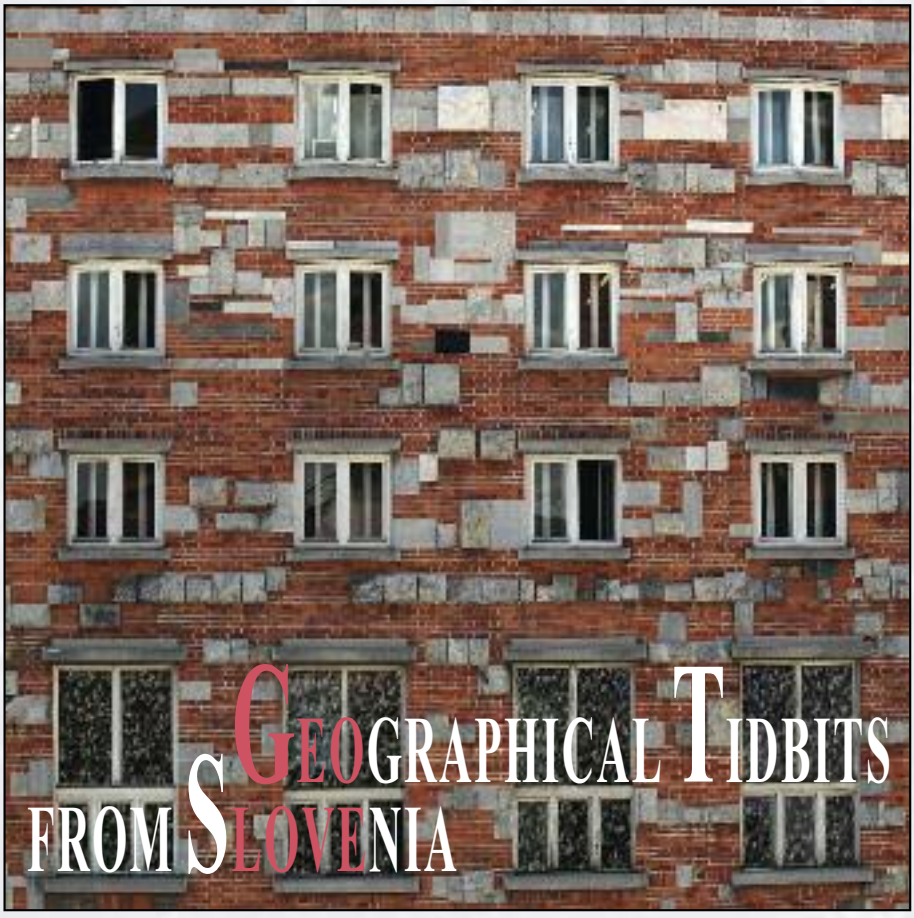
2012

GEOGRAFSKI VESTNIK

84-1

Special Issue on the Occasion of the 32nd International Geographical Congress in Cologne



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L'ASSOCIATION DES GÉOGRAPHES SLOVÉNES

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Edited by:

Matija Zorn
Rok Ciglič
Drago Perko

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BULLETIN FOR GEOGRAPHY AND RELATED SCIENCES
BULLETIN POUR GÉOGRAPHIE ET SCIENCES ASSOCIÉES

LJUBLJANA 2012

GEOGRAPHICAL TIDBITS FROM SLOVENIA
Matija Zorn, Rok Ciglič, Drago Perko

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Front page: Some architectonic tidbits of the National and University Library in Ljubljana designed by Jože Plečnik in 1931 and built in 1941. Photographer: Marko Zaplatil.

Naslovnica: Nekaj arhitektonskih poslastic Narodne in univerzitetne knjižnice v Ljubljani, ki je bila zgrajena leta 1941 po načrtih Jožeta Plečnika iz leta 1931. Fotograf: Marko Zaplatil.

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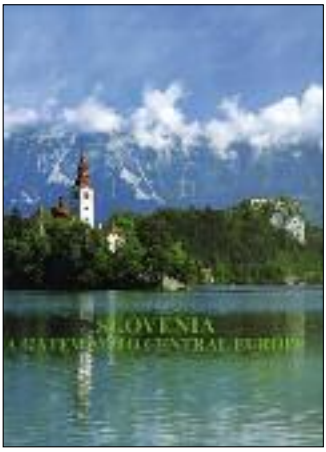
FOREWORD

After Slovenia attained independence in 1991, three volumes about Slovenia were issued to inform the international geographic community about this nation state and geographic research on it:

- **Slovenia, Geographic Aspects of a New Independent European Nation**, published on the occasion of the 27th International Geographical Congress of the International Geographical Union (IGU) at Washington in 1992 (9 authors, 10 chapters, 98 pages),
- **Slovenia: A Gateway to Central Europe**, published on the occasion of the 28th International Geographical Congress of the International Geographical Union in the Hague in 1996 (9 authors, 12 chapters, 100 pages), and
- **Slovenia: A Geographical Overview**, published on the occasion of the 30th International Geographical Congress of the International Geographical Union in Glasgow in 2004 (27 authors, 27 chapters, 160 pages).



This is the fourth such volume, **Geographical Tidbits from Slovenia**, which Slovenian geographers have prepared for the 32nd International Geographical Congress of the International Geographical Union in Cologne in 2012. It was published as the first issue of volume 84 of the journal *Geografski vestnik*/Geographical Bulletin. This journal is being published by the Association of Slovenian Geographers, which celebrates its 90th anniversary in 2012.

This volume presents certain geographic topics that Slovenian geographers have dealt with in recent years. It contains 20 articles by 29 different contributors at various Slovenian research institutions.

Matija Zorn, Rok Ciglič, Drago Perko

ARTICLES

GEOGRAPHY IN SLOVENIA

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ABSTRACT
Geography in Slovenia
This article discusses the current situation of geography as a discipline in Slovenia. Geography flourished after Slovenia became independent in 1991. The number of geographic publications rose sharply, seminal geographic and cartographic works about Slovenia were published, and up until the onset of the economic crisis there was also an increase in the number of geography researchers, who dealt with an increasingly broad selection of topics. Modern methods, especially connected to geographic information systems, were established. Digital cartography completely replaced traditional methods. After Slovenia joined the European Union in 2004, there was a marked increase in international cooperation by Slovenian geographers, in particular in the widest variety of European and other international projects. The focus of national and international projects has shifted from pure research to applied and targeted research.

KEY WORDS
geography, cartography, science, geographer, project, research, Slovenia

IZVLEČEK
Geografija v Sloveniji
Prispevek govori o današnjem stanju geografije kot znanosti v Sloveniji. Po osamosvojitvi države leta 1991 se je gegrafija razcvetela. Močno se je povečalo število geografskih publikacij, izšla so temeljna geografska in kartografska dela o Sloveniji, do začetka gospodarske krize je naraščalo tudi število geografov znanstvenikov, ki se ukvarjajo z vse širšim naborom vsebin. Uveljavile so se sodobne metode, predvsem geografski infomacijski sistemi. Digitalna kartografija je povsem spodrinila klasično. Po vstopu Slovenije v Evropsko unijo leta 2004 se je izrazito povečalo mednarodno sodelovanje slovenskih geografov, predvsem v najrazličnejših evropskih in drugih mednarodnih projektih. Težišče nacionalnih in mednarodnih projektov se je s temeljnih raziskav premaknilo k uporabnim in ciljnim raziskavam.

KLJUČNE BESEDE
geografija, kartografija, znanost, geograf, projekt, raziskava, Slovenija

The article was submitted for publication on March 1, 2012.

1 Historical milestones

Until the independence of Slovenia in 1991, Slovenian geography was connected with the development of geography in the Habsburg Monarchy and in Yugoslavia; that is, the states that for long centuries had included most of the territory that comprises Slovenia today.

The following are a few of the geographical and cartographic milestones in the past few centuries. These were described in detail up to 1920 by Bohinc (1925) and to the beginning of the 1970s by Ilešič (1979); the period from 1945 to 1990 was described by Vrišer (2007) and Klemenčič (2010), and briefer overviews were written by Kranjec (1964), Vrišer and Šifrer (1978), Gosar (1993a; 1993b; 1994), Perko (2000), Fridl (1998; 2007), and Fridl and Mihevc (2001):

- Žiga Herberstein or Siegmund (Sigismund) Freiherr von Herberstein (1486–1566) was a Carniolan diplomat most noted for his extensive writing on the geography, history, and customs of Russia. His work *Rerum Moscoviticarum Commentarii* (Notes on Muscovite Affairs), published in 1549, became the main source of knowledge about Russia in Europe.
- In 1689, Janez Vajkard Valvasor or Johann Weichard Freiherr von Valvasor (1641–1693) comprehensively described and cartographically presented Slovenian territory between the Alps and the Adriatic Sea, its natural characteristics, the life of its people, and its administrative divisions in the fifteen volumes of *Die Ehre deß Hertzogthums Crain* (The Glory of the Duchy of Carniola; Slovene *Slava Vojvodine Kranjske*). For his description of certain karst processes, the author was awarded membership in the Royal Society in London.
- In 1853, the first map was published that presented Slovenian territory using exclusively Slovenian place names. It was made by Peter Kozler (1824–1879) and published during a period of political turbulence. Immediately after its publication, this map titled *Zemljovid Slovenska dežela in pokrajin* (A Map of the Slovenian Land and Provinces) was confiscated and only appeared publicly in 1861.
- In 1860 the school geographer and cartographer Blaž Kocen (Blasius Kozenn, 1821–1871) published a school atlas that was later reprinted several dozen times in various languages, and which is still being published under his name in updated editions today (Bratec Mrvar et al. 2011).
- Between 1869 and 1877, a series of map sheets were published that comprised the first atlas of the world in Slovenian. It was prepared by Matej Cigale (1819–1889) and later called *Atlant* (Urbanc et al. 2006).
- In 1919, a university was founded in the Slovenian capital Ljubljana and geography was introduced. With the founding of the geography department, a base for geographical research was established (Ilešič 1950, 1969; Plut 1989).
- In 1922, the Geographical Society was founded, which later grew into the Association of Slovenian Geographers.
- In 1925, the association began publishing the journal *Geografski vestnik* (Geographical Bulletin).
- In 1935, Anton Melik (1890–1966), who is considered Slovenia's greatest geographer, prepared a book titled *Slovenija* (Slovenia), the first general geographical monograph on the country. Four regional volumes followed: *Slovenski alpski svet* (Slovenia's Alpine World, 1954), *Štajerska s Prekmurjem in Mežiška dolina* (Styria with Prekmurje and the Mežica Valley, 1957), *Posavska Slovenija* (The Lower Sava Region of Slovenia, 1959), and *Slovensko Primorje* (The Slovenian Littoral, 1960).
- In 1946, the geographical institute (since 1976 the Anton Melik Geographical Institute) was established by the Slovenian Academy of Sciences and Arts. In 2002 the Institute for Geography (established in 1962) and the Geographical Museum of Slovenia (established in 1946) were joined to the institute.

Figure 1: Janez Vajkard Valvasor: Map of Lake Cerknica, supplement to chapter 46 of volume four of The Glory of the Duchy of Carniola. Valvasor was the first to professionally describe and present the »functioning« of an intermittent karst lake. He attempted to explain the periodic appearance and disappearance of the lake with a system of underground currents, catchment basins, and mechanical siphons. He submitted his research findings to the Royal Society in London in 1687 and become a member. ►

MONS LAVORNICH
CIRKNIZE
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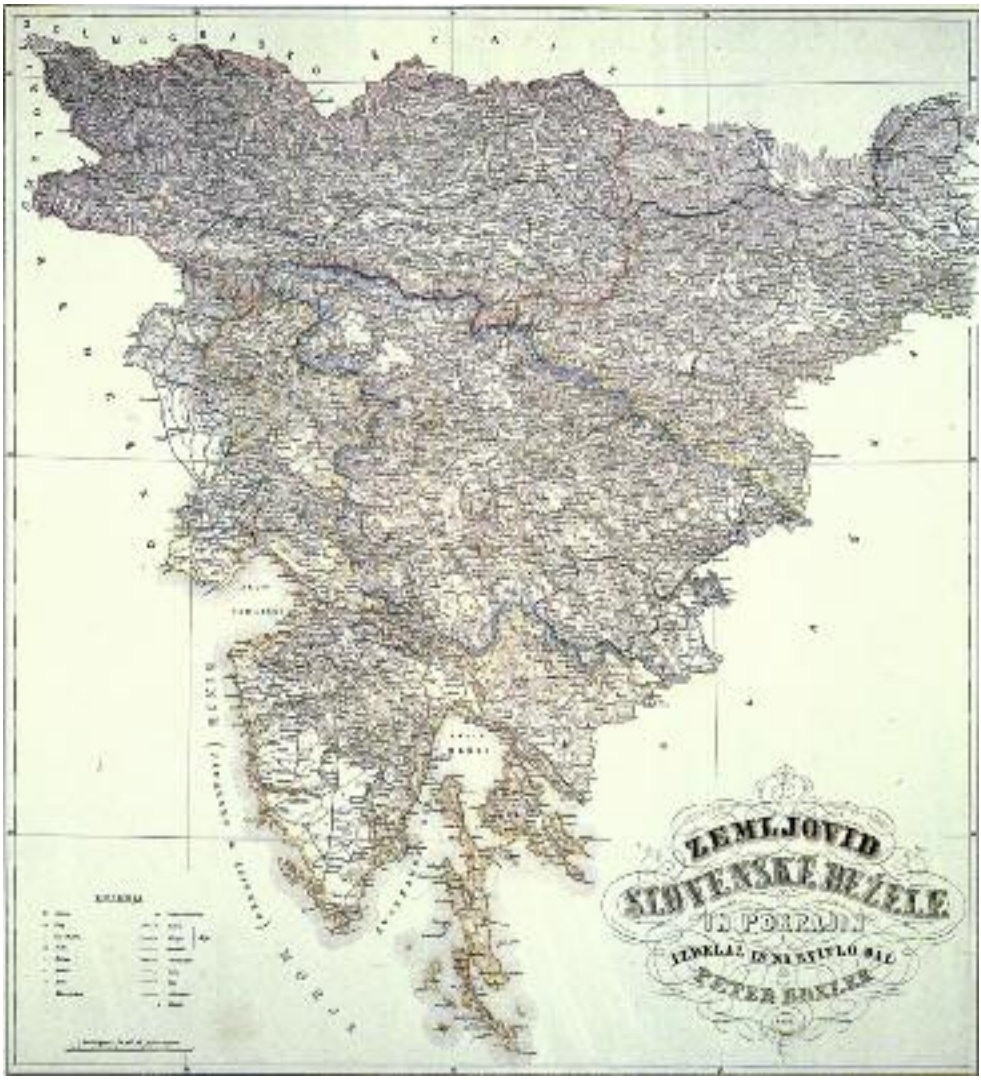

Figure 2: Kozler's 1853 map Zemljovid Slovenske dežele in pokrajin (A Map of the Slovenian Land and Provinces) marked the borders of Slovenian ethnic territory for the first time.

- In 1946 systematic study of the Triglav Glacier began; this is the oldest ongoing geographical and research project in Slovenia.
- Between 1968 and 1980 four extensive volumes of *Krajevni leksikon Slovenije* (Lexicon of Places in Slovenia), edited by Roman Savnik (1902–1987), were published.
- In 1972, the first modern Slovenian general geographical atlas, *Veliki atlas sveta* (Great Atlas of the World), was published.
- In 1986, the Commission for the Standardization of Geographical Names of the Government of the Republic of Slovenia was established. Now the commission operates at the geographical institute and is an active member of the United Nations Group of Experts on Geographical Names.

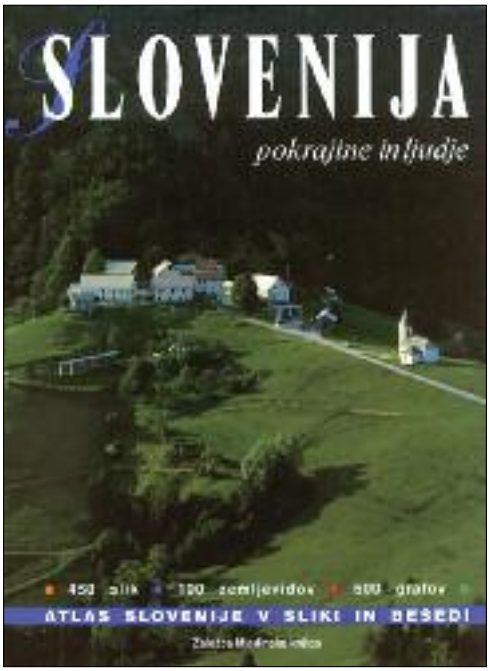

Figure 3: The three-year project Regional Geography of Slovenia, in which all geographical institutions participated, culminated in the volume Slovenia: Landscapes and People.

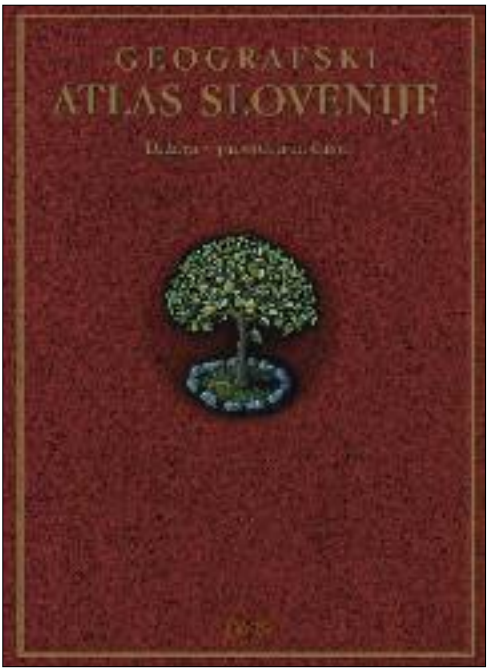

Figure 4: The three-year project Geographical Atlas of Slovenia involved nearly 200 geographers and experts from other disciplines, cartographers, photographers, and others.

- In 1992, at the 27th IGU Congress in Washington, the Association of Slovenian Geographers was accepted as full member into the International Geographical Union.
- In 1998, three extensive seminal geography books on Slovenia were published: the general volume *Geografija Slovenije* (Geography of Slovenia), the regional volume *Slovenija – pokrajine in ljudje* (Slovenia: Landscapes and People), and *Geografski atlas Slovenije* (Geographical Atlas of Slovenia), the first national atlas of the country.
- In 2005 the first Slovenian *Geografski terminološki slovar* (Geographical Terminology Dictionary) was published.
- In 2006, the *Popisni atlas Slovenije* (Census Atlas of Slovenia), the first atlas of its kind in Slovenia, was published.
- In 2008, the book *Slovenia in Focus* was published in English in honor of the European Union presidency of Slovenia.

2 Current organization

Contemporary Slovenian geography has three major institutional forms: the national association, the research institutes, and the university departments (Gosar 1994).

In Slovenia the majority of geographical studies take place at the geographical and karst studies institute and at the geography departments at the universities in Ljubljana, Maribor, and Koper.

The **Anton Melik Geographical Institute of the Scientific Research Centre of the Slovenian Academy of Sciences and Arts** (hereinafter: the geographical institute; Natek and Perko 1999) employs

UNKNOWN AUTHOR, GEOGRAPHICAL INSTITUTE ARCHIVE

MIHA PAVŠEK, GEOGRAPHICAL INSTITUTE ARCHIVE

Figure 5: The Triglav Glacier (above in September 1957, below in September 2007) has nearly disappeared. Systematic study of the glacier began in 1946. This is the oldest geographical project and the oldest ongoing long-term research project in Slovenia.

thirty-six researchers and three technical aides. The **Karst Research Institute of the Scientific Research Centre of the Slovenian Academy of Sciences and Arts** (hereinafter: the karst studies institute; Slabe 1997) has fourteen researchers and five technical aides. Both institutes are entirely financed through national and international projects. Approximately half of the budget of the geographical institute is represented by European public funds, one third by national public funds, and one-fifth by commercial projects. The budget of the karst studies institute remains predominantly national public funds.

The salaries of most of the full-time researchers and lecturers at all three university geography departments are covered by the state. In principal, half of the funding is to be earmarked for teaching and half for research. Departmental employees can receive an additional one-fifth of funding through national and international projects.

The **Geography Department at the University of Ljubljana's Faculty of Arts** (hereinafter: the Ljubljana department; Resnik Planinc and Kušar 2010) employs twenty-one researchers and eight research aids, the **Geography Department at the University of Maribor's Faculty of Arts** (hereinafter: the Maribor department) has nine researchers, and the **Geography Department at the University of Primorska's Faculty of Humanities** in Koper, or the Geographical Studies Institute at the University of Primorska's Scientific and Research Centre (hereinafter: the Koper department; Brečko Grubar and Gosar 2011) has eight researchers. Researchers that are simultaneously employed at more than one geographical institute are counted for the institute where their employment share is largest.

At both institutes and all three departments there are therefore just over 100 employees altogether, the majority of whom are geographers. Geographers represent about one-half of one percent of all active Slovenian researchers.

There are considerably more (about ten times as many) geography teachers. Nearly 800 teachers teach geography at Slovenian primary schools, and nearly 300 in secondary schools (both vocational and college-prep), making somewhat over 1,000 teachers altogether.

National public financing of Slovenian geographical studies mostly takes place through the Slovenian Research Agency. The agency classifies the sciences into six groups:

- Natural science and mathematics (9 research areas);
- Technology (12 research areas);
- Medicine (22 research areas);
- Biotechnology (6 research areas);
- Social sciences (13 research areas);
- Humanities (12 research areas).

These groups of sciences are headed by research councils, and individual areas (which geography also belongs to) by national coordinators, who are simultaneously members of the research councils.

Geography, which also includes karst studies, is traditionally part of the humanities in Slovenia. All of the research areas within the humanities are: history, archaeology, anthropology, ethnology, linguistics, cultural studies, literary studies, musicology, art history, philosophy, theology, and geography.

In 2012 the agency financed five geographical research programs and seven geographical research projects. The research programs are more pure-research oriented; they last from three to six years and are connected to individual geographical institutions. The projects involve more applied research; they last from two to three years, and since 2011 they have connected at least two institutions, of which one must be geographical. The agency invites applications for research projects once a year in general.

The titles of the research programs underway in geography (alphabetized by Slovenian name) are:

- *Geografija Slovenije* Geography of Slovenia (geographical institute);
- *Območja kulturnega stika v integracijskih procesih* Areas of cultural contact in integration processes (Koper department);
- *Raziskovanje krasa* Karst research (karst studies institute);

- *Slovenska identiteta in kulturna zavest v jezikovno in etnično stičnih prostorih v preteklosti in sedanjosti* Slovenian identity and cultural conscious in linguistic and ethnic contact areas in the past and present (Maribor department);
- *Trajnostni regionalni razvoj Slovenije* Sustainable regional development of Slovenia (Ljubljana department).

In terms of their content and the researchers involved, the two programs of the geographical institute and the Ljubljana department are distinctly geographical, whereas the other three are more interdisciplinary.

The titles of the research projects underway in geography, alphabetized by Slovenian name (with the head institution), are:

- *Določanje naravnih pokrajinskih tipov Slovenije z geografskim informacijskim sistemom* Determining natural landscape types of Slovenia using a geographic information system (geographical institute);
- *Evropske multikulturne regije med družbeno-prostorsko konvergenco in divergenco* Multicultural European regions between social and spatial convergence and divergence (Koper department);
- *Meritve in analiza izbranih klimatskih parametrov v kraških jamah: primer sistema Postojnskih jam* Measurement and analysis of climatic parameters in karst caves: An example from the Postojna Caves system (karst studies institute);
- *Povečanje učinkovitosti in aplikativnosti preučevanja naravnih nesreč s sodobnimi metodami* Increasing the effectiveness and applicability of research on natural disasters using modern methods (geographical institute);
- *Prometna raba tal: spreminjanje in vpliv na vsakodnevno življenje* Transport land use: Changes and effects on everyday life (geographical institute);
- *Šolski učbeniki kot orodje za oblikovanje geografskih predstav o slovenskih pokrajinah* Textbooks as tools for shaping the geographical imagination of Slovenian landscapes (geographical institute);
- *Terasirane pokrajine v Sloveniji kot kulturna vrednota* Terraced landscapes in Slovenia as cultural values (geographical institute).

Geographers also participate in certain agency projects outside geography and the humanities.

3 Regular geographical publications

Following Slovenia's independence, geographers considerably increased their number of publications in international books and periodicals, but by far the largest number of their publications continued to appear in Slovenian books and periodicals, which are co-financed in part by the Slovenian Book Agency.

The oldest Slovenian geography journal is *Geografski vestnik* (Geographical Bulletin), which has been published by the Association of Slovenian Geographers since 1925. Since 2000 it has appeared twice a year. This journal for geography and related disciplines, as the association's publication is subtitled, publishes research and discussion articles in all areas of geography and related disciplines. The largest share of published articles is in human geography, followed by physical geography, and then contributions from related disciplines and regional geography. The articles have abstracts and summaries in English. The journal also publishes reviews of geographical publications, notes milestone birthdays and anniversaries of prominent experts in the field and presents their biographies and bibliographies, follows major events, conferences, and symposiums in Slovenia and abroad, and reports on the research work of geographical institutes (Turk 1999; Perko and Zorn 2008). The journal has been accessible on the internet since 1999 (Internet 3). The Association of Slovenian Geographers also publishes the popular science magazine *Geografski obzornik* (Geographic Horizon), which has appeared four times a year since 1954 (Potočnik Slavič 2003) and is also available on the internet (Internet 4), proceedings from conferences of Slovenian geographers (since 1969), and occasional books about Slovenia for global and regional congresses (since 1992). The Ljubljana Geographical Society, which is a member of the Association

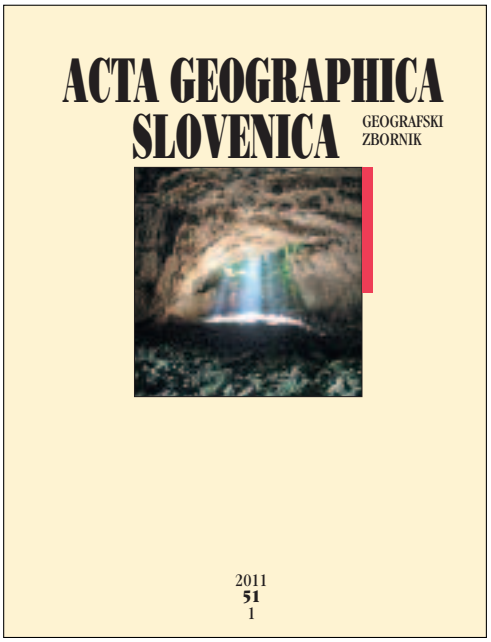

Figure 6: Title page of the journal Acta geographica Slovenica.

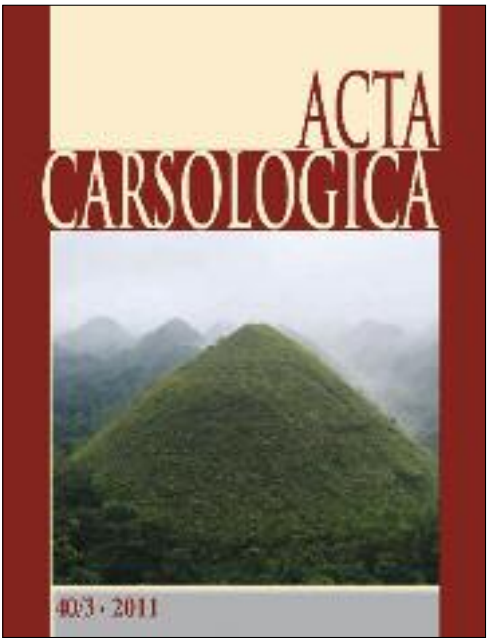

Figure 7: Title page of the journal Acta carsologica.

Figure 8: Title page of the book series Geografija Slovenije (Geography in Slovenia).

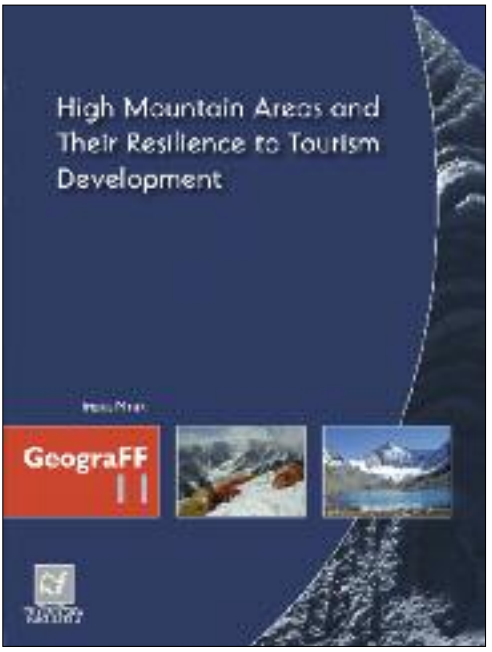

Figure 9: Title page of the book series GeograFF.

Table 1: Geographical institutions with current printed publications and projects:

English and Slovenian name	Mailing and web address	Regular research publications (journals and book series)	Number of national geographical programs underway (as of spring 2012)	Number of national geographical projects underway (as of spring 2012)
Anton Melik Geographical Institute, Scientific Research Centre of the Slovenian Academy of Sciences and Arts *Geografski inštitut Antona Melika, Znanstvenoraziskovalni center Slovenske akademije znanosti in umetnosti*	Gosposka ulica 13 SI – 1000 Ljubljana, Slovenia http://giam.zrc-sazu.si	Journals: *Acta geographica Slovenica / Geografski zbornik* (since 1952) Series: *Geografija Slovenije* (Geography of Slovenia, 23 books since 1999) *Georitem* (Georhythm, 19 books since 2007) *GIS v Sloveniji* (GIS in Slovenia, 11 books since 1992) *Regionalni razvoj* (Regional Development, 3 books since 2009) *Naravne nesreče* (Natural Hazards, 2 books since 2010)	1	5
Karst Research Institute, Scientific Research Centre of the Slovenian Academy of Sciences and Arts *Inštitut za raziskovanje krasa, Znanstvenoraziskovalni center Slovenske akademije znanosti in umetnosti*	Titov trg 2 SI – 6230 Postojna, Slovenia http://izrk.zrc-sazu.si	Journals: *Acta carsologica / Krasoslovni zbornik* (since 1974) Series: *Carsologica* (14 books since 2002)	1	1
Department of Geography, Faculty of Humanities Koper, University of Primorska *Oddelek za geografijo, Fakulteta za humanistične študije Koper, Univerza na Primorskem*	Titov trg 5 SI – 6000 Koper, Slovenia http://www.fhs.upr.si	/	1	1
Department of Geography, Faculty of Arts, University of Ljubljana *Oddelek za geografijo, Filozofska fakulteta, Univerza v Ljubljani*	Aškerčeva 2 SI – 1000 Ljubljana, Slovenia http://geo.ff.uni-lj.si	Journals: *Dela* (Works, since 1985) Series: *GeograFF* (11 books since 2008)	1	/
Department of Geography, Faculty of Arts, University of Maribor *Oddelek za geografijo, Filozofska fakulteta, Univerza v Mariboru*	Koroška cesta 160 SI – 2000 Maribor, Slovenia http://www.ff.uni-mb.si/oddelki/geografija	Journals: *Revija za geografijo* (Journal for Geography, since 2006)	1	/
Association of Slovenian Geographers *Zveza geografov Slovenije*	Gosposka ulica 13 SI – 1000 Ljubljana, Slovenia http://zgs.zrc-sazu.si/	Journals: *Geografski vestnik* (Geographical Bulletin, since 1925) *Geografski obzornik* (Geographic Horizon, since 1954)	/	/

of Slovenian Geographers, publishes the travelogues *Vodniki LGD* (Ljubljana Geographical Society Guides, since 2004).

Acta geographica Slovenica / Geografski zbornik is the main Slovenian geography journal. It is published by the geographical institute. From 1952 to 2002 it was usually published once a year, and since 2003 it has been published twice a year. Initially it was called *Geografski zbornik / Acta geographica*, but the name was changed in 2002, when it merged with the journal *Geographica Slovenica* (which was published from 1972 to 2002). Since 1993 it has been published in English and Slovenian, and it has also been available on the Internet since 1995 (Internet 1). Before the merger of the two journals, publications tended to be lengthy research articles in physical geography, especially geomorphology, glacier and natural disaster studies, as well as human geography, especially studies of mountain farms and land use. After the merger, there was a more balanced representation of various branches of geography (Topole 2000; Zorn and Komac 2010). Since 2003 the journal has been included in *Science Citation Index Expanded* and it is one of the Slovenian scholarly journals most cited abroad.

From 1950 to 1968 the geographical institute published *Dela inštituta za geografijo* (Works of the Geographical Institute), which is the oldest Slovenian geographical book series. Its successor is the research book series *Geografija Slovenije* (Geography in Slovenia), which has been published since 1999. The geographical institute has also published the research book series *GIS v Sloveniji* (GIS in Slovenia) since 1992 (Perko and Zorn 2010), *Georitem* (Georhythm) since 2007, *Regionalni razvoj* (Regional Development) since 2007, and *Naravne nesreče* (Natural Hazards) since 2010. The collections are also accessible on the Google Books web portal.

The karst studies institute publishes the world-renowned journal *Acta carsologica / Krasoslovni zbornik* (since 1955, with two or three issues a year since 1997), which is also available on the internet (Internet 2) and is included in *Science Citation Index Expanded*, as well as the research book series *Carsologica* (since 2001).

The Ljubljana department has published the journal *Dela* (Works) since 1985, which is also available on the internet (Internet 2), and the research book series *GeograFF* since 2008, the Maribor department has published *Revija za geografijo* (Journal for Geography) since 2006, also available on the internet (Internet 6), and the Slovenian National Education Institute has published *Geografija v šoli* (Geography in School) since 1991.

4 Conclusion

After Slovenia gained its independence in 1991, Slovenian geography flourished; among other things, this is shown by the great increase in the number of geographical publications. Seminal geographical and cartographic works about Slovenia were also published. Until the onset of the economic crisis there was also an increase in the number of geography researchers, who dealt with an increasingly broad selection of topics. Modern methods, especially connected to geographical information systems, were established. Digital cartography completely replaced traditional methods. After Slovenia joined the European Union in 2004, there was a marked increase in international cooperation by Slovenian geographers, in particular in the widest variety of European and other international projects. The focus of national and international projects has shifted from pure research to applied and targeted research.

Where to go from here and how? Currently in Slovenia the belief dominates that training experts in the humanities and social sciences cannot pull Slovenia out of the grip of the economic crisis that has affected Europe in recent years. Slovenian geographers face the important task of showing that supporting geographical research still makes sense. Perhaps this does not have a direct impact on job creation but it may, for example, help locate new activities in a place such that these activities will not suffer additional costs; for example, from natural disasters. Applied studies can be used to change such beliefs.

We are also faced by the task that, after over a decade of rapid and comprehensive development in Slovenia in many areas, it is necessary to update certain seminal works of Slovenian geography that were published at the end of the twentieth century and that are cited in Chapter 1. Money is also an obstacle because major Slovenian publishers are currently unable to afford such financial investment.

With the gradual blurring of borders between individual research areas, our educational institutions are facing increasing greater competition from non-geographical disciplines. Only their prompt response to this competition and social needs will make possible a demand for geographers among employers.

While writing this article and reviewing the literature, the authors also became aware that Slovenian geographers still lack a suitable perspective on themselves; that is, a thorough study of the development of Slovenian geography.

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ARTICLES

SLOVENIA IN GEOGRAPHICAL TYPIFICATIONS AND REGIONALIZATIONS OF EUROPE

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ABSTRACT
Slovenia in geographical typifications and regionalizations of Europe
Slovenian geographical literature often emphasizes Slovenia's landscape diversity and its position at the intersection of four major European geographical units: the Alps, the Mediterranean, the Pannonian Basin, and the Dinaric Alps. This article establishes whether Slovenia's diversity is also reflected in non-Slovenian geographical divisions (classifications, typifications, and regionalizations) of Europe. It examines various divisions of Europe and establishes how Slovenia is divided and to what extent these divisions resemble the well-established Slovenian geographical typification of Slovenia.

KEY WORDS
regional geography, geographical typification, regionalization, Slovenia, Europe

IZVLEČEK
Slovenija v geografskih tipizacijah in regionalizacijah Evrope
V slovenski geografski literaturi se pogosto poudarja pokrajinska raznolikost Slovenije in njena lega na stiku štirih velikih evropskih geografskih enot: Alp, Sredozemlja, Panonske kotline in Dinarskega gorovja. V prispevku ugotavljamo, ali se raznolikost Slovenije kaže tudi pri tujih geografskih členitvah (klasifikacijah, tipizacijah in regionalizacijah) na ravni Evrope. Pregledali smo različne členitve Evrope in ugotavljali, kam se uvršča Slovenija, kako je Slovenija razdeljena in koliko so te delitve Slovenije podobne eni od uveljavljenih slovenskih geografskih tipizacij Slovenije.

KLJUČNE BESEDE
regionalna geografija, geografska tipizacija, regionalizacija, Slovenija, Evropa

The article was submitted for publication on June 29, 2011.

1 Introduction

Slovenia's landscape diversity is a feature that counterbalances its smallness. At the same time, it is also a natural value that demands greater care for the environment and more detailed planning because best practices usually cannot simply be transferred from one area to another. A number of Slovenian researchers have drawn attention to this diversity. Melik (1935) emphasized that Slovenia is where the Alps meet the Dinaric Alps and that Slovenia extends all the way to *the Adriatic Sea*, *the Friulian Plain*, and *the Pannonian Basin*. He characterized Slovenia as »the land of intersections« (Melik 1935, 1–3). The intersection of four European natural geographical regions (i.e., *the Alps*, *the Dinaric Alps*, *the Mediterranean*, and *the Pannonian Basin*) was also described by Gams (1998), who drew attention to the non-uniform delineation of Slovenian macro-regions (Gams 1998, 9–11). Slovenia's landscape diversity was well described by Kladnik and Perko, who noted that »in a circle with a diameter of 150 km, encompassing Slovenia, the high mountainous *Alps* meet and mingle with prealpine hills and basins, the flat *Pannonian Plain* with its hilly edges, the karstified *Dinaric Alps* with karst plateaus and lowlands in between, and the *Mediterranean* with the mitigating effects of the *Adriatic Sea*« (Kladnik and Perko 1998, 20). On top of everything, Slovenia is also at the intersection of four cultural areas (i.e., Slavic, Germanic, Romance, and Hungarian), which is why a number of cultural landscape types have also formed in this small area (Kladnik and Perko 1998, 20). Plut (1999, 12) also mentioned the intersection of four European physical-geographical macro-regions (i.e., *the Alps*, *the Pannonian Plan*, *the Dinaric Alps*, and *the Mediterranean*) and the formation of five landscape types (in addition to the ones mentioned above, he also included *the Prealps*) as a geographical constant that needs to be taken into account in sustainable development planning.

2 The purpose of this article and overview of geographical divisions of Europe

This article presents several European geographical divisions, especially those that take into account natural landscape elements (i.e., relief, rocks, climate, vegetation, etc.). It examines how many macro-units (types or regions) Europe is divided into and which ones Slovenia belongs to. It establishes whether Slovenia's diversity is also reflected in small-scale divisions of Europe. In addition, it also examines some divisions that are based on social landscape elements such as land use. According to Meeus (1995, 57–58), only 10 to 30% of Europe can be characterized as true natural landscape.

The geographical scope, the number of levels and categories (i.e., the number of various regions or types) in the entire area covered by division and the number of levels and categories in Slovenia, the spatial resolution of data, the purpose, the main methodological procedures, and the authors were defined for each division. An attempt was also made to determine the type of division (typification or regionalization), even though they mainly involve a combination of both.

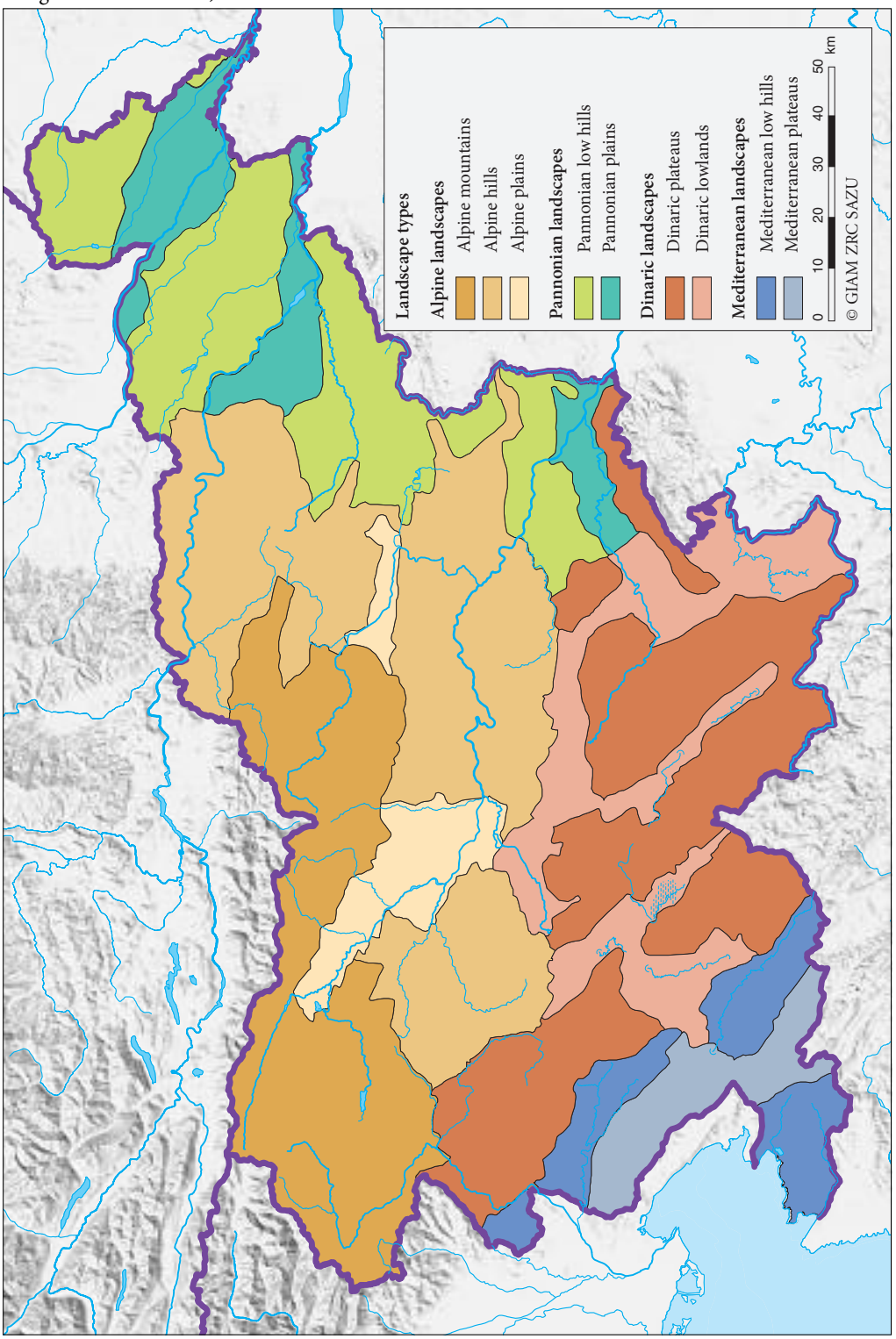
Detailed methodological procedures and other data were unavailable for some divisions and so only the number of individual categories used for Slovenia is provided for these.

To make comparison easier, all the divisions of Slovenia are presented on maps using the same scale.

3 Geographical typification of Slovenia

In order to compare how individual geographical typifications and regionalizations of Europe show Slovenian landscapes and how they differentiate between them, a relatively simple geographical typi-

Figure 1: Geographical typification of Slovenia, levels 1 and 2 (Perko 2008, 54) ➤


Landscape types
Alpine landscapes
Alpine mountains
Alpine hills
Alpine plains
Pannonian landscapes
Pannonian low hills
Pannonian plains
Dinaric landscapes
Dinaric plateaus
Dinaric lowlands
Mediterranean landscapes
Mediterranean low hills
Mediterranean plateaus
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© GIAM ZRC SAZU

fication was selected that divides Slovenia into four types at the first level, and into nine types or subtypes at the second level (Figure 1). The first level is connected with Slovenia's location at the intersection of four major European geographical units – *the Alps*, *the Pannonian Basin*, *the Dinaric Alps*, and *the Mediterranean* – and, at the second level, the first-level types are divided primarily according to relief and rock structure (Perko 2008, 33–54).

This geographical typification, which is primarily based on natural landscape elements and land use, has the following structure:

- The first type (*Alpine landscapes*) has three subtypes: *Alpine mountains*, *Alpine hills*, and *Alpine plains*;
- The second type (*Pannonian landscapes*) has two subtypes: *Pannonian low hills* and *Pannonian plains*;
- The third type (*Dinaric landscapes*) has two subtypes: *Dinaric plateaus* and *Dinaric lowlands*;
- The fourth type (*Mediterranean landscapes*) has two subtypes: *Mediterranean low hills* and *Mediterranean plateaus*.

Based on this, a regionalization of Slovenia was also designed (Perko 2008, 55), dividing Slovenia into four macro-regions at the first level, and into 48 regions at the second level:

- The first macro-region (*the Alps*) consists of 11 regions (e.g., the Julian Alps, the Sava Hills, and the Sava Plain);
- The second macro-region (*the Pannonian Basin*) consists of 12 regions (e.g., the Haloze Hills and the Mura Plain);
- The third macro-region (*the Dinaric Alps*) consists of 19 regions (e.g., the Javornik Hills, Mount Snežnik, and White Carniola);
- The fourth macro-region (*the Mediterranean*) consists of six regions (e.g., the Gorizia Hills and the Karst).

The boundaries of the macro-regions specified in the regionalization match the boundaries of types in the typification (e.g., in the regionalization, *the Alps* cover the same area as *the Alpine landscape* in the typification) and each region specified in the regionalization matches one of the subtypes in the typification (e.g., the Alps macro-region includes four regions of the Alpine mountains subtype, five regions of the Alpine hills subtype, and two regions of the Alpine plains subtype).

Because Slovenia is at the intersection of two very different geographical units, the majority of its geographical types and regions are characterized by transition and influences from neighboring types and regions. Slovenia's geographical typification and regionalization thus also present a great research challenge.

Based on how a specific geographical typification or regionalization of Europe or its areas divides Slovenia, a connoisseur of Slovenia's geography may determine the suitability and quality of this geographical division relatively well.

4 Overview of European divisions

Older divisions of Europe were produced in a traditional manner, based on the subjective judgment and expertise of their authors (Mücher et al. 2003), whereas the latest divisions (e.g., the Environmental Stratification of Europe, and the European Landscape Classification) have been prepared using geographical information systems and are especially interesting because of their methodology and high data resolution; with some, the basic spatial data unit (cell) is only 1 km^2. Because vegetation is closely connected with other natural factors (Internet 5), this article also presents some maps with classifications that are based on vegetation because it can provide a good picture of natural landscape diversity.

The divisions of Europe that were examined in greater detail are:

- 1: The Environmental Stratification of Europe (Mücher et al. 2003; Metzger et al. 2005; Jongman et al. 2006);

- 2: The European Landscape Classification (LANMAP2; Mücher et al. 2003; 2006; 2010);
- 3: The Digital Map of European Ecological Regions (Internet 1);
- 4: Biogeographical Regions (Internet 2);
- 5: The Physical-Geographical Classification of Europe (Germ. *Physisch-geographische Gliederung Europas*; Bohn et al. 2002/2003);
- 6: The Pan-European Landscape Types (Meeus 1995);
- 7: The Terrestrial Ecoregions of the World (Olson et al. 2001);
- 8: The Biogeographical Provinces of Europe (Internet 3);
- 9: The Biogeographic Map of Europe and Bioclimatic Map of Europe (Rivas-Martínez, Penas, and Díaz 2009);

4.1 The Environmental Stratification of Europe

A group of researchers from the Netherlands, the United Kingdom, and Portugal developed a division of Europe in order to define sample areas in Europe and units applicable to various environmental models and reports (Mücher et al. 2003; Metzger et al. 2005). They used the principal component method, in which they replaced several data layers (e.g., height, slope, vicinity of the ocean, latitude, and several climate variables for January, April, July, and October) with only three combined variables (components), which they used to divide the cells into groups. They defined 84 environmental classes and combined them into 13 environmental zones, which they combined furher into six biogeographic regions. Also taking into account the islands in the Atlantic Ocean, the total number of zones is 14 (and seven regions). The entire stratification uses a spatial resolution of 1 km^2 (Mücher et al. 2003; Metzger et al. 2005; Jongman et al. 2006). It covers the territory between 11° W and 32° E, and between 34° and 72° N (Metzger 2005, 558). Because of great differences, the entire area was statistically processed in two divisions: north and south (Metzger 2005, 554, 558). Even though the units at the highest level are called regions, this is more of a typification than a regionalization. It is interesting that the Alpine region also appears in Scandinavia.

Slovenia lies in three of the six biogeographical regions (Figure 2) and in five of the 13 environmental zones. It includes the following environmental zones: the *Alpine south, Mediterranean mountain, Mediterranean north*, *Pannonian,* and *Continental* zones. At the lowest level, Slovenia contains 12 of the 84 classes (Metzger et al. 2005, 558). The boundary between both major divisions also runs across Slovenia because the *Mediterranean mountain* zone and the *Mediterranean north* zone belong to the south, and the rest to the north.

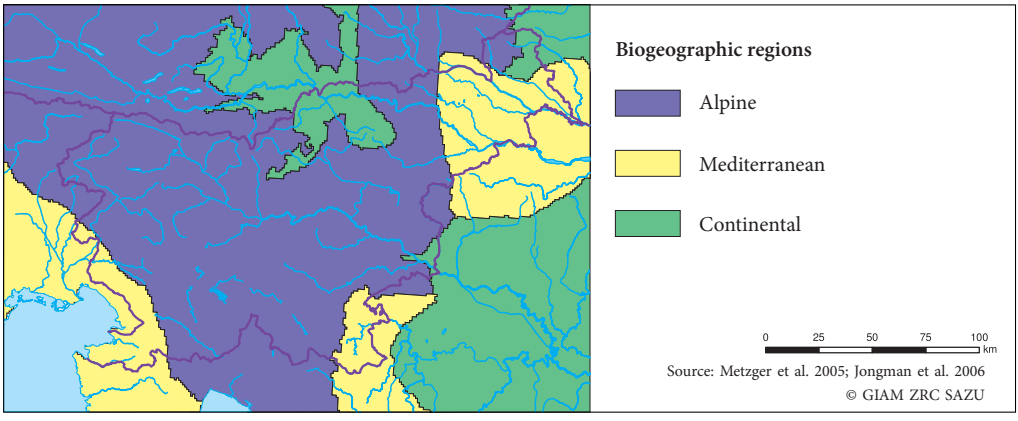

Figure 2: Environmental Stratification of Europe, level 2 (Metzger et al. 2005; Jongman et al. 2006).

4.2 The European Landscape Classification

The Alterra Institute prepared a typification that differs from the previous one primarily in the fact that it also includes the sociogeographical element of land use, and uses the method of segmentation and classifying segments into groups. The purpose of this classification was to develop a landscape typification for all of Europe that could be connected with typifications at the level of individual countries and used as a basis for other projects (Mücher et al. 2003, 53). The authors used data on climate, elevation, soil, and land use (Mücher et al. 2006, 5). They also specified major urban areas, water surfaces, and tide areas (Mücher et al. 2006). They first divided Europe into small homogenous units (segments) using elevation, soil, and land-use data, and afterwards also took into account the climate data in order to classify these units into individual types (Mücher et al. 2010, 4). In classifying the homogenous units at the first level (Figure 3), they took into account the climate; it contains eight types: *Arctic*, *Boreal*, *Atlantic*, *Alpine*, *Mediterranean*, *Continental*, *Anatolian*, and *Steppic*. At the second level, they also took into account the elevation; this level consists of 31 types. The third level also took into account the soil and includes 76 types. The lowest (i.e., fourth) level then also took into account special land-use areas and includes 350 landscape types and more than 14,000 polygons (Mücher et al. 2006, 9). Except for the Alpine type, only a few types occur in different, spatially separated areas at the highest level.

Raster processing was first performed on 1 km^2 cells and then the obtained polygons or units smaller than 11 km^2 were combined with the neighboring ones. The final map at a scale of 1 : 2,000,000 covers all of Europe, up to the Ural Mountains in the east and Azerbaijan in the southeast and Novaya Zemlya in the northeast; the map does not include Cyprus (Mücher et al. 2006). The first version of the map (Mücher et al. 2003) covered only part of the European Union and did not take climate into account in its classification.

In Slovenia three types can be observed at the first level: *Mediterranean*, *Continental*, and *Alpine*. Nearly all of Slovenia lies in the Mediterranean type but, surprisingly, the Gorizia Hills are part of the Alpine type. At the second level, Slovenia includes eight types (not counting the excluded urban areas of Ljubljana and Maribor). The third level includes 12 of a total of 76 types, and the final, fourth level includes 19 of a total of 350 types.

4.3 The Digital Map of European Ecological Regions (DMEER)

The DMEER is a biogeographical map showing European ecological regions based on climate, topography, and geobotanical data. It was produced by researchers from several European institutes and the

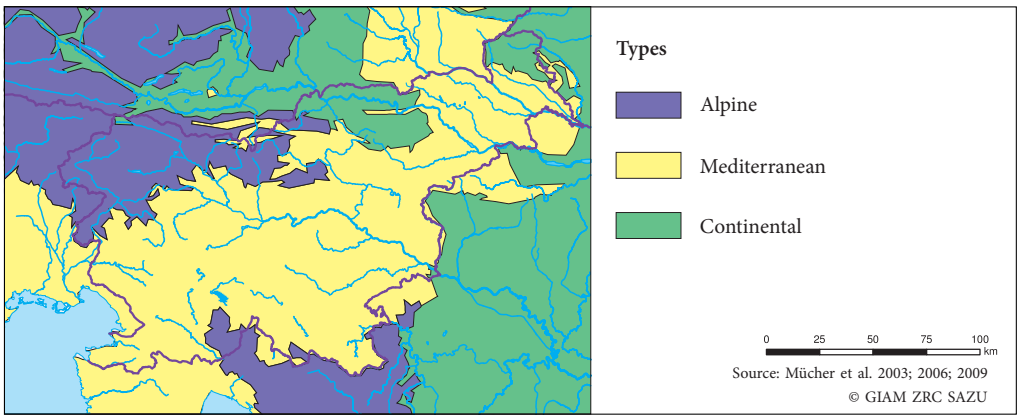

Figure 3: The European Landscape Classification, level 1 (Mücher et al. 2003; 2006; 2010).

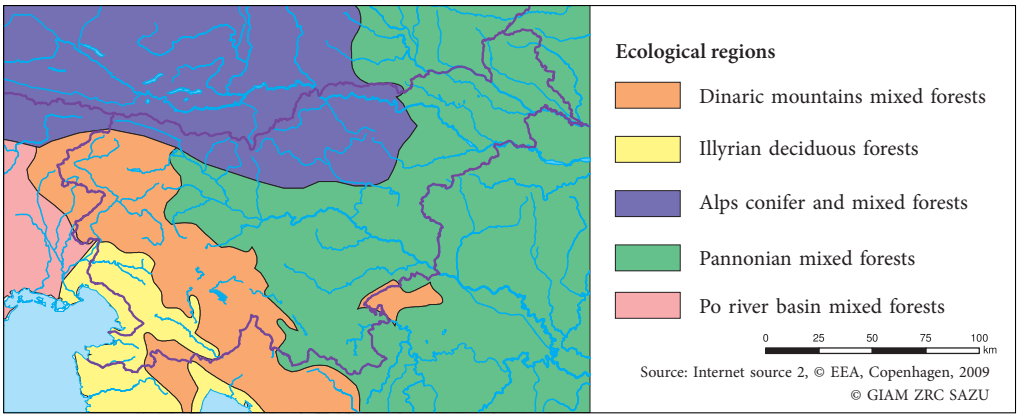

Figure 4: European ecological regions, level 1 (Internet 1; © EEA, Copenhagen, 2009)

World Wildlife Fund (WWF) based on the hierarchical classification of data they obtained from the natural vegetation map by the German Federal Agency for Nature Conservation and the European Landscape Classification map by the British Institute of Terrestrial Ecology with a $0.5° \times 0.5°$ resolution. The polygons that were defined based on both data layers were then divided into groups several times by testing, and then the most suitable classification was selected for individual parts of Europe. All polygons smaller than 2,000 km^2 were eliminated. The final map at a scale of 1 : 2,500,000 was harmonized with the map of WWF ecoregions. This classification was used in order to promote more effective managing of the regions and show areas with homogenous ecological conditions. The map shows all of Europe measuring 10.5 million km^2, including Turkey, the coast of the Middle East, and Sinai (Mücher et al. 2003, 114, 116; Internet 1; Internet 5).

The final classification is markedly based on vegetation and has typification features because the same units are spatially separated. Ecological regions are largely named after the vegetation type (Figure 4). The classification includes 68 European ecological regions (Internet 5).

In the map, Slovenia is classified under four units and it borders on one:

- *Dinaric Mountains mixed forests*,
- *Illyrian deciduous forests*,
- *Alpine coniferous and mixed forests*,
- *Pannonian mixed forests*,
- *Po Basin mixed forests*.

4.4 Biogeographical Regions

The Map of Biogeographical Regions was produced for the NATURA2000 network (Directive 92/43/EEC). This was the first time that non-administrative boundaries were accepted in an official EU-document (Mücher et al. 2003, 113). The division used was spatially expanded and also applied to the EMERALD network (with slight modifications). The last version from 2008 was prepared at a scale of 1 : 1,000,000. The map of Europe only shows EU countries, including the Canary Islands and the Azores (Internet 2; European Topic Centre … 1996). The first versions were based on combining natural vegetation in the member states of the European Community and the Council of Europe (Noirfalies 1987), whereby forest communities were combined into biogeographical regions (including azonal units) and the map was generalized. In later versions, the Map of Potential Vegetation prepared by the German Federal Agency for Nature Conservation was also used (European Topic Centre … 1996). The 2008 division (Figure 5), which covers the EU, includes nine biogeographical regions: *Alpine*, *Atlantic*, *Black Sea*,

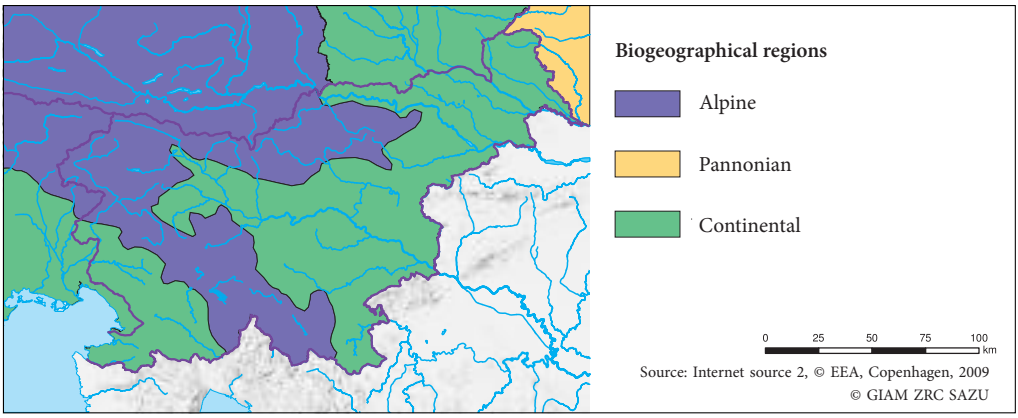

Figure 5: Biogeographical Regions, level 1, 2008 version (Internet 2; © EEA, Copenhagen, 2009).

Boreal, *Continental*, *Macaronesia*, *Mediterranean*, *Pannonian*, and *Steppic*. The 2005 division of Europe shows all the European countries from the Ural Mountains to the Caucasus and Turkey. It includes 11 categories; in addition to the ones listed above, it also includes the Arctic and Anatolian regions.

This division is generally based on natural vegetation, but some boundaries also run along the administrative state borders, which is why it deviates from a completely natural division. Some biogeographical regions appear in several spatially separated areas (e.g., the Alpine region in Scandinavia).

According to the 2005 and 2008 divisions, Slovenia is part of the *Continental* and *Alpine* regions, touching the *Pannonian* region in the northeast (the boundary runs along the state border). However, it is surprising that southwestern Slovenia is part of the *Continental* region. In the 2005 map, which shows all the countries, Slovenia also touches the *Mediterranean* region in the southwest.

4.5 The Physical-Geographical Classification of Europe

The German Federal Agency for Nature Conservation prepared the Map of Natural Vegetation of Europe (Germ. *Karte der natürlichen Vegetation Europas*) at the scale of 1 : 2,500,000. This map is based on the Physical-Geographical Classification of Europe, which included climate, rocks, and soil as the main components. Europe was divided into four subcontinents: *Northern Europe*, *Western and Central*

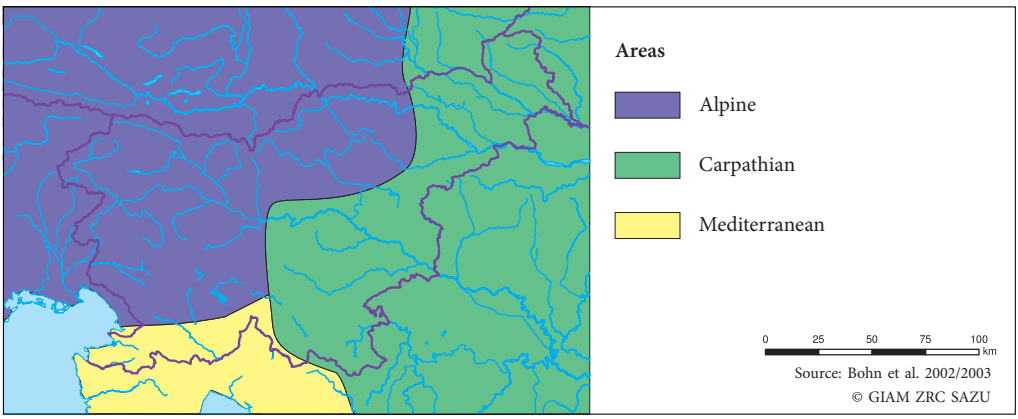

Figure 6: Physical-Geographical Classification of Europe, level 2 (Bohn et al. 2002/2003).

Europe, *Southern Europe*, and *Eastern Europe*. These were then divided into nine major areas and 47 physical-geographical regions, which were further divided into subunits or subregions (Bohn et al. 2002/2003, 68, 69). At all levels, this physical-geographical classification is more of a regionalization than a typification. Slovenia is part of two subcontinents, three major areas, and four regions (Figure 6).

4.6 Pan-European Landscape Types

The map of pan-European landscape types at a scale of 1 : 25,000,000 (Meeus 1995) was among the first attempts to represent European landscape diversity (Mücher et al. 2006, 3). Meeus defined 30 categories in Europe, extending to the Ural Mountains and the Caucasus, also including Novaya Zemlya in the north (Meeus 1995, 57). The criteria used included relief forms (as the consequence of the rock base and climate), economic land-use potential, sustainability of human activity, nature preservation, settlement pattern, field pattern, visual impression, and the quality of the view (Meeus 1995, 61–62). The purpose of this typification was to develop the bases for Europe's sustainable development at various levels (Meeus 1995, 57–58).

Meeus (1995) defined 30 landscape types, which he combined into nine groups: *Tundras*, *Taigas*, *Highlands and mountains*, *Bocages*, *Open fields*, *Regional landscapes*, *Steppes*, *Arid landscapes*, and *Terrace landscapes*. The division was to be relevant at the level of Europe, and according to the author the typification was merely a rough one (Meeus 1995, 61–62). Regional landscapes are the types that only appear in one or several places thanks to their exceptional natural or cultural features (Meeus 1995, 65).

Almost all of Slovenia (Figure 7) is part of a single landscape type: *the Mediterranean semi-bocage*. The word *bocage* denotes a landscape of mixed meadows and forests (Internet 4). This is an area in a mountain's rain shadow that is cultivated despite the dry climate. The climate is Mediterranean, with diverse land use and predominantly rural settlements (Meeus 1995, 69). Some other types can be found near Slovenia: the *Collective open fields* in the east, the *Delta* type in the west, and the *Mountain* type in the north (Meeus 1995, 63).

4.7 The Terrestrial Ecoregions of the World

The map of the terrestrial ecoregions of the world was designed to improve environmental-protection planning at the global and regional levels. The authors based their work primarily on the biogeographical features of landscapes around the world (Olson et al. 2001, 933).

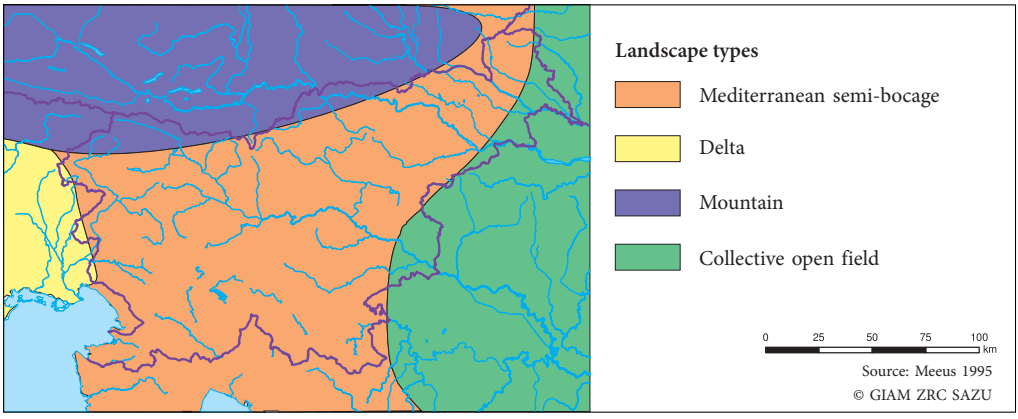

Figure 7: Pan-European Landscape Types, level 1 (Meeus 1995).

Ecoregions were defined as relatively extensive spatial units primarily characterized by special combinations of natural communities and species. The borders between these areas match the natural conditions prior to major changes introduced by man (Olson et al. 2001, 933).

The terrestrial part of the world was divided into eight geographical realms and 14 biomes. Within these, they further defined 867 ecoregions. The geographical realms include *Oceania* (covering the Pacific), *Nearctic* (covering North America), *Neotropic* (covering Central and South America), *Afrotropic* (covering Sub-Saharan Africa), *Palearctic* (covering Europe and the majority of Asia), *Indo-Malay* (covering South and Southeast Asia), and *Australasia* (covering Australia and part of the islands between Asia and Australia). The biomes (Olson et al. 2001) include the following:

- *Tropical and subtropical moist broadleaf forests*,
- *Tropical and subtropical dry broadleaf forests*,
- *Tropical and subtropical coniferous forests*,
- *Temperate broadleaf and mixed forests*,
- *Temperate coniferous forests*,
- *Boreal forests/taiga*,
- *Tropical and subtropical grasslands, savannas, and shrublands*,
- *Temperate grasslands, savannas, and shrublands*,
- *Flooded grasslands and savannas*,
- *Montane grasslands and shrublands*,
- *Tundra*,
- *Mediterranean forests*, *woodlands*, *and scrub*,
- *Deserts and xeric shrublands*,
- *Mangroves*,
- (*Lakes*),
- (*Rock and ice*).

Individual units were defined based on various sources; the DMEER map (see section 4.3) was used for the western Palearctic region, which also covers Europe. In areas for which no biogeographical divisions were found, the authors relied on relief forms and vegetation. The average size of ecoregions is approximately 150,000 km^2 (Olson et al. 2001, 934).

Of 14 biomes, three are present in Slovenia (Figure 8):

- *Mediterranean forests*, *woodland, and scrub*,
- *Temperate broadleaf and mixed forests*,
- *Temperate coniferous forests*.

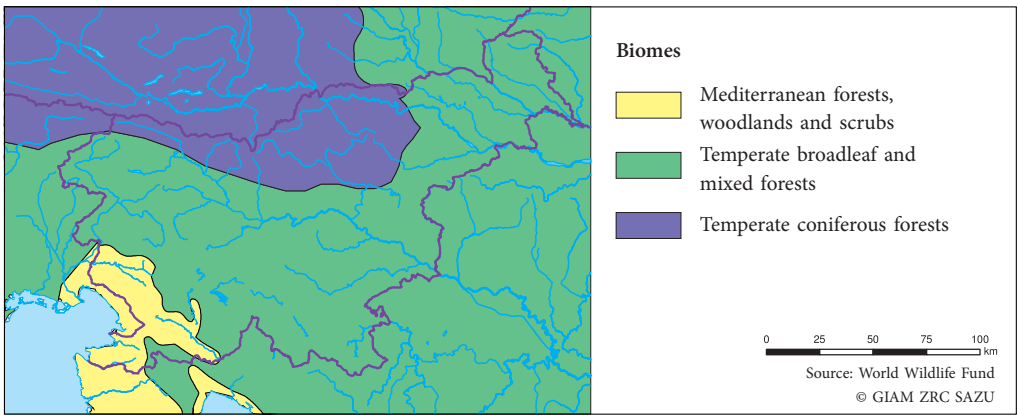

Figure 8: Terrestrial Ecoregions of the World, level 2.

Ecoregions found in Slovenia or its immediate vicinity include the following:

- *Pannonian mixed forests*,
- *Dinaric Mountains mixed forests*,
- *Illyrian deciduous forests*,
- *Alpine coniferous and mixed forests*,
- *Po Basin mixed forests*.

4.8 The Biogeographical Provinces of Europe

The biogeographical provinces of Europe (Figure 9) used in the Europe's Environment report of 1995 are based on Udvardy's Classification of the Biogeographical Provinces of the World (1975).

Almost all of the units are named after geographical names and occur only once. Thus this classification can be placed among regionalizations, although this cannot be done with certainty because of the inconsistencies in naming the units and because the classification is not further divided into smaller units. Slovenia is part of four out of 19 provinces: the *Balkan highland*, *Continental*, *Mediterranean sclerophyll*, and *Central European highlands*. In addition to Europe's biogeographical provinces, the report also showed four biogeographical zones of the EU covering the territory of the EU at that time.

The reason for the smaller number and share of categories in Slovenia is also the fact that the classification also covers northern Africa, Turkey, the eastern Mediterranean, and the area east of the Caspian Sea.

4.9 The Biogeographic Map of Europe and the Bioclimatic Map of Europe

The University of Leon prepared the Biogeographic Map of Europe, which covers the area up to the Arabian Peninsula and the Caspian Sea, and also includes the Canary Islands, Spitsbergen, Novaya Zemlya, and Franz Josef Land. The 1 : 16,000,000 map includes five regions: the *Circumartic*, *Eurosiberian*, *Mediterranean*, *Irano-Turanian*, and *Saharo-Arabian*. The first two regions are further divided into three subregions. The third level contains 30 provinces, and the fourth level contains a total of 71 sectors (Rivas-Martínez, Penas, and Díaz 2009).

All of Slovenia is part of *the Eurosiberian region* and *the Alpino-Caucasian subregion*, which is further divided into the *Alpine* and the *Apennine-Balkan* provinces. At the lowest level it is part of the *Eastern Alpine*, *Illyrian*, and *Padanian* sectors (Figure 10).

The *Bioclimatic Map of Europe* (Figure 11) at a scale of 1 : 16,000,000 was prepared in addition to the *Biogeographic Map of Europe*; this map contains three levels. Europe was divided into four macro-

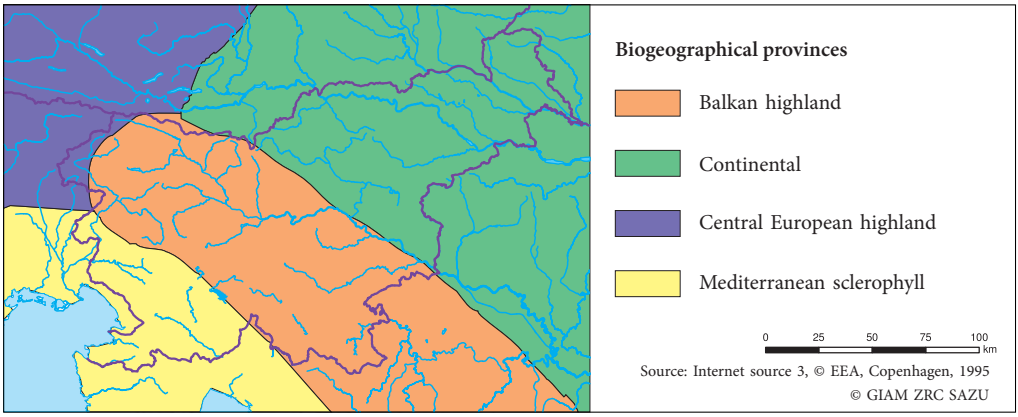

Figure 9: The Biogeographical Provinces of Europe, level 2 (Internet 3; © EEA, Copenhagen, 1995)

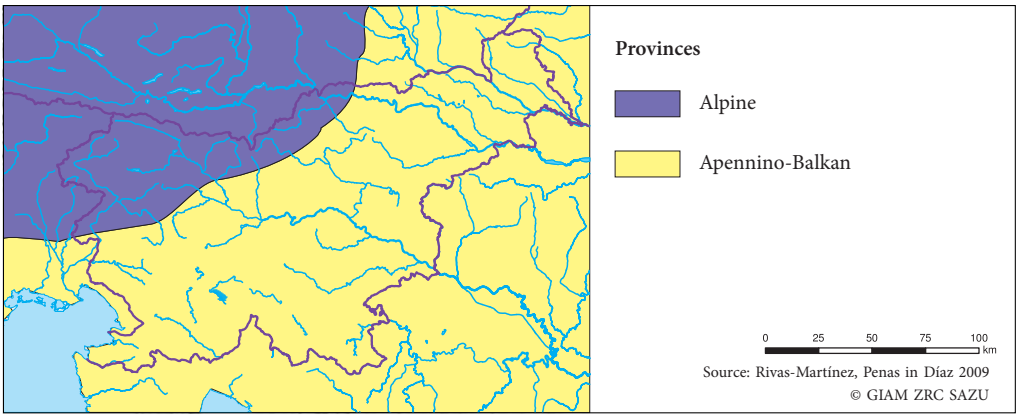

Figure 10: Biogeographic Map of Europe, level 3 (Rivas-Martínez, Penas, and Díaz 2009).

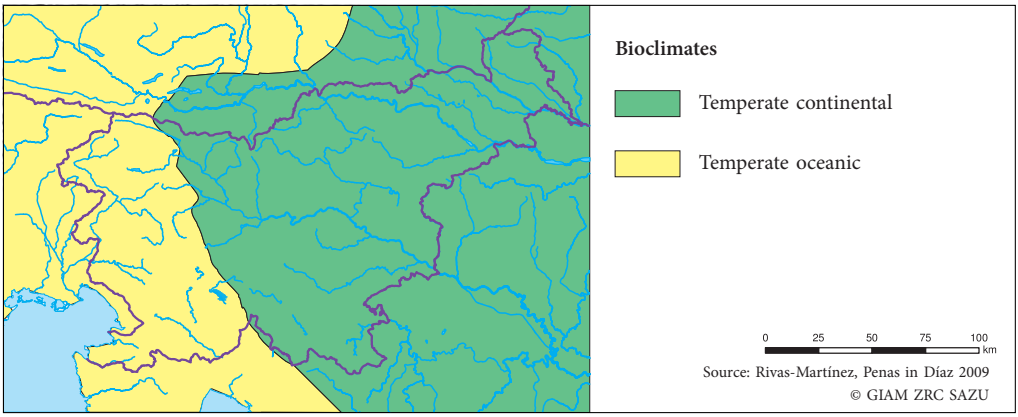

Figure 11: Bioclimatic Map of Europe, level 2 (Rivas-Martínez, Penas, and Díaz 2009).

bioclimatic units: the *Polar*, *Boreal*, *Temperate*, and *Mediterranean*; these are further divided into 16 bioclimatic units with certain variants for some (Rivas-Martínez, Penas, and Díaz 2009).

Western Slovenia is part of the *Temperate Oceanic* bioclimate and eastern Slovenia is part of the *Temperate Continental* bioclimate. The border between them runs across the Sava Valley, west of Ljubljana, and then in the Dinaric direction towards the southeast. By comparing both maps one can get a better idea of the natural conditions in Slovenia.

5 Comparing the divisions

In determining the number of units presented in Slovenia in various divisions, the surrounding areas or units touching Slovenia were also taken into account due to the various methods used for defining the borders between units. Table 1 shows individual divisions and the number of categories by individual level. The number of categories occurring in Slovenia is given in parentheses.

At the highest levels, Slovenia is part of various units (types or regions). The names of these units are based on geographical names and the names of the vegetation type, climate, and other natural factors. The following geographical names of major geographical units and their derivatives are most common

Table 1: Overview of selected features of divisions of Europe.

	Name (source) of division	Number of all categories (number of categories in Slovenia)				Prevailing type (method) of division	Unit names
		Level 1	Level 2	Level 3	Level 4		
1	Environmental Stratification of Europe (Mücher et al. 2003; Metzger et al. 2005; Jongman et al. 2006)	2 (2)	6 (3)	13 (5)	84 (12)	Upper level: regionalization, lower level: typification	*Biogeographic regions: Mediterranean, Continental, Alpine*
2	European Landscape Classification LANMAP2 (Mücher et al. 2003; 2006; 2010)	8 (3)	31 (8)	76 (12)	350 (19)	Upper level: regionalization, lower level: typification	*Types: Mediterranean, Continental, Alpine*
3	Digital Map of European Ecological Regions (Internet 1)	68 (5)	–	–	–	Typification	*Ecological regions: Dinaric Mountains mixed forests, Illyrian deciduous forests, Alpine conifer and mixed forests, Pannonian mixed forests, Po Basin mixed forests*
4	Biogeographical Regions (Internet 2)	9 (3)	–	–	–	Typification	*Biogeographical regions: Continental, Alpine, Pannonian*
5	Physical-Geographical Classification of Europe (Germ. *Physisch-geographische Gliederung Europas*) (Bohn et al. 2002/2003)	4 (2)	9 (3)	47 (4)	–	Regionalizaiton	*Areas: Alpine, Carpathian, Mediterranean*
6	Pan-European Landscape Types (Meeus 1995)	9 (4)	30 (4)	–	–	Typification	*Landscape types: Mediterranean semi-bocage, Delta, Mountain, Collective open field*
7	Terrestrial Ecoregions of the World (Olson et al. 2001)	8 (1)	14 (3)	867 (5)	–	The highest level: regionalization, lower levels: typifications	*Biomes: Mediterranean forests, woodlands and scrubs, Temperate broadleaf and mixed forests, Temperate coniferous forests*
8	Biogeographical Provinces of Europe (Internet 3)	4 (–)	19 (4)	–	–	Regionalization	*Biogeographical provinces: Balkan highland, Continental, Central European highland, Mediterranean sclerophyll*
9A	Biogeographic Map of Europe (Rivas-Martínez, Penas, and Díaz 2009)	5 (1)	*Subregions in places*	30 (2)	71 (3)	Upper levels: typification, lower level: regionalization	*Provinces: Alpine, Apennine-Balkan*
9B	Bioclimatic Map of Europe (Rivas-Martínez, Penas, and Díaz 2009)	4 (1)	16 (2)	*Versions in places*	–	Typification	*Bioclimates: Temperate continental, Temperate oceanic*

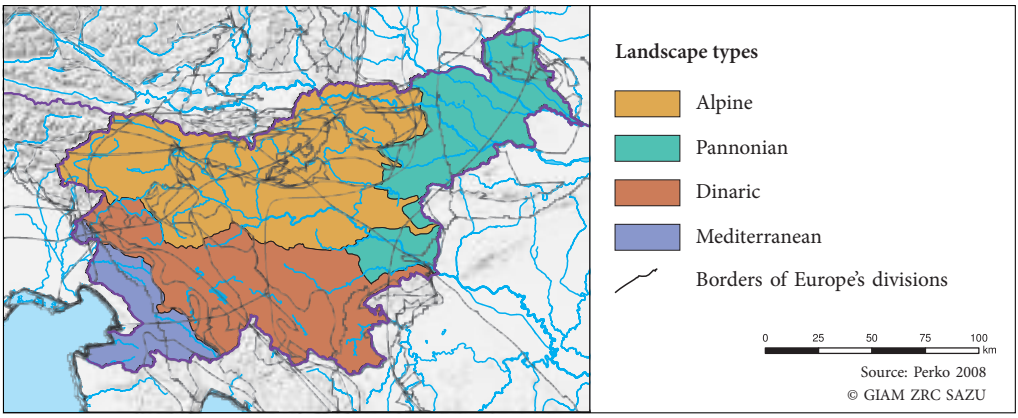

Figure 12: Interconnection of borders of the examined divisions of Europe compared to the geographical typification of Slovenia (Perko 2008).

(listed in the adjectival form): Alpine, Mediterranean, Continental, Pannonian, Balkan, Illyrian, Padanian, Dinaric, Carpathian, Central European, and Apennine. The analysis of names did not take into account the Map of Potential Vegetation and the Bioclimatic Map, which are typifications based on a single physical-geographical element (vegetation or climate). The same applies to the levels that include the cardinal points in their names (e.g., Southern Europe) and levels that only classify Slovenia in one unit.

The map showing the borders of the divisions' types or regions indicates how these divisions of Europe differ from one another and how insignificantly they approximate the established Slovenian geographical typification of Slovenia (Figure 12).

6 Conclusion

Even though these geographical typifications and regionalizations of Europe have been developed for various purposes, using various methods, and based on various factors, minor differences were nonetheless expected between them with regard to Slovenia (Figure 2). The majority only partly approximate the geographical typification of Slovenia (Perko 2008), which shows Slovenia's actual geographical features relatively well.

On the other hand, these great differences between the divisions of Europe confirm the findings of Slovenian geographers regarding how difficult it is to typify and regionalize a country with such a wide variety of landscapes as Slovenia. This is further confirmed by the fact that, despite Slovenia's small area, which accounts for less than one percent of the territory in the majority of European divisions, its share of types or regions is several times larger than the share of its size in all of Europe.

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ARTICLES

MORPHOLOGICAL TYPIFICATIONS OF SLOVENIA'S SURFACE USING GLOBAL CLASSIFICATION METHODS

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ABSTRACT
Morphological typifications of Slovenia's surface using global classification methods
Morphology is often the most important factor in distinguishing landscapes and is an important element in geographical classifications, typifications, and regionalizations. Therefore, morphological divisions of the surface have a long tradition in Slovenia and abroad. The development of geographic information systems has significantly increased the number of methods and indicators used for determining, analyzing, and classifying morphological units at various size levels. In terms of spatial combinations, one distinguishes between continuous and discontinuous surface classifications, and between global and regional surface classifications in terms of the values and value limits of indicators. This article presents examples of foreign methods of global surface classification of Slovenia and compares them to the established Slovenian typification of Slovenia's surface.

KEY WORDS
geomorphology, relief, surface, continuous and discontinuous surface classification method, global and regional surface classification method, digital elevation model, geographic information system, Slovenia

IZVLEČEK
Morfološke tipizacije površja Slovenije z globalnimi metodami
Oblikovanost površja je pogosto najpomembnejši dejavnik razlikovanja med pokrajinami in pomembna prvina pri geografskih klasifikacijah, tipizacijah in regionalizacijah, zato imajo morfološke delitve površja v tujini in pri nas že dolgo tradicijo. Z razvojem geografskih informacijskih sistemov se je močno povečalo število metod in kazalnikov za določanje, analizo in razvrščanje enot oblikovanosti površja na različnih velikostnih ravneh. Glede na prostorsko združevanje lahko ločimo zvezne in nezvezne delitve površja, glede na vrednosti in meje vrednosti kazalnikov pa globalne in regionalne delitve površja. V prispevku predstavljamo primere tujih metod globalne delitve površja Slovenije in jih primerjamo z uveljavljeno slovensko tipizacijo površja Slovenije.

KLJUČNE BESEDE
geomorfologija, relief, površje, metoda zvezne in nezvezne delitve površja, metoda globalne in regionalne delitve površja, digitalni model višin, geografski informacijski sistem, Slovenija

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1 Introduction

Morphology is often the most important factor in distinguishing between landscapes and an important element in geographical classifications, typifications, and regionalizations. Therefore, morphological classifications of the surface have a long tradition in Slovenia and abroad. The development of geographic information systems has significantly increased the number of methods and indicators used for determining, analyzing, and classifying morphological units at various size levels.

The former tedious and time-consuming landform classifications based on maps have been replaced by faster and more accurate classifications using computer-supported geographic information systems. These types of classifications are more objective, even though the selection of classification elements and their classes remain subjective. Iwahashi and Pike (2006) prepared an overview of 12 landform classifications that have been published in recent years and all of them were developed electronically.

Slovenia has an extremely varied relief and can thus serve as a good indicator of the effectiveness or suitability of individual methods and indicators used in landform classification.

2 Global, non-global, continuous, and discontinuous landform classifications

In terms of spatial combinations, one distinguishes between continuous and discontinuous landform classifications, and between global and regional surface classifications in terms of the values and value limits of indicators.

Landform classification may be continuous or discontinuous. Classification and typification may be either continuous or discontinuous, but it is more common for classification to be continuous and typification discontinuous; regionalization is always discontinuous.

In discontinuous landform classification, individual parts of the surface are combined into areas with the same or similar values of selected relief indicators and clear borders with adjacent areas with different values of selected relief indicators. These areas can be referred to as units. Areas with the same or similar values of relief indicators may appear several times in the landscape studied, but they are separated from one another by areas with different values of relief indicators.

In continuous landform classification, individual parts of the surface are classified only based on the values of selected relief indicators, regardless of their spatial position. These non-spatial units are most commonly referred to as classes. Parts of the surface are thus not necessarily connected or do not touch one another, and they can appear anywhere in the landscape studied.

Discontinuous classification is more qualitative, is based on expert knowledge, and has greater applied value; however, it is more subjective. Continuous classification is more quantitative and objective, and has greater analytical value. Continuous landform classification is often only the first stage of discontinuous classification – or, in other words: discontinuous classification is usually an improved continuous landform classification.

In older landform classifications used in Slovenia and elsewhere, discontinuous classifications predominated; however, after the introduction of computers and geographic information systems, continuous classifications and combinations of continuous and discontinuous classifications prevailed.

If a landform classification uses the same values and value limits of selected relief indicators as are used for the entire world, this is referred to as the global landform classification method. If their values and value limits are adjusted to individual areas, this is referred to as the regional landform classification method.

The advantages of the global classification method is that it makes it possible to compare all parts of the world and the advantage of the regional classification method is that internal differences can be shown even in those parts of the world that would remain completely unclassified under the global classification method; this can be achieved by adjusting the values and value limits of relief indicators to *de-facto* conditions in the selected landscape.

In Slovenian and international classifications, typifications, and regionalizations, the global landform classification methods or adjusted global classification methods prevail; the use of the regional landform classification method, which in itself contains elements of adaptation to various landscapes, is very rare. Adjusted global landform classification methods thus represent a type of intermediate solution between global and regional landform classifications.

3 Hammond

One of the first and best-known morphological typifications was developed by the American geographer Edwin H. Hammond, who classified the land-surface forms of the U.S. in greater detail (Hammond 1964). Later on, his method was reused several times using the geographic information system and the digital elevation model (Dikau, Brabb, and Mark 1991; Brabyn 1998; Gallant, Douglas, and Hoffer 2005).

Hammond used a square cell with a baseline of 6 miles (approximately 9.65 km and an area of 93.12 km^2) as the basic surface unit for calculating relief elements; this may seem enormous, but in the U.S. context this does not even account for 0.001% of its entire territory. The cells followed one another without overlapping. Using 1 : 250,000 maps, he defined the following three elements for each cell: slope, local relief, and profile type. He labeled each element with an agreed-upon sign and used their combinations to determine the land-surface form units.

The first element in Hammond's classification is slope. For each cell, he calculated what share of its area has a slope below 8% (approximately 4.57°). He labeled this element with capital letters:

- A: > 80% of area gently sloping,
- B: 50–80% of area gently sloping,
- C: 20–50% of area gently sloping,
- D: < 20% of area gently sloping.

The second element in Hammond's classification is local relief. He defined the maximum and minimum elevation and their difference for each cell. He labeled this element with numerals:

- 1: 0–30 m,
- 2: 30–90 m,
- 3: 90–150 m,
- 4: 150–300 m,
- 5: 300–900 m,
- 6: 900–1,500 m.

The third element in Hammond's classification is profile type. For each cell he defined the percentage of gently inclined surface that lies below or above the average local relief of the cell. He labeled this element with lower-case letters:

- a: > 75% of gentle slope is in lowland,
- b: 50–75% of gentle slope is in lowland,
- c: 50–75% of gentle slope is on upland,
- d: > 75% of gentle slope is on upland.

Hammond combined these elements to define the land-surface forms. He drew them onto a large color map at a scale of 1 : 5,000,000. However, he did not present the results of his classification in square form, but with the land-form boundaries that he set subjectively by following the edges of flat plains, tablelands, hills, and similar major relief forms. Because of this the map is slightly generalized, but more synoptic.

To define the landform units, Hammond used three elements with four (slope), six (local relief), and another four (profile type) classes; this theoretically makes up 96 combinations or 96 possible landform units. However, he actually only chose 21 units, which he combined into five groups (plains, tablelands, plains with hills or mountains, open hills and mountains, and hills and mountains).

Only 13 of his 21 landform units (morphological types) appear in Slovenia (Table 1, Figure 1).

Table 1: Morphological types of Slovenia according to Hammond.

	Unit	km^2	%
1	Flat plains	99.83	0.49
2	Smooth plains	93.40	0.46
3	Tablelands with moderate relief	1.93	0.01
4	Plains with hills	609.21	3.01
5	Plains with high hills	1,102.06	5.44
6	Plains with low mountains	1,371.04	6.76
7	Open hills	141.44	0.70
8	Open high hills	819.23	4.04
9	Open low mountains	3,990.24	19.68
10	Open high mountains	411.04	2.03
11	High hills	147.23	0.73
12	Low mountains	6,003.36	29.61
13	High mountains	5,482.92	27.05

4 Meybeck, Green and Vörösmarty

The classification by Meybeck, Green, and Vörösmarty (2001) is the simplest of all the ones presented because the authors only used two classification elements: relief roughness and mean elevation. They used the global digital elevation model GTOPO30 with 30 arc seconds grid resolution, which corresponds to approximately 1 km.

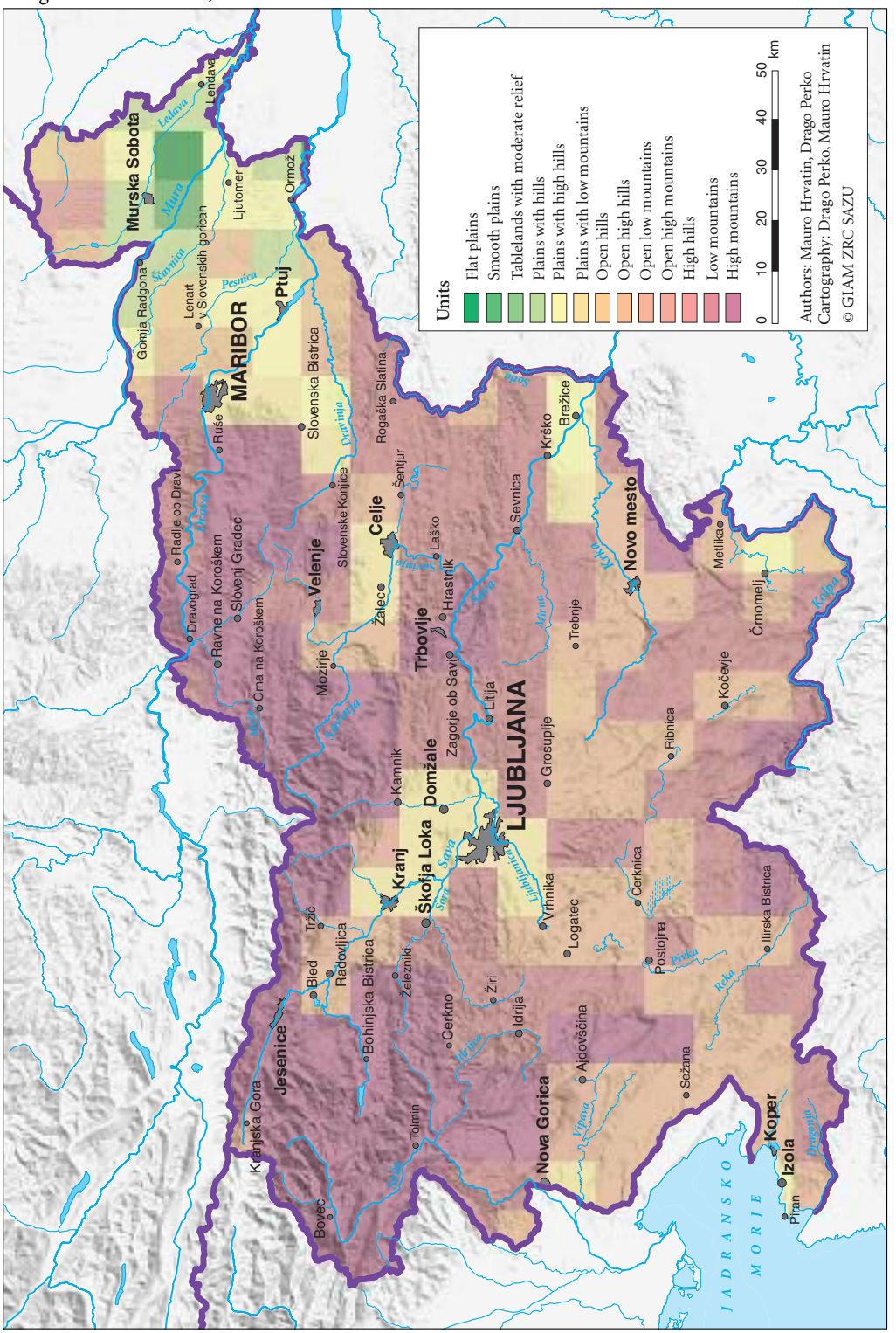
The first element used in the classification by Meybeck, Green, and Vörösmarty is relief roughness. They defined the maximum and minimum elevation for each cell and divided their difference by the cell's baseline length. The unit of relief roughness calculated this way is 1 m/km or ‰. They divided the values estimated into seven classes:

- 1: < 5‰,
- 2: 5–10‰,
- 3: 10–20‰,
- 4: 20–40‰,
- 5: 40–80‰,
- 6: 80–160‰,
- 7: > 160‰.

The second classification element is the average elevation. The values estimated were divided into eight classes:

- 1: 0–200 m,
- 2: 200–500 m,
- 3: 500–1,000 m,
- 4: 1,000–2,000 m,
- 5: 2,000–3,000 m,
- 6: 3,000–4,000 m,
- 7: 4,000–5,000 m,
- 8: 5,000–6,000 m.

Figure 1: Morphological typification of Slovenia according to Hammond. ➤


Units
Flat plains
Smooth plains
Tablelands with moderate relief
Plains with hills
Plains with high hills
Plains with low mountains
Open hills
Open high hills
Open low mountains
Open high mountains
High hills
Low mountains
High mountains
0 10 20 30 40 50 km
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Cartography: Drago Perko, Mauro Hrvatin
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Lendava
Ledava
Mura
Ščavnica
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Pesnica
Ptuj
MARIBOR
Ruše
Slovenska Bistrica
Rogaška Slatina
Šentjur
Celje
Slovenske Konjice
Dravinja
Radlje ob Dravi
Dravograd
Drava
Ravne na Koroškem
Slovenj Gradec
Črna na Koroškem
Velenje
Mozirje
Šoštanj
Žalec
Laško
Hrastnik
Trbovlje
Sava
Zagorje ob Savi
Litija
Sevnica
Krško
Brežice
Novo mesto
Metlika
Črnomelj
Kolpa
Trebnje
Kočevje
Ribnica
Grosuplje
LJUBLJANA
Kamnik
Domžale
Kranj
Škofja Loka
Tržič
Bled
Radovljica
Jesenice
Bohinjska Bistrica
Železniki
Žiri
Cerkno
Idrija
Vrhnika
Logatec
Cerknica
Postojna
Pivka
Ilirska Bistrica
Reka
Ajdovščina
Vipava
Sežana
Nova Gorica
Tolmin
Soča
Idrijca
Kranjska Gora
Bovec
Koper
Izola
Piran
Dragonja
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Meybeck, Green, and Vörösmarty combined these elements to define 15 landform units, of which 13 also appear in Slovenia. The typification of Slovenia's surface, which was performed as part of the typification of the surface of the entire world following the methodology developed by Meybeck, Green, and Vörösmarty, was taken from the website of the Institute for Environment and Sustainability, which is part of the European Commission Joint Research Centre (Internet 1).

Table 2: Morphological types of Slovenia according to Meybeck, Green, and Vörösmarty.

	Unit	km^2	%
1	Plains	1,063.04	5.24
2	Mid Altitude Plains	1,723.99	8.50
3	High Altitude Plains	145.31	0.72
4	Lowlands	580.66	2.86
5	Rugged Lowlands	66.96	0.33
6	Very Low Plateaus	5,514.21	27.20
7	Low Plateaus	2,554.05	12.60
8	Mid Altitude Plateaus	305.83	1.51
9	High Altitude Plateaus	10.15	0.05
10	Hills	1,904.12	9.39
11	Low Altitude Mountains	4,529.24	22.34
12	Mid Altitude Mountains	1,815.29	8.95
13	High Altitude Mountains	60.10	0.30

5 Iwahashi and Pike

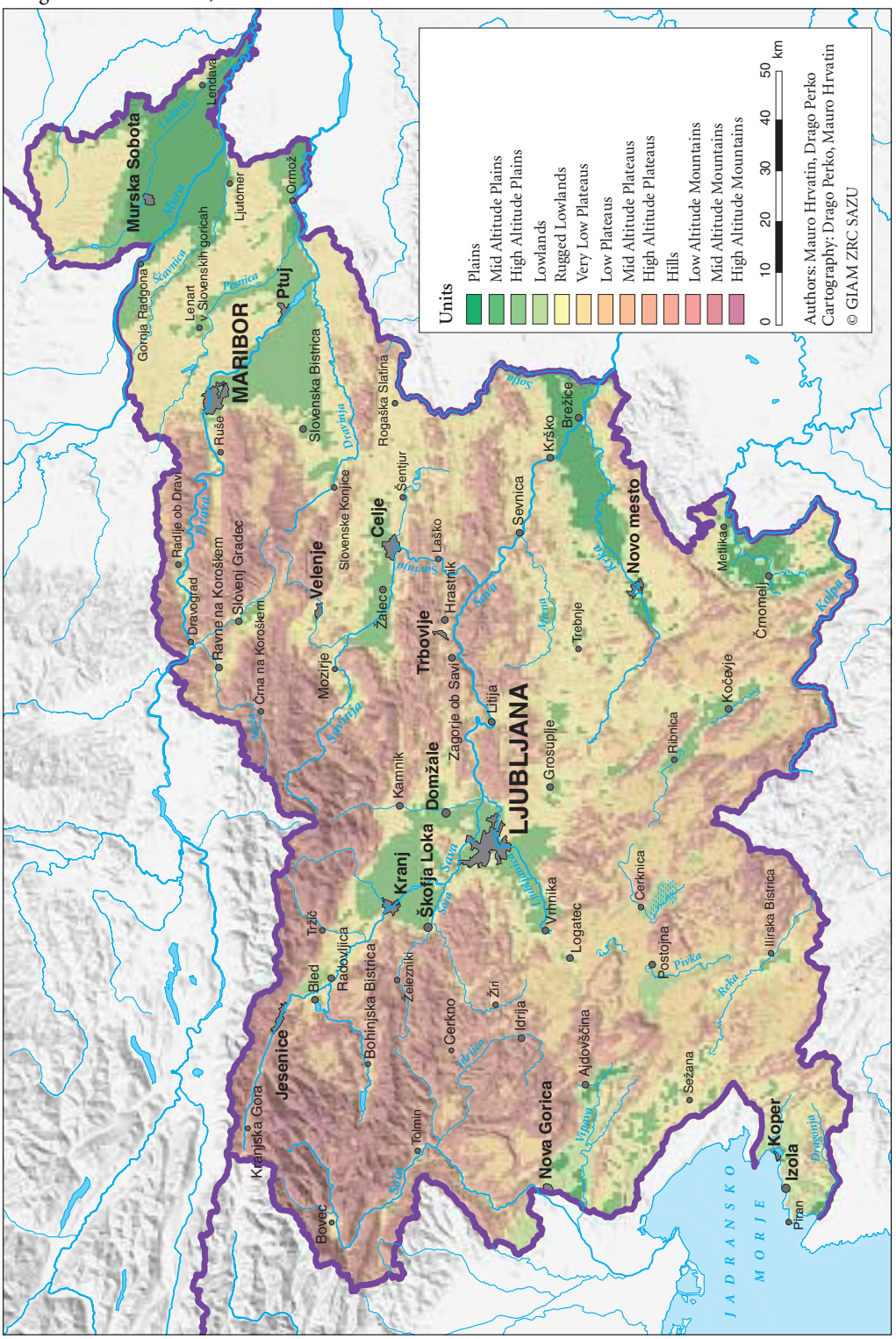
Iwahashi and Pike (2007) developed their landform classification in three areas of various size using three different digital elevation models. Their landform classification of a part of Hokkaido was based on a 55-meter digital elevation model, their classification of Japan was based on a 270-meter digital elevation model, and their classification of the world was based on a 1,000-meter digital elevation model.

They used the same criteria in all of their classifications:

- Slope gradient,
- Local convexity,
- Surface texture.

They calculated slope gradient with ArcGIS, which uses Horn's algorithm (1981). They determined local convexity using the highly permeable Laplacian filter for detecting edges, which is similar to the mathematical operation of the second derivative. This filter enhances the edges in all directions and thus the basic features of landforms such as the bottoms of valleys and the peaks of ridges. They determined the surface texture so that they first calculated the median of every cell using a 9-cell moving window (3×3 cells). Then they subtracted the layer with the median values from the original digital elevation model and thus gained a layer in which the peaks of ridges and the bottoms of valleys were the most pronounced. From the geomorphological viewpoint, this layer could be named the map of density of valleys and ridges. At the same time, this layer shows the terrain or the surface texture. In further developing the surface texture indicator, they took into account all of the positive and negative cells and ascribed them the value 1; all the other cells retained the value 0. Then they used a round

Figure 2: Morphological typification of Slovenia according to Meybeck, Green, and Vörösmarty. ►


Units
Plains
Mid Altitude Plains
High Altitude Plains
Lowlands
Rugged Lowlands
Very Low Plateaus
Low Plateaus
Mid Altitude Plateaus
High Altitude Plateaus
Hills
Low Altitude Mountains
Mid Altitude Mountains
High Altitude Mountains
0 10 20 30 40 50 km
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moving window with a diameter of 10 cells to determine the frequency of the terrain. This data finaly enabled them to calculate the percentage of terrain occurrence for each cell by dividing the frequency of occurrence by the area of the round moving window.

Iwahashi and Pike connected the prepared classification layers (slope gradient, local convexity, and surface texture) using the nested-means classification procedure, which was introduced to geographical research and classification by Scripter (1970) and makes it possible to divide the surface into 8, 12, or 16 classes.

This procedure is especially recommended for dividing unevenly or asymmetrically classified data such as data on the elevation and slope gradient, in which greater values are increasingly rarer.

The typification of Slovenia's surface made following Iwahashi's and Pike's methodology as part of the typification of the entire world's surface was based on the website of the Geospatial Information Authority of Japan (Internet 2).

Of the 16 landform units defined by Iwahashi and Pike in their classification of the world surface, 13 appear in Slovenia (Table 3, Figure 3).

Table 3: Morphological types of Slovenia according to Iwahashi and Pike.

	Unit	km^2	%
1	Gentle surface with low convexity and coarse texture	190.03	0.94
2	Gentle surface with low convexity and fine texture	574.63	2.83
3	Gentle surface with high convexity and fine texture	59.83	0.30
4	Moderately gentle surface with low convexity and coarse texture	44.13	0.22
5	Moderately gentle surface with low convexity and fine texture	925.44	4.56
6	Moderately gentle surface with high convexity and fine texture	245.37	1.21
7	Moderately steep surface with low convexity and coarse texture	80.25	0.40
8	Moderately steep surface with low convexity and fine texture	3,060.27	15.10
9	Moderately steep surface with high convexity and fine texture	1,720.62	8.49
10	Steep surface with low convexity and coarse texture	95.61	0.47
11	Steep surface with low convexity and fine texture	5,599.23	27.62
12	Steep surface with high convexity and coarse texture	10.05	0.05
13	Steep surface with high convexity and fine texture	7,667.47	37.82

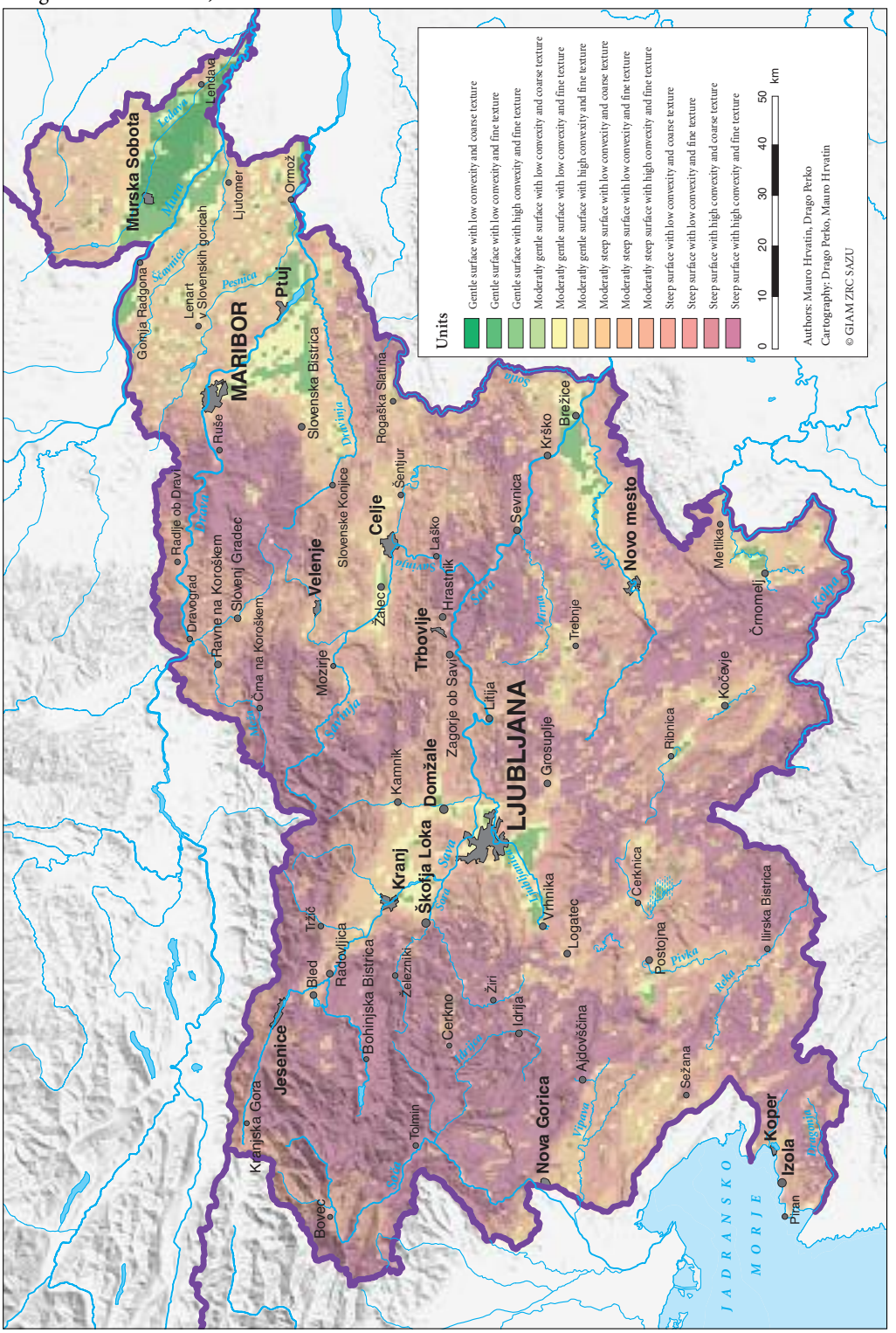
6 Perko

The first computerized relief typification in Slovenia was created by Drago Perko, who initially divided Slovenian territory into eight landform units (Perko 1992; 2001; 2007), and later on into seven (Table 4, Figure 4).

This classification is based on spatial variability in elevation and slope. For each square cell of a 100-meter digital elevation model, Perko took into account its eight neighboring cells (a moving window measuring 9 ha or 3×3 cells) to first calculate the elevation variation and the slope variation coefficient; following this, he used both variation coefficients to calculate their geometric mean, which he called the relief coefficient (Perko 2001). By generalizing the relief coefficient, he defined the landform units. He manually adjusted the final borders between these units to the natural borders in the landscape (rivers, plateau edges, etc.).

Later he determined the variability of Slovenia's relief (Perko 2007) using a new version of the relief coefficient, which he calculated as a geometric mean of the slope variation coefficient and the aspect

Figure 3: Morphological typification of Slovenia according to Iwahashi and Pike. ►


Units
Gentle surface with low convexity and coarse texture
Gentle surface with low convexity and fine texture
Gentle surface with high convexity and fine texture
Moderatly gentle surface with low convexity and coarse texture
Moderatly gentle surface with low convexity and fine texture
Moderatly gentle surface with high convexity and fine texture
Moderatly steep surface with low convexity and coarse texture
Moderatly steep surface with low convexity and fine texture
Moderatly steep surface with high convexity and fine texture
Steep surface with low convexity and coarse texture
Steep surface with low convexity and fine texture
Steep surface with high convexity and coarse texture
Steep surface with high convexity and fine texture
0 10 20 30 40 50 km
Authors: Mauro Hrvatin, Drago Perko
Cartography: Drago Perko, Mauro Hrvatin
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Domžale
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Škofja Loka
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Ilirska Bistrica
Bohinjska Bistrica
Tolmin
Kranjska Gora
Bovec
Nova Gorica
Ajdovščina
Sežana
Koper
Izola
Piran
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variation coefficient of each square cell of the 25-meter digital elevation model and its 120 neighbors (a moving window measuring 75,625 ha or 11 × 11 cells).

Table 4: Morphological types of Slovenia according to Perko.

	Unit	km^2	%
1	Plains	1,918.31	9.46
2	Rough Plains	1,195.38	5.90
3	Low Hills	4,842.91	23.89
4	Rough Low Hills	2,645.48	13.05
5	High Hills	6,686.63	32.98
6	Rough High Hills	1,028.94	5.08
7	Mountains	1,955.29	9.64

7 Conclusion

Various surface classifications are more or less successful in dividing Slovenia's surface. The majority show Slovenia as a hilly or even mountainous country with a diverse relief. Some areas are placed in classes that deviate considerably from the actual conditions. The classification criteria have obviously been adjusted to areas with less diverse relief, such as the North European Plain, the West Siberian Plain, and the Tibetan Plateau. However, with appropriate modification of the classification criteria (Perko and Hrvatin 2009) the same classifications yield significantly better results even for countries with such a diverse relief as Slovenia.

Hammond's method proved to be of relatively good quality in classifying the surface of the United States. However, for Slovenia, where the morphological features of the surface change rapidly in space, this method is insufficiently accurate. Thus a number of Slovenian landscapes are classified in units that do not show their actual morphological features because, due to the size of the basic square cell, the morphological features of their neighboring landscapes are also taken into account. The original basic cell with an area of nearly 100 km^2 is significantly too large to determine all three of Hammond's elements for Slovenia.

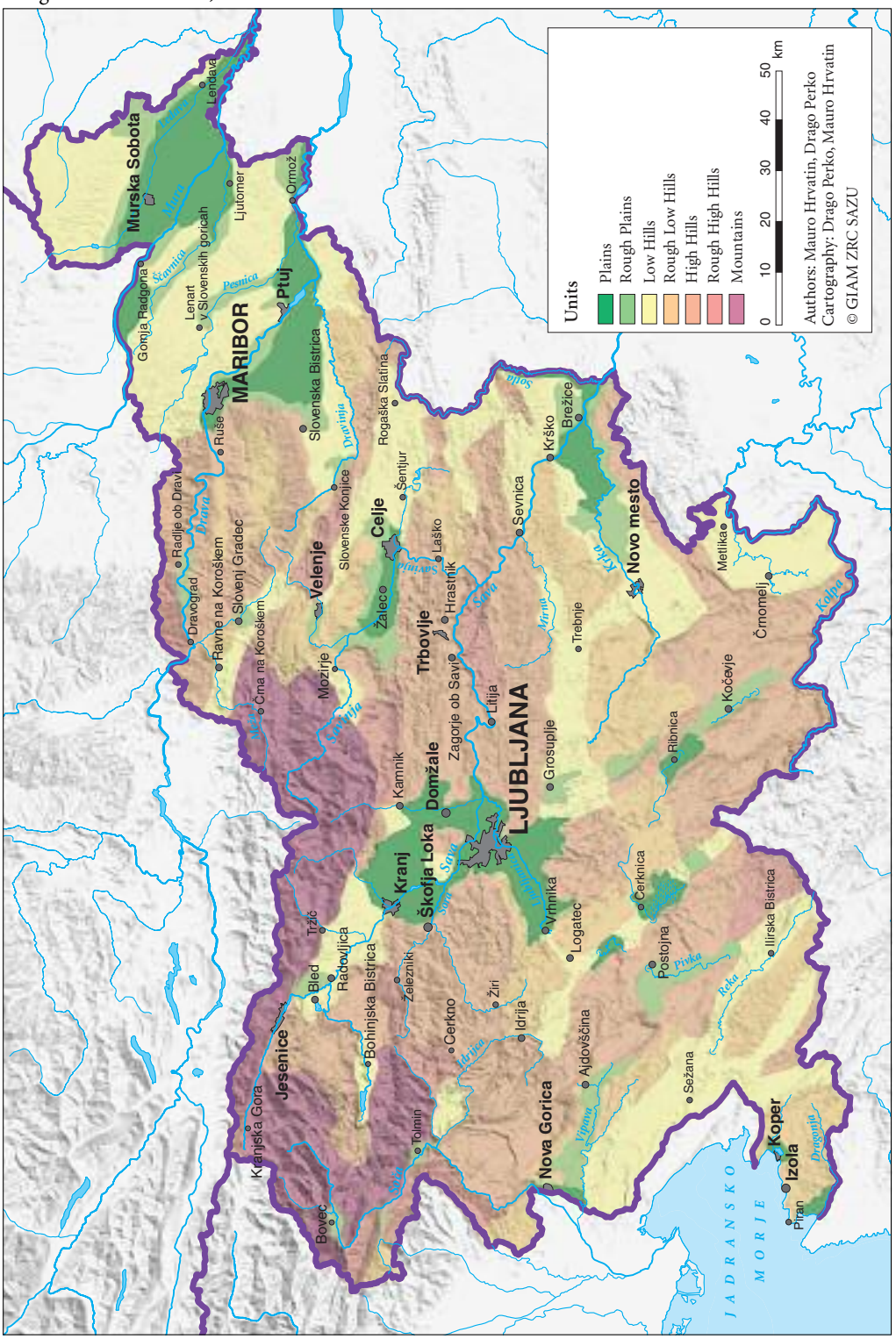
The results of **Meybeck, Green, and Vörösmarty's method** are the closest to our idea of Slovenia's landforms. Among all three foreign methods selected, it is the only one that does not require major adjustments. However, as in practically all computerized surface classifications, individual relief units are spatially too fragmented.

Of the 16 classes in the original classification of the entire world's surface following **Iwahashi and Pike's method**, 13 classes appear in Slovenia. The percentage of the surface covered by individual classes is very uneven because nearly nine-tenths of Slovenian territory is classified under only four classes. The weaknesses noticed in this classification include the excessive similarity between the second and third classification criteria (the percentage of local convexity and surface texture), which consequently partly duplicate each other.

It is interesting that all three selected foreign classifications are statistically more correlated with that of Perko (correlation coefficients between 0.345 and 0.446) than with one another (correlation coefficients between 0.270 and 0.306). The classification by Meybeck, Green, and Vörösmarty statistically correlates the best with Perko's classification (correlation coefficient of 0.446) (Table 5).

By comparing the units in Perko's classification or typification with the units used by Hammond, by Meybeck, Green, and Vörösmarty, and by Iwahashi and Pike, it can be seen how the use of the glob-

Figure 4: Morphological typification of Slovenia according to Perko. ►


Units
Plains
Rough Plains
Low Hills
Rough Low Hills
High Hills
Rough High Hills
Mountains
0 10 20 30 40 50 km
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Slovenj Gradec
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al classification methods can create a poor or completely wrong picture in smaller areas with diverse relief.

Table 5: Correlation coefficients between the morphological typifications of Slovenia.

	Hammond's classification	Meybeck, Green, and Vörösmarty's classification	Iwahashi and Pike's classification	Perko's classification
Hammond's classification	1.000	0.306	0.296	0.413
Meybeck, Green, and Vörösmarty's classification	0.306	1.000	0.270	0.446
Iwahashi and Pike's classification	0.296	0.270	1.000	0.345
Perko's classification	0.413	0.446	0.345	1.000

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ARTICLES

GEODIVERSITY AND GEOMORPHOSITE RESEARCH IN SLOVENIA

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COBISS: 1.02

ABSTRACT
Geodiversity and geomorphosite research in Slovenia
Slovenia's geodiversity, or its abiotic natural diversity, becomes more and more significant when considering regulations on nature conservation. This article presents theoretical background information to the study of geodiversity and geomorphological heritage and the current state of this field in Slovenia. The first quantitative evaluation of geomorphological heritage in Slovenia, which was carried out in the Triglav Lakes Valley, is also presented. The significance of regions with a high concentration and diversity of landforms is presented. Some inconsistencies in the current register of natural values are described and recommendations are presented for adding to this register.

KEY WORDS
geography, geomorphology, geodiversity, geomorphosites, nature conservation, Triglav Lakes Valley, Slovenia

IZVLEČEK
Preučevanje geodiverzitete in geomorfološke dediščine v Sloveniji
Geodiverziteta ali pestrost nežive narave v Sloveniji vse bolj pridobiva na pomenu pri vprašanju zakonskega varovanja narave. Predstavljena so nekatera teoretska izhodišča za preučevanje geodiverzitete in geomorološke dediščine ter stanje na tem področju v Sloveniji. Predstavljeno je tudi prvo kvantitativno vrednotenje geomorfološke dediščine v Sloveniji, izvedeno v Dolini Triglavskih jezer. Izpostavljen je pomen območij z veliko gostoto in raznovrstnostjo reliefnih oblik. Ugotovljena so bila nekatera neskladja z obstoječim registrom naravnih vrednot ter podani predlogi za dopolnitev le-tega.

KLJUČNE BESEDE
geografija, geomorfologija, geodiverziteta, geomorfološka dediščina, varstvo narave, Dolina Triglavskih jezer, Slovenija

The article was submitted for publication on September 23, 2011.

1 Introduction

In the past two decades, the trend toward describing and evaluating natural diversity around the world and in Slovenia has been strongest in biology (Serrano and Ruiz-Flaño 2007) because concerns about species extinction and habitat loss have grown. The concept of biodiversity was introduced in 1988 as a scientific term to define the variability of the Earth's living organisms, its »biological diversity« (Wilson 1992), and was intended to include »the diversity within species, between species and of ecosystems« (Hawksworth 1996). Its use became widespread as a result of the Earth Summit held in Rio de Janeiro in 1992, which was held in order to encourage analysis of conservation of biodiversity and related issues. Biodiversity promotes the idea that the world is biologically diverse, that there are significant threats to this biological diversity, and that there is therefore a need to take action to conserve it. It quickly became obvious to geoscientists that there must be an equivalent to biodiversity to describe the variety of non-living or abiotic natural wealth. The first uses of the term »*geodiversity*« occurred in 1993 in publications from Germany and Australia (Wiedenbein 1993; Sharples 1993; Gray 2008). Thus, some researchers quickly realized that it is possible to consider geology, geomorphology, and hydrology in much the same way as biology; that is, planet Earth is very diverse in these senses as well, and this diversity is also valuable and threatened, and there is a need to conserve it. Thus the concept of geodiversity took its place as a tool for managing protected areas, often in contrast to the term *biodiversity* (Cañadas and Ruiz-Flaño 2007). In Slovenia, the term did not appear in professional literature until 2007 (Erhartič 2007).

The term *biodiversity* is still more common than the term geodiversity, which is shown by the two terms' use on the World Wide Web. Using the Googlefight webpage to compare biodiversity (with 4.3 million hits) and geodiversity (with around 17,400 hits) on 22 January 2012 showed that the difference is a factor of nearly 250.

The concept of conservation and management of natural areas has changed over time. Broadly speaking, the main phases have been (Skoberne 2005):

- Conservationist, with implementation of landscape and monumental concepts involving the most outstanding visible elements of natural areas (e.g., trees, caves, waterfalls);
- Biological, with protection of species being placed in the foreground (over time, activities were extended to include ecosystems);
- Holistic, with extension of understanding ecosystem protection to a global level that includes habitats and landscapes as visible elements of the multiple relations between living beings, including humankind, and the abiotic environment.

These changes in conservation concepts and the incorporation of biodiversity have led to a greater understanding of the role that the abiotic components of a landscape play in determining value, an aspect without which it is impossible to conserve nature. Indeed, protected areas are often defined as such because of the abiotic elements that make up these outstanding landscapes. It is within this framework that new terms have been coined and concepts such as geodiversity have been created.

In Slovenia, the first known example of conscious nature conservation was the protection of the virgin forest *Rajhenavski pragozd* in 1892. Despite over a century of tradition, however, management of natural areas is only now moving from the second, biological and ecosystem phase, to the third, holistic phase or paradigm.

2 Geodiversity

The Australian Heritage Commission report of 2002 defines geodiversity as »the natural range (diversity) of geological (rocks, minerals, fossils), geomorphological (landform, processes) and soil features. It includes their assemblages, relationships, properties, interpretations and systems« (Gray 2004, 8;

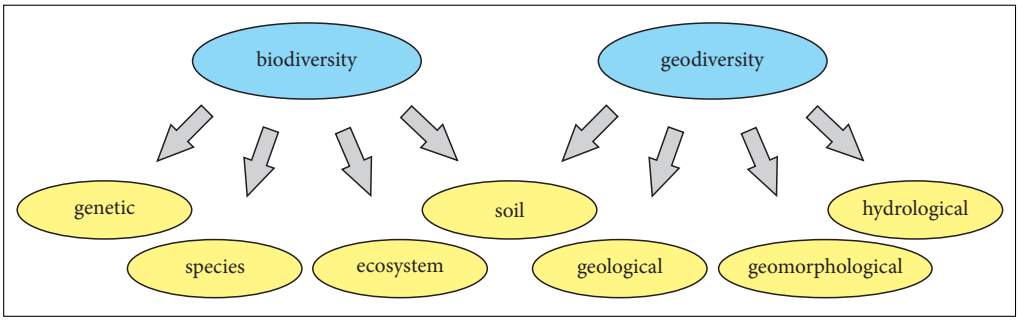

Figure 1: Levels of biodiversity and geodiversty (Erhartič 2011, 28).

Internet 1). The British definition is similar, except that it also includes people and culture: »It is the link between people, landscapes and culture; it is the variety of geological environments, phenomena and processes that make those landscapes, rocks, minerals, fossils and soils which provide the framework for life on Earth« (Gray 2004, 7). In marked contrast to the clear and precise definition of biodiversity, which includes a concept of hierarchical levels – genes, species and ecosystems (Figure 1) – geodiversity has shown a conceptual weakness that has left it adrift in various fields. The concept of geodiversity as »the variety of abiotic nature« (Gray 2004) includes a plethora of interrelated elements on the land surface and in the seas and oceans. It has also led to attempts to formulate more integrative definitions that try to take into account all the elements involved in the structure and physical processes of the land surface. Sharples (2002), on the other hand, includes not only geological, geomorphological, and soil elements, but also the interrelated character of their links, assemblages, properties, systems, and processes. The most integrative vision is that of Kozlowski (2004, 834) who defines geodiversity as the »natural variety of the Earth's surface, referring to geological and geomorphological aspects, soils and surface waters, as well as to other systems created as a result of both natural (endogenic and exogenic) processes and human activity.«

Slovenians use a somewhat simplified definition (Erhartič 2007, 60): »geodiversity is the diversity and complex connection of features and processes in the geology, geomorphology, hydrology, and soil geography of a particular area«; it is also understood as the diversity of non-living nature.

There is a natural tendency to think of wildlife as being fragile and vulnerable and therefore in need of conservation, whereas rocks, mountains, and landforms are seen as stable, static, and much too prolific to ever be endangered. The world's geodiversity is of value in several respects but is threatened by many human activities (Gray 2004). Pressures on geodiversity arise principally from planning developments and land-use changes. These may damage key features, impair their visibility and accessibility, or fragment the interest. There is therefore a need for *geoconservation*, but the objectives and methods of geoconservation need to take the various elements of geodiversity into account. For example, the conservation of soils needs to be approached very differently from the conservation of fossils. Important geomorphological sites can be protected by legislation, but soils and landscapes in the wider countryside are better conserved by policy development and partnerships (e.g., in agriculture). Slovenia lacks a holistic perspective on landscape because this is dealt with by sectors within various ministries (e.g., the Ministry of Infrastructure and Spatial Planning, the Ministry of Education, Science, Culture, and Sport, and the Ministry of Agriculture and the Environment). Only in the past few years has Slovenia focused more on studying the issues of geodiversity and geoheritage, primarily geomorphological heritage (geomorphosites) (Erhartič 2007; 2010a; 2010b; Zorn, Erhartič, and Komac 2009; Komac, Zorn, and Erhartič 2011), although awareness of geological heritage (geosite) is older (e.g., Rotar 1991; Hlad 1998; Hlad and Šolar 1998; Kavčič and Peljhan 2010; Peljhan, Gorjup-Kavčič, and Benčina 2011).

The geodiversity concept highlights the sensitivity of abiotic elements and dynamics and the value of the natural, geological, geomorphological, pedological, and hydrological factors in nature conservation and land planning and management. However, this does not imply a focus on concrete sites (e.g., geosite and geomorphosites), but rather on a set of elements found within a stretch of the land continuum or in a region as a whole. According to Gray (2005), geodiversity is a means for inclusion of natural diversity in conservation, planning, and education through different forms (e.g., geotopes, geomorphosites, geoparks, and protected landscapes). The objectives and methods of geoconservation vary, depending on which element of geodiversity is being considered.

3 Geomorphological heritage

Of course, it is not necessary to protect all geodiversity because that would lead to pragmatic problems due to society's needs to use certain resources. Thus it is necessary to highlight, evaluate, and protect the most important or most valuable parts of abiotic nature.

Landforms are one of the most widespread, immediately recognizable, and attractive non-living natural elements of the landscape, which have always aroused interest among people due to their beautiful, exceptional, or unusual appearance. By selecting interesting, memorable shapes, people unconsciously endow them with some meaning or value. These forms thus become heritage, or (with professional evaluation) a value. Its attributes are those that give it value and allow the landform to be declared a geomorphological natural value.

Geomorphological heritage (e.g., Hribar 2010) thus entails phenomena and processes to which value can be ascribed: scientific, aesthetic, historical, tangible, and intangible cultural, social, or economic value, depending on people's perceptions or the needs of a given study. Evaluation is personal and depends on the awareness and knowledge of an individual and the entire society (Hlad 2002). A given landform becomes a natural value only if it also contains a social component, and if the geomorphology and nature conservation professionals recognize it as a value and ascribe it the status of a value. However, because society develops and changes over time, and with it also the criteria and measures, values are also subject to change (Šmid Hribar 2008). The problem of evaluating nature and natural values is that, regardless of the evaluation method used, it is practically impossible to exclude the subjective component (Erhartič 2010a).

In international literature, the term *geomorphosite* has come into use for geomorphological heritage. Panizza (2001, 4) defines this term as »a landform to which a value can be attributed.« Regardless of the fact that terms change, parts of nature that have been recognized as such remain. What is essential is that they contain special values (Berginc 2006). With non-living heritage, researchers first primarily studied the scientific value of forms and phenomena (Panizza and Piacente 1993; Rivas et al. 1997; Bruschi and Cendrero 2005; Coratza and Giusti 2005; Serrano and Gonzales-Trueba 2005) because they were merely used to support the inventorying of heritage and the analysis of environmental impacts (Reynard et al. 2007). Scientific criteria were soon joined by cultural, ecological, economic, and aesthetic criteria of evaluating non-living nature (Panizza and Piacente 1993; Reynard et al. 2007). In order to reduce subjective influence and enable comparison of geomorphological heritage in various parts of the world, a number of quantitative methods of evaluating geomorphological heritage have developed in recent years (e.g., Panizza 2003; Coratza and Giusti 2005; Serrano and Gonzales-Trueba 2005; Pereira, Pereira, and Caetano Alves 2007; Reynard et al. 2007). Which evaluation method is the most appropriate depends on the research goals (Erhartič 2010a). Until recently, this type of (quantitative) evaluation had not been present in Slovenia (Erhartič 2010a; 2011). The first protected area where it was carried out was Triglav National Park, which is also the only Slovenian national park (Erhartič 2011; chapter 5.1).

4 Geodiversity in Slovenia

The Republic of Slovenia covers 20,273 km^2 and encompasses four macro-geographical regions: the Alps and Dinaric Alps, and the Mediterranean and Pannonian basins (Orožen Adamič 2004). Significant landscape and biological diversity within a relatively small territory is one of Slovenia's main characteristics. It is greatly supported by different types of climate, geological structure, varied relief, and great differences in elevation. Due to prevailing carbonate bedrock (43%), an appropriate climate, and the amount of precipitation, karst phenomena are especially well developed in Slovenia. The Sežana-Komen karst region, known also as the Classical Karst, attracted the attention of geotourists as early as the Middle Ages (Zorn, Erhartič, and Komac 2009).

Even though geodiversity has not yet been systematically studied in Slovenia, it can be concluded on the basis of natural-geographical landscape elements that the level of geodiversity is high in Slovenia because a large number of geological, geomorphological, and hydrologic phenomena are manifested in a small area.

Slovenia's nature conservation system is thematically oriented toward three fields: natural assets (values), plant and animal species, and ecosystems. Due to EU requirements, Slovenia introduced Natura 2000 as a mechanism for the conservation of natural habitats, fauna (especially birds), and flora. The aim of the network is to assure the long-term survival of Europe's most valuable and threatened species and habitats (Internet 2). The EU describes habitats as »terrestrial or aquatic areas differentiated by their geographical, abiotic and biotic characteristics, whether they be wholly natural or semi-natural« (Internet 2). Thus habitats include abiotic and spatial components. The variety of abiotic elements forming habitats can also be referred to as geodiversity. The framing of the concept of geodiversity in this context is of special interest because it reflects an understanding of natural diversity, and links the concept to development of conservation policies and management of natural protected areas and natural heritage in national and transnational areas, such as Natura 2000 in Europe. Even though Natura 2000 has thus been based on biological criteria, the determination and management of these areas also entails the study and preservation of geodiversity.

The average percentage of Natura 2000 area in EU countries is 15%, whereas in Slovenia it is much higher, over 36% (Internet 2). This very high percentage is a consequence of the diverse landscape/abiotic compounds and relatively well-preserved natural environment in Slovenia. The surface contains a great diversity of rocks. Sedimentary rocks originate in various geological periods and are thus extremely diverse, which is why the soils are also extremely diverse (Jeršek and Vidrih 2009). Great diversity can also be observed with climatic conditions, which especially depend on distance from the sea, elevation, and the quantity of precipitation. These factors are reflected in exceptionally great geodiversity.

Due to the large share of carbonate rocks, geodiversity in Slovenia may be the greatest when it comes to karst forms. The karst features in the Slovenian Karst (*Kras*) are so distinct and characteristic that the Slovenian-based term *karst* has become standardized in international terminology for this type of landform (Jeršek and Vidrih 2009).

The possibility of measuring and quantifying geodiversity has been discussed since the beginning of geodiversity research (Serrano and Ruiz-Flano 2007). It is accepted that the effectiveness of the incorporation of geodiversity in land management depends on the capacity to understand and evaluate it. Nevertheless, the applications of the term and the theoretical reflections thereof have not been accompanied by systematic evaluation of geodiversity assessment methods.

One of the first attempts to evaluate parts of geodiversity in Slovenia applied to the Soča River and the project of constructing a hydroelectric power plant at Kobarid (Peterlin and Sedej 1965; Orožen Adamič 1970). Peterlin and Sedej (1965) used an exclusively descriptive evaluation method, whereas Orožen Adamič (1970) used a simple method to numerically illustrate the »value« and thus reduce the subjective influence of evaluating nature. This resulted in a list of factors that were able to be assessed with a specific unit of measurement.

5 Geomorphosites in Slovenia

In Slovenia, natural heritage is defined as a part of nature »that a society of a specific time and place recognizes as value« (Inventar … 1988). In 1999, the Nature Conservation Act (Zakon o ohranjanju … 1999) eliminated the term »natural heritage« and introduced a new one: »natural value/valuable natural feature.«

Even though 170 years ago the first initiative to protect natural sites (Praprotnik 2004; Skoberne 2007) referred to the aesthetic experience of nature and all of the old nature conservation legislation was familiar with natural beauty or the aesthetic aspect, the currently valid Nature Conservation Act (Zakon o ohranjanju … 1999; 2004) does not mention any aesthetic criteria for evaluating nature. At the management level, this severely encumbers the evaluation of nature and defining heritage. According to this act, »natural values shall encompass all natural heritage in the territory of the Republic of Slovenia« (Zakon o ohranjanju … 2004) and »in addition to a rare, valuable or well-known natural phenomenon, a natural value shall be any other valuable phenomenon; component or part of living or non-living nature; natural area or part thereof; ecosystem; landscape; or designed landscape.«

The Slovenian Nature Conservation Act (Zakon o ohranjanju … 2004) defines ten different kinds of natural values (Erhartič 2009). At least four of them correspond to the term »geoheritage«: surface geomorphological, underground geomorphological, geological, and hydrological natural values. However, other types of natural values may also contain abiotic nature.

There are about 19,000 natural values in Slovenia (Internet 3). Figure 2 shows that half of them are underground geomorphological values because all karst caves are declared as (subsurface) natural values of national importance (Zakon o varstvu … 2004). Surface geomorphological and hydrological natural values follow, in third and fourth place. Abiotic natural values as defined above represent 73% of Slovenia's natural values.

Around 85% of natural values can be shown as points (cave entrances, erratic boulders, trees), and the rest of them are indicated as areas, mostly very small. There are only 338 areas larger than 1 km^2 (Internet 3). The total area of the ten largest natural values is 656.8 km^2, which is 3.24% of the national territory. The large majority of them are geomorphological values: karst mountain plateaus, thrust structures, glacier valleys, and karst poljes (Internet 3).

5.1 Example of evaluating landforms in high mountain areas

From 2008 to 2011, an extensive study (Erhartič 2011) was conducted on the geodiversity and geomorphological heritage in the oldest Slovenian protected area, from which the Triglav National

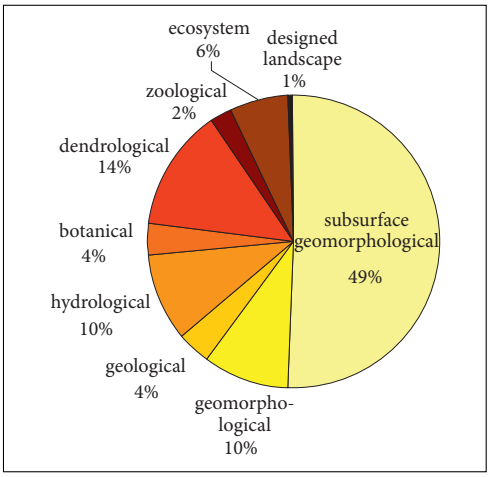

Figure 2: Natural values in Slovenia (Internet 3).

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Figure 3: The central part of the Triglav Lakes Valley.

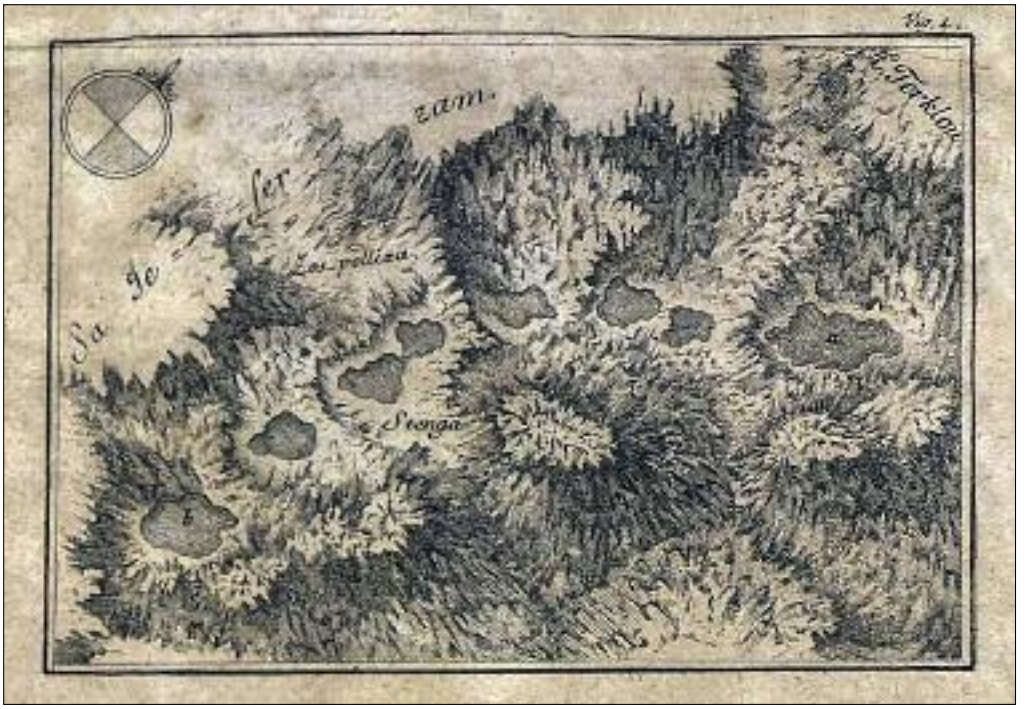

Figure 4: A map from the second half of the eighteenth century showing the Triglav Lakes Valley (Hacquet 1778).

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Figure 5: The Triglav Lakes Valley contains seven large bodies of water; the photo shows Jezero v Ledvici lake with roche moutonnée in the background.

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Figure 6: Numerous karren tables have been preserved on the glacial karst surface of Velika vrata area.

Park developed. The high mountainous Triglav Lakes Valley in the heart of the Julian Alps, which is relatively difficult to access (Figures 3 and 4), was protected in 1924. It is visited by approximately 40,000 people a year (Erhartič 2004, 69), which places a significant burden on this vulnerable high mountain karst area with its characteristic underground streams, thin soil, and modest vegetation.

The study focused on the landform analysis of the Triglav Lakes Valley and the nature-conservation evaluation of landforms. A detailed inventory of landforms was made, which included recording, analysis, and cartographic presentation of landforms. It turned out that areas with a high density and diversity of landforms had greater nature-conservation significance than individual landforms because the latter can also be in various developmental stages. Therefore, based on the relief landscape elements, the surface of the Triglav Lakes Valley was then divided into units or geomorphological complexes. A simple Swiss method (Reynard et al. 2007) was used to evaluate seventeen uniform geomorphological units. The method includes central or scientific evaluation criteria (e.g., rarity, typicality, completeness, and paleogeographical value), which are complemented by additional criteria (e.g., ecological, aesthetic, cultural, and economic value). The total value, which is the result of central and additional evaluation criteria, is provided descriptively because this preserves greater transparency of the procedure. Landform evaluation showed that the greatest geomorphological value can be ascribed to a wide variety of valley parts. However, lakes (Figure 5) and the glacial-karst surface of *Velika vrata* area (Figure 6) were evaluated as the most important nature-conservation areas. The *Velika vrata* area is important especially because of its numerous corrosion and glacial erosion forms at various developmental stages. Karren tables stand out among the glacial karst shapes because the area of *Velika vrata* is their *locus typicus* in Slovenia (Figure 6). In the high-mountain areas of the limestone Alps, lakes are important already because they are so rare and because of their ecological and aesthetic value. These are followed by the limestone pavement areas south of the Prehodavci Pass, especially thanks to its completeness and the presence of rare and typical high-mountain karst features; the roche moutonnée south of *Jezero v Ledvici* lake (Figure 5), and limestone pavement *Gladki lašt*, which is the largest limestone pavement in the Triglav Lakes Valley.

With regard to the Triglav Lakes Valley, certain discrepancies were established with the register of natural values kept by the Institute of the Republic of Slovenia for Nature Conservation and the Environmental Agency of the Republic of Slovenia; proposals for expanding the list were presented as well as (Figure 7) proposals for awarding the status of a natural value and for establishment of small protected area (natural monument):

- All the lakes are natural values, but only First Lake is recognized as a natural monument; all the lakes should acquire the status of a natural monument;
- The evaluation confirms the justification of limestone pavement *Gladki lašt* to be recognized as a natural value;
- The evaluation did not confirm the reasons for limestone pavement *Debeli lašt* to have the status of a natural value; according to the Swiss criteria, this unit does not meet the requirements to be listed among the most important natural heritage in Slovenia;
- The area of limestone pavement *Kosmata lašta* is inaccessible, so its status can neither be confirmed nor rejected;
- The geomorphologically most important area in the Triglav Lakes Valley is the area of *Velika vrata*, which has not been awarded any legal status so far; therefore we believe it should become a natural value; a further appropriate legal step in this area would be to protect it as a natural monument; – In terms of scientific value, *Velika vrata* is followed by the limestone pavement *Podi* south of the Prehodavci Pass; we also suggest that a status of natural value be ascribed to this unit;

Figure 7: Geomorphological units in the Triglav Lakes Valley and proposals for geomorphological heritage and its protection (Erhartič 2011, 139, 196). ► *str. 60*

Geomorphosites
existing geomorphosites
proposed geomorphosite
proposed natural monument
Geomorphological Units
geomorphological unit
geomorphhological unit – lake
1 Kanjavec
2 Hribarice
3 upper part of the Triglav Lakes Valley
4 limestone pavement below the Prehodavci Saddle
5 moraines in the eastern part of the Triglav Lake Valley
6 Jezerski greben Ridge
7 scree under Jezerski greben Ridge
8 Lepo Špičje–Plaski Vogel–Čelo Ridge
9 tectonically broken zone under the Lepo Špičje Ridge
10 limestone pavement and roche moutonnée between Ledvica Lake and Pri Utah mountain pasture
11 forested limestone pavement with karst depressions
12 Debeli lašt
13 Gladki lašt
14 limestone plateau Za dolino and Pri bajti
15 Velika vrata
16 Kosmata lašta
17 lakes
border of the Triglav Lakes Valley
0 0,5 1 2 km
Author of the content: Bojan Erhartič
Author of the map: Manca Volk
Source: ARSO, GURS, MKGP
© Anton Melik Geographical Institute ZRC SAZU

- The upper part of the Triglav Lakes Valley has a great nature-conservation value; this unit also includes five bodies of waters with natural value status. *Jezero pod Vršacem* lake is also protected as a natural monument and so it does not require an additional conservation regime;
- The area between *Jezero v Ledvici* lake and the deserted mountain pasture *Pri Utah* also stands out in terms of its value. We think that the roche moutonnée and patches of moraine material that prevent corrosion – which is extremely visible in the field – are so important that the area should be awarded the status of a natural value.

6 Conclusion

Even though the awareness of geoheritage in Slovenia is approximately as old as the country itself (Chapter 2), until a few years ago we had been lacking a problem-oriented approach to its study. However, we still too often lack the applicability of geoheritage and, nearly a decade and a half later, also geodiversity as a tool within the management of protected areas. According to Gray (2004), geodiversity is a basic principle of geoconservation and protection of places. As a term, it appears easily accessible to managers and politicians, supporting quick recognition of the need to take other aspects of conservation, in addition to biological ones, into consideration. In particular, it is felt to be useful for the conservation of abiotic heritage and the incorporation thereof in local sustainable development policies, as well as for the assessment of non-biological natural resources. From the planning point of view, the term can help integrate nature conservation into sustainable land management. This is reflected well in geoparks (Internet 4), which are actually a response by geo-science professionