a combination of thematic and region-based regional geography, in which one can distinguish between a »once-combined« or »twice-combined« approach. (They could also be referred to as a simple and composite combined approach.) Each version is further divided into a version »with a systematic (general geography) introduction to Europe« and a version »with a non-systematic (thematic geography) introduction to Europe.« The former includes more or less classic themes from general geography, which are largely social. The thematic or general geography part of the examination of Europe, referred to here as an »introduction« to Europe, sometimes comes after the regional part of the examination and not before it.

With the twice-combined approach, the combination of thematic or general and region-based regional geography also repeats in the examination of individual regions because one can further distinguish between a version »with a systematic introduction« and a version »with a non-systematic introduction to an individual region.« Every examination of individual European regions can entail one of the five possible versions, which are numbered 1 to 5 in Figure 4. Specifically, individual regions can be examined by non-selected themes from general geography, by selected themes, by non-selected countries, by selected countries, and by selected themes and countries. There is practically no approach that would examine everything about each and every country, although some textbooks still try to achieve this. In addition, it is also possible to include case studies in various combinations with individual themes or countries, which naturally increases the final number of possible combinations.

4 Discussion

The main result of this study (i.e., classification in the form of four schemes) fills the large research gap in the current findings on regional and thematic textbook approaches. The analysis of these textbook approaches showed that no detailed classification was currently available, and so a new one had to be produced.

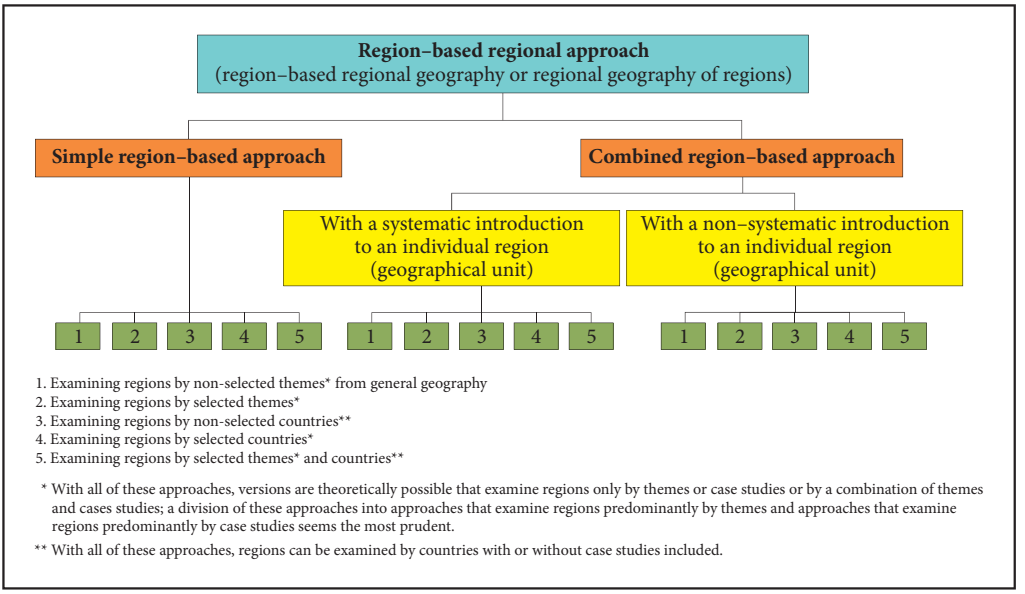

Figure 3: The region-based regional approach as part of the regional geography of Europe.

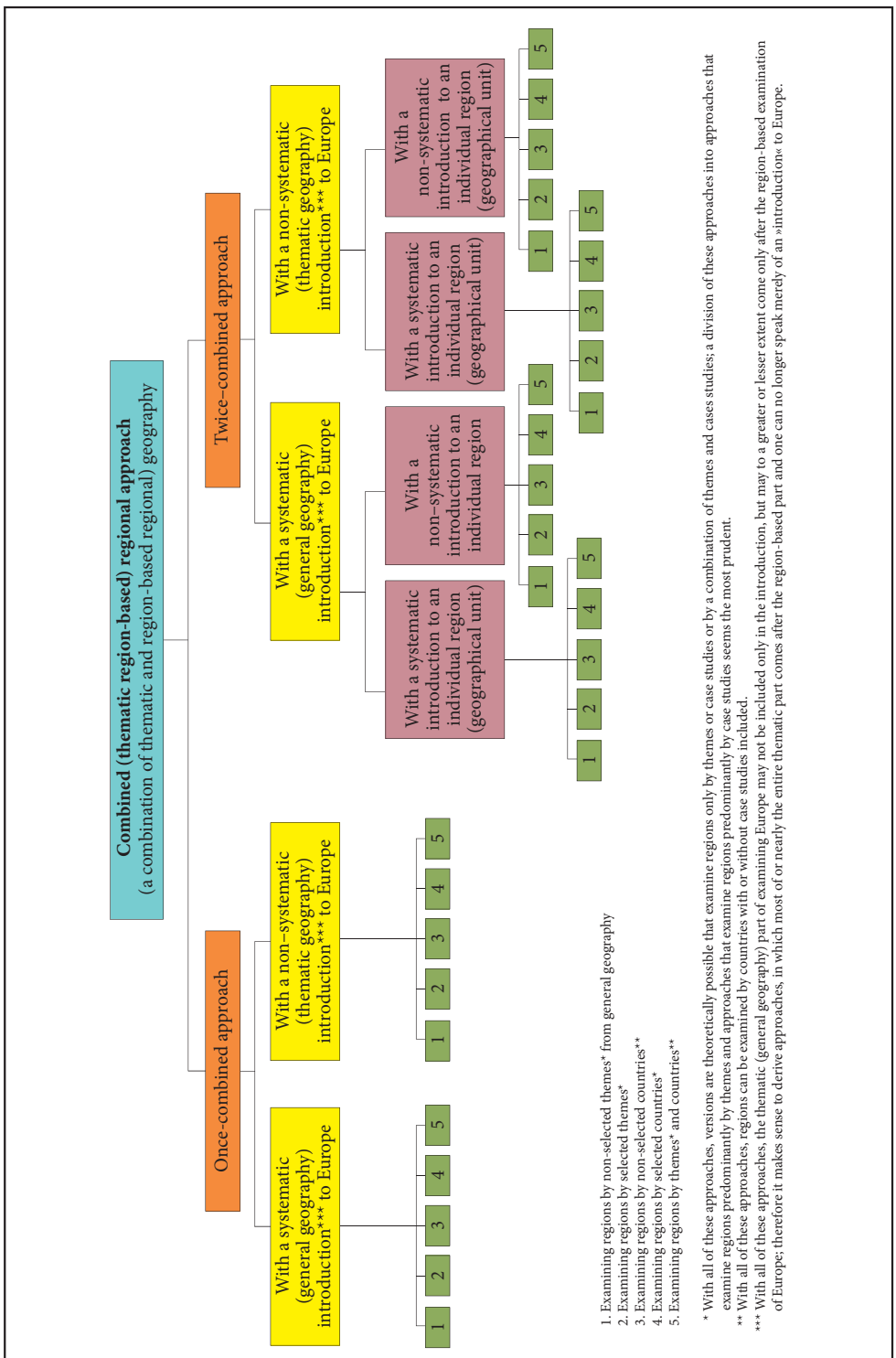

Figure 4: The combined (thematic region-based) regional approach as part of the regional geography of Europe.

The analysis of all possible regional and thematic textbook approaches proved to be significantly more complex than might be expected based on the previous studies. As a rule, these were limited to the use of two basic approaches, failing to also take into account the numerous combinations and versions that can in fact be found in the textbooks. Somewhat greater efforts to analyze these approaches in more detail were only made by German geography educators, but they were limited to the level of the curricula. Their definitions thus do not extend as deeply into the research issue as the classification presented in this study.

Another important result of this study was the preparation of appropriate terminology, which partly had to be formulated anew. The newly defined terms included extra-systemic geography, a region-based regional approach, region-based regional geography, and so on.

The study has also yielded some unexpected results. It turned out that textbook authors follow the system of the geographical sciences to a much lesser extent than initially expected, and that by using a combination of both basic approaches they created a significantly larger number of possible versions than initially anticipated.

5 Conclusion

The main value of this study does not lie in important empirical results, but first and foremost in its contribution to the theory of geography or the system of the geographical sciences, and to geography textbook theory. The basic research goal was to prepare the first detailed classification of all possible regional and thematic textbook approaches using the examples of European textbooks covering the regional geography of Europe, while also solving the issue of lacking terminology. The main result of this study is four classification schemes derived from the system of the geographical sciences. The first one is the scheme for geography in textbooks in general, where one can distinguish between thematic geography (in the broadest sense), regional geography (in the broadest sense), and extra-systemic geography. This is followed by the schemes for three approaches used for covering the regional geography of Europe: one thematic and two regional. The two regional approaches include the region-based regional approach and the combined (thematic-regional) regional approach.

The study was limited to textbooks covering the regional geography of Europe, and so it would make sense to repeat it using textbooks with different content (e.g., examining the home country) and interpret the results quantitatively as well. The classification produced can be used by teachers as an effective instrument for analyzing and evaluating textbooks and selecting the best ones for use in the classroom.

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Guidelines for contributing authors in Acta geographica Slovenica

EDITORIAL POLICIES

1 Focus and scope

The Slovenian geographical journal *Acta geographica Slovenica* (print version: ISSN: 1581-6613, digital version: ISSN: 1581-8314) is published by the Anton Melik Geographical Institute of the Slovenian Academy of Sciences and Arts Research Center.

Acta geographica Slovenica publishes original research papers from all fields of geography and related disciplines, and provides a forum for discussing new aspects of theory, methods, issues, and research findings, especially in central and southeast Europe.

We accept original research papers and review papers.

Papers presenting new developments and innovative methods in geography are welcome. Submissions should address current research gaps and explore state-of-the-art issues. Research based on case studies should have the added value of transnational comparison and should be integrated into established or new theoretical and conceptual frameworks.

The target readership is researchers, policymakers, and university students studying or applying geography at various levels.

Submissions are accepted in English or Slovenian.

The journal is indexed in the following bibliographic databases: SCIE (Science Citation Index Expanded), Scopus, JCR (Journal Citation Report, Science Edition), ERIH PLUS, GEOBASE Journals, Current Geographical Publications, EBSCOhost, Geoscience e-Journals, Georef, FRANCIS, SJR (SCImago Journal & Country Rank), OCLC WorldCat, and Google Scholar. The journal's publisher is a member of CrossRef.

2 Types of papers

Unsolicited or invited original research papers and review papers are accepted. Papers and materials or sections of them should not have been previously published elsewhere. The papers should cover subjects of current interest within the journal's scope.

3 Special issues

The journal also publishes special issues (thematic supplements). Special issues usually consist of invited papers and present a special topic, with an introduction by the (guest) editors. The introduction briefly presents the topic, summarizes the papers, and provides important implications.

4 Peer-review process

All papers are examined by the editor-in-chief. This includes fact-checking the content, spelling and grammar, writing style, and figures. Papers that appear to be plagiarized, are ghost-written, have been published elsewhere, are outside the scope of journal, or are of little interest to readers of *Acta geographica Slovenica* may be rejected. If the article exceeds the maximum length, the author(s) must correct this before the article is reviewed. The paper is then sent to responsible editors, who check the relevance, significance, originality, clarity, and quality of the paper. If accepted for consideration, the papers are then sent to peer reviewer(s) for double-blind review. Paper are rejected or accepted based on the peer reviews and editorial board's decision.

5 Publication frequency

Acta geographica Slovenica is published twice a year.

6 Open-access policy

This journal provides immediate free open access to its content and supports greater global exchange of knowledge by making research freely available. The papers in *Acta geographica Slovenica* and its predecessors *Acta geographica / Geografski zbornik* and *Geographica Slovenica* are available online free of charge. The author(s) receive a free print copy.

The journal's publication ethics and publication malpractice statement is available online, as well as information on subscriptions and prices for print copies.

AUTHOR GUIDELINES

Before submitting a paper, please read the details on the journal's focus and scope, peer-review process, publication frequency, history, and open-access policy. This information is available in the editorial policies.

1 The papers

Research papers must be prepared using the journal's template and contain the following elements:
- **Title:** this should be clear, short, and simple.
- **Information about author(s):** submit names (without academic titles), institutions, and e-mail addresses through the online submission system.
- **Abstract:** introduce the topic clearly so that readers can relate it to other work by presenting the background, why the topic was selected, how it was studied, and what was discovered. It should contain one or two sentences about each section (introduction, methods, results, discussion, and conclusions). The maximum length is 800 characters including spaces.
- **Key words:** include up to seven informative key words. Start with the research field and end with the place and country.
- **Main text:** limit the text of the paper to 20,000 characters including spaces and without the reference list, and tables. Do not use footnotes or endnotes. Divide the paper into sections with short, clear titles marked with numbers without final dots: **1 Section title**. Use only one level of subsections: **1.1 Subsection title**.

Research papers should have the following structure:
- **Introduction:** present the background of the research problem (trends and new perspectives), state of the art (current international discussion in the field), research gap, motivation, aim, and research questions.
- **Methods:** describe the study area, equipment, tools, models, programs, data collection, and analysis, define the variables, and justify the methods.
- **Results:** follow the research questions as presented in the introduction and briefly present the results.
- **Discussion:** interpret the results, generalize from them, and present related broader principles and relationships between the study and previous research. Critically assess the methods and their limitations, and discuss important implications of the results. Clarify unexpected results or lacking correlations.
- **Conclusion:** present the main implications of the findings, your interpretations, and unresolved questions, offering a short take-home message.

Review papers (narratives, best-practice examples, systematic approaches, etc.) should have the following structure:
- **Introduction:** include 1) the background; 2) the problem: trends, new perspectives, gaps, and conflicts; and 3) the motivation/justification.
- **Material and methods:** provide information such as data sources (e.g., bibliographic databases), search terms and search strategies, selection criteria (inclusion/exclusion of studies), the number of studies screened and included, and statistical methods of meta-analysis.

- **Literature review:** use subheadings to indicate the content of the various subsections. Possible structure: methodological approaches, models or theories, extent of support for a given thesis, studies that agree with one another versus studies that disagree, chronological order, and geographical location.
- **Conclusions:** provide implications of the findings and your interpretations (separate from facts), identify unresolved questions, summarize, and draw conclusions.

– **Acknowledgement:** use when relevant.
– **Reference list:** see the guidelines below.

2 Paper submission

2.1 Open journal system

Author(s) must submit their contributions through the *Acta geographica Slovenica* Open Journal System (OJS) using the Word document template.

Enter all necessary information into the OJS. Any addition, deletion, or rearrangement of names of the author(s) in the authorship list should be made and confirmed by all coauthors before the manuscript has been accepted, and is only possible if approved by the journal editor.

To make anonymous peer review possible, the paper text and figures should not include names of author(s).

Do not use contractions or excessive abbreviations. Use plain text, with sparing use of **bold** and *italics*. Do not use auto-formatting, such as section or list numbering and bullets.

If a text is unsatisfactory, the editorial board may return it to the author(s) for professional copyediting or reject the paper. See the section on the peer-review process for details. Author(s) may suggest reviewers when submitting a paper.

2.2 Language

Papers are published in English.

Papers are submitted in English or Slovenian and copyedited/translated after acceptance by a professional chosen by the editorial board.

The translation or copyediting costs are borne by the author(s) (translation €500, copyediting €200) and must be paid before layout editing.

All papers should have English and Slovenian abstracts.

2.3 Supplementary file submission

Supplementary files (figures) can be submitted to the OJS packed in one zip file not exceeding 50 MB.

2.4 Submission date

The journal publishes the submission date of papers. Please contact the editor, Blaž Komac, with any questions.

3 Citations

Examples for citing publications are given below. Using "gray literature" is highly discouraged.

3.1 Citing papers

- Fridl, J., Urbanc, M., Pipan, P. 2009: The importance of teachers' perception of space in education. Acta geographica Slovenica 49-2. DOI: https://doi.org/10.3986/AGS49205
- Perko, D. 1998: The regionalization of Slovenia. Geografski zbornik 38.
- Gams, I. 1994a: Types of contact karst. Geografia fisica e dinamica quaternaria 17.

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- de Kerk, G. V., Manuel, A. R. 2008: A comprehensive index for a sustainable society: The SSI – the Sustainable Society Index. Ecological Economics 66-2,3. DOI: https://doi.org/10.1016/j.ecolecon.2008.01.029
- van Hall, R. L., Cammeraat, L. H., Keesstra, S. D., Zorn, M. 2016: Impact of secondary vegetation succession on soil quality in a humid Mediterranean landscape. Catena, In press. DOI: https://doi.org/10.1016/j.catena.2016.05.021 (25. 11. 2016).

3.2 Citing books

- Cohen, J. 1988: Statistical power analysis for the behavioral sciences. New York.
- Nared, J., Razpotnik Visković, N. (eds.) 2014: Managing cultural heritage sites in Southeastern Europe. Ljubljana.
- Fridl, J., Kladnik, D., Perko, D., Orožen Adamič, M. (eds.) 1998: Geografski atlas Slovenije. Ljubljana.
- Luc, M., Somorowska, U., Szmańda, J. B. (eds.) 2015: Landscape analysis and planning. Heidelberg. DOI: https://doi.org/10.1007/978-3-319-13527-4

3.3 Citing parts of books or proceedings

- Zorn, M., Komac, B. 2013: Land degradation. Encyclopedia of Natural Hazards. Dordrecht. DOI: https://doi.org/10.1007/978-1-4020-4399-4_207
- Hrvatin, M., Perko, D., Komac, B., Zorn, M. 2006: Slovenia. Soil Erosion in Europe. Chichester. DOI: https://doi.org/10.1002/0470859202.ch25
- Gams, I. 1987: A contribution to the knowledge of the pattern of walls in the Mediterranean karst: a case study on the N. island Hvar, Yugoslavia. Karst and man, Proceedings of the International Symposium on Human Influence in Karst. Ljubljana.
- Komac, B., Zorn, M. 2010: Statistično modeliranje plazovitosti v državnem merilu. Od razumevanja do upravljanja, Naravne nesreče 1. Ljubljana.

3.4 Citing expert reports, theses, and dissertations

- Breg Valjavec, M. 2012: Geoinformatic methods for the detection of former waste disposal sites in karstic and nonkarstic regions (case study of dolines and gravel pits). Ph.D. thesis, University of Nova Gorica. Nova Gorica.
- Hrvatin, M. 2016: Morfometrične značilnosti površja na različnih kamninah v Sloveniji. Ph.D. thesis, Univerza na Primorskem. Koper.
- Holmes, R. L., Adams, R. K., Fritts, H. C. 1986: Tree-ring chronologies of North America: California, Eastern Oregon and Northern Great Basin with procedures used in the chronology development work including user manual for computer program COFECHA and ARSTAN. Chronology Series 6. University of Arizona, Laboratory of tree-ring research. Tucson.
- Šifrer, M. 1997: Površje v Sloveniji. Elaborat, Geografski inštitut Antona Melika ZRC SAZU. Ljubljana.

3.5 Citing online material with authors and titles

- Bender, O., Borsdorf, A., Heinrich, K. 2010: The interactive alpine information system GALPIS. Challenges for mountain regions, Tackling complexity. Internet: http://www.mountainresearch.at/images/Publikationen/Sonderband/bender-borsdorf-heinrich.pdf (4. 8. 2014).

3.6 Citing online material without authors

- Internet: http://giam.zrc-sazu.si (18. 11. 2016).
- Internet 1: http://giam.zrc-sazu.si/ (22. 7. 2012).
- Internet 2: http://ags.zrc-sazu.si (23. 7. 2012).

3.7 Citing sources without authors

- WCED – World commission on environmental and development: Our common future – Brundtland report. Oxford, 1987.
- Popis prebivalstva, gospodinjstev, stanovanj in kmečkih gospodarstev v Republiki Sloveniji, 1991 – končni podatki. Zavod Republike Slovenije za statistiko. Ljubljana, 1993.

3.8 Citing cartographic sources

- Državna topografska karta Republike Slovenije 1 : 25.000, list Brežice. Geodetska uprava Republike Slovenije. Ljubljana, 1998.
- Franciscejski kataster za Kranjsko, k. o. Sv. Agata, list A02. Arhiv Republike Slovenije. Ljubljana, 1823–1869.
- Buser, S. 1986: Osnovna geološka karta SFRJ 1 : 100.000, list Tolmin in Videm (Udine). Savezni geološki zavod. Beograd.
- The vegetation map of forest communities of Slovenia 1 : 400,000. Biološki inštitut Jovana Hadžija ZRC SAZU. Ljubljana, 2002.
- Digitalni model višin 12,5. Geodetska uprava Republike Slovenije. Ljubljana, 2005.

3.9 Citing official gazettes

- Zakon o kmetijskih zemljiščih. Uradni list Republike Slovenije 59/1996. Ljubljana.
- Zakon o varstvu pred naravnimi in drugimi nesrečami. Uradni list Republike Slovenije 64/1994, 33/2000, 87/2001, 41/2004, 28/2006 in 51/2006. Ljubljana.
- 1999/847/EC: Council Decision of 9 December 1999 establishing a Community action programme in the field of civil protection. Official Journal 327, 21. 12. 1999.

3.10 In-text citations

Please ensure that every reference cited in the text is also in the reference list (and vice versa). In-text citations should state the last name of the author(s) and the year, separate individual citations with semicolons, order the quotes according to year, and separate the page information from the name of the author(s) and year information with a comma; for example: (Melik 1955), (Melik, Ilešič and Vrišer 1963; Kokole 1974, 7–8; Gams 1982a; Gams 1982b).

For sources with more than three authors, list only the first followed by *et al.*: (Melik et al. 1956). Cite page numbers only for direct citations: Perko (2016, 25) states: »Hotspots are …« To cite online material with authors, cite the name: (Zorn 2010). To cite online material without authors, cite only Internet followed by a number: (Internet 2).

3.11 Works cited list

Arrange references alphabetically and then chronologically if necessary. Identify more than one reference by the same author(s) in the same year with the letters *a*, *b*, *c*, etc., after the year of publication: (1999a, 1999b). Use this format for indirect citations: (Gunn 2002, cited in Matei et al. 2014).

Include the Digital Object Identifier (DOI) in the reference if available. Format the DOI as follows: https://doi.org/… (for example: https://doi.org/10.3986/AGS.1812).

4 Tables and figures

Number all tables in the paper uniformly with their own titles. The number and the text are separated by a colon, and the caption ends with a period. Example:

Table 1: Number of inhabitants of Ljubljana.
Table 2: Changes in average air temperature in Ljubljana (Velkavrh 2009).

Tables should contain no formatting and should not be too large; it is recommended that tables not exceed one page.

Upload figures to the OJS as separate supplementary files in digital form. If the graphic supplements prepared cannot be uploaded using these programs, consult the editorial board in advance.

Number all figures (maps, graphs, photographs) in the paper uniformly with their own titles. Example:

Figure 1: Location of measurement points along the glacier.

All graphic materials must be adapted to the journal's format. Illustrations should be exactly 134 mm wide (one page) or 64 mm wide (half page, one column), and the height limit is 200 mm.

To make anonymous peer review possible, include the name of the author(s) with the title of the illustration in the supplementary file metadata, but not in the paper text.

Maps should be made in digital vector form with *Corel Draw, Adobe Illustrator*, or a similar program, especially if they contain text. They can exceptionally be produced in digital raster form with at least 300 dpi resolution, preferably in TIFF or JPG format. For maps made with *CorelDraw* or *Adobe Illustrator*, two separate files should be prepared; the original file (.cdr or .ai format) and an image file (.jpg format).

For maps made with *ArcGIS* with raster layers used next to vector layers (e.g., .tif of relief, airborne or satellite image), three files should be submitted: the first with a vector image without transparency together with a legend and colophon (export in .ai format), the second with a raster background (export in .tif format), and the third with all of the content (vector and raster elements) together showing the final version of the map (export in .jpg format).

Do not print titles on maps; they should appear in a caption.

Save colors in CMYK, not in RGB or other formats.

Use Times New Roman for the legend (size 8) and colophon (size 6). List the author(s), scale, source, and copyright in the colophon. Write the colophon in English (and Slovenian, if applicable). Example:

Scale: 1 : 1,000,000
Content by: Drago Perko
Map by: Jerneja Fridl
Source: Statistical Office of the Republic of Slovenia, 2002
© 2005, ZRC SAZU Anton Melik Geographical Institute

Graphs should be made in digital form using *Excel* on separate sheets and accompanied by data.

Photos must be in raster format with a resolution of 240 dots per cm or 600 dpi, preferably in .tif or .jpg formats; that is, about 3,200 dots per page width of the journal.

Figures containing a screenshot should be prepared at the highest possible screen resolution (Control Panel\All Control Panel Items\Display\Screen Resolution). The figure is made using Print Screen, and the captured screen is pasted to the selected graphic program (e.g., *Paint*) and saved as .tif. The size of the image or its resolution must not be changed.

Examples of appropriate graphic data forms: see the templates of maps in cdr and mxd files for a whole-page map in landscape view and an example of correct file structure for submitting a map made with *ESRI ArcGIS*.

SUBMISSION PREPARATION CHECKLIST

As part of the submission process, check your submission's compliance with the following items. Submissions may be returned to author(s) that do not follow these guidelines.

1. The journal policies have been reviewed.
2. The submission has not been previously published and is not being considered for publication elsewhere (or an explanation has been provided in comments to the editor).
3. The metadata (title, abstract, key words, full address, etc.) are provided in English and Slovenian, when applicable.
4. The submission is in Microsoft Word format and the document template was used (single-spaced text, 12-point font, no formatting except italics and bold).

5. The manuscript has been checked for spelling and grammar.
6. All figure locations in the text are marked. Figures are not in the text and are provided as supplementary files: cdr, .ai for maps and illustrations; .tif for photographs; xlsx for graphs.
7. Tables are placed in the text at the appropriate place.
8. The reference list was prepared following the guidelines.
9. All references in the reference list are cited in the text, and vice versa.
10. Where available, URLs and DOI numbers for references are provided.
11. Supplementary files are in one .zip file not exceeding 50 MB.
12. I agree for this article to be translated or copyedited at my expense AFTER the article is accepted for publication (see guidelines for details).
13. Permission has been obtained for the use of copyrighted material from other sources, including online sources; see the copyright notice below.
14. The instructions for ensuring a double-blind review have been followed.

ACTA GEOGRAPHICA SLOVENICA EDITORIAL REVIEW FORM

Acta geographica Slovenica editorial review form

1 The paper is an original scientific one – the paper follows the standard IMRAD scheme and is original and the first presentation of research results with the focus on methods, theoretical aspects or case study.)

Yes No

2 The paper's content is suitable for publishing in the AGS journal – the paper is from the field of geography or related fields of interest, the presented topic is interesting and well presented. In case of negative answer add comments below.)

Yes No

3 Editorial notes regarding the paper's content.

4 Length of the paper is acceptable for further processing (20.000 characters including space). If longer, the paper has to be shortened by the author and resubmitted.

- The paper has less than 20.000 characters.
- The paper has more than 20.000 characters, but less than 25.000.
- The paper has more than 25.000 characters.

5 The style and formatting of the paper is according to the AGS guidelines – the paper is prepared in plain text, no other text formatting is used than bold and italic. See the Guidelines of AGS journal for details.)

Yes No

6 Notes regarding style and formatting.

7 Citing in the paper is according to the AGS guidelines and style, including DOI identificators.

Yes No

8 The reference list is suitable (the author cites previously published papers with similar topic from other relevant scientific journal).

Yes, the author cited previously published papers on similar topic.

No, the author did not cite previously published papers on similar topic.

9 Scientific language of the paper is appropriate and understandable.

Yes No

10 Supplementary files (ai, cdr, pdf, tif, jpg, xlsx etc.) that were added to the paper are in proper format and resolution (including the introductory photo), maps are prepared according to the AGS Guidelines. (In this step contact the technical editor [rok.ciglic@zrc-sazu.si] for assistance if needed).
- Supplementary files are correct.
- Supplementary files are not appropriate and need a major correction.
- Some supplementary files need corrections.

11 Describe the possible deficiencies of the supplementary files:

12 DECISION OF THE RESPONSIBLE EDITOR
The paper is accepted for further processing and may be sent to the reviewer.
The paper is accepted for further processing but needs technical improvements (see notes).
The paper is accepted for further processing but its content needs additional improvements (see notes).
The paper is not accepted for publication because:
- It is more suitable for a specialized journal.
- Does not fit the aims and scopes of the AGS journal.
- Is not an original scientific paper.
- The presentation of the results is poor.
- The paper is of very low quality.
- The paper has already been published elsewhere.
- Other (see comments below).
- Other reasons for rejection of the paper.

ACTA GEOGRAPHICA SLOVENICA REVIEW FORM

1 RELEVANCE

1a) Are the findings original and the paper is therefore a significant one?

Yes No Partly

1b) Is the paper suitable for the subject focus of the AGS journal?

Yes No

2 SIGNIFICANCE

2a Does the paper discuss an important problem in geography or related fields?

Yes No Partly

2b Does it bring relevant results for contemporary geography?

Yes No Partly

2c What is the level of the novelty of research presented in the paper?

High Middle Low

3 ORIGINALITY

3a Has the paper been already published or is too similar to work already published?

Yes No

3b Does the paper discuss a new issue?

Yes No

3c Are the methods presented sound and adequate?

Yes No Partly

3d Do the presented data support the conclusions?

Yes No Partly

4 CLARITY

4a Is the paper clear, logical and understandable?

Yes No

4b If necessary, add comments and recommendations to improve the clarity of the title, abstract, keywords, introduction, methods or conclusion:

5 QUALITY

5a Is the paper technically sound? (If no, the author should discuss technical editor [rok.ciglic@zrc-sazu.si] for assistance.)

Yes No

5b Does the paper take into account relevant current and past research on the topic?

Yes No

Propose amendments, if no is selected:

5d Is the references list the end of the paper adequate?

Yes No

Propose amendments, if no is selected:

5e Is the quoting in the text appropriate?

Yes No Partly

Propose amendments, if no is selected:

5f Which tables are not necessary?

5g Which figures are not necessary?

6 COMMENTS OF THE REVIEWER

Comments of the reviewer on the contents of the paper:
Comments of the reviewer on the methods used in the paper:

7 RECOMMENDATION OF THE REVIEWER TO THE EDITOR-IN-CHIEF

My recommendation is:
Please rate the paper from 1 [low] to 100 [high]:
Personal notes of the reviewer to editor-in-chief.

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Research Center of the Slovenian Academy of Sciences and Arts
PO Box 306
SI–1001 Ljubljana
Slovenia

SOURCES OF SUPPORT

Slovenian Academy of Sciences and Arts
Slovenian Research Agency

JOURNAL HISTORY

Acta geographica Slovenica (print version: ISSN: 1581-6613, digital version: ISSN: 1581-8314) was founded in 1952. It was originally named *Geografski zbornik / Acta geographica* (ISSN 0373-4498). Altogether 42 volumes were published. In 2002 *Geographica Slovenica* (ISSN 0351-1731, founded in 1971, 35 volumes) was merged with the journal.

Since 2003 (from volume 43 onward) the name of the joint journal has been *Acta geographica Slovenica*. The journal continues the numbering system of the journal *Geografski zbornik / Acta geographica*.

Those interested in the history of the journal are invited to read the paper »The History of *Acta geographica Slovenica*.«

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ISSN: 1581-6613
UDC – UDK: 91
ACTA GEOGRAPHICA SLOVENICA
GEOGRAFSKI ZBORNIK

58-2
2018

Print/tisk: Collegium Graphicum d. o. o.

Ljubljana 2018

ACTA GEOGRAPHICA SLOVENICA
GEOGRAFSKI ZBORNIK
58-2 • 2018

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ISSN 1581-6613
9 771581 661010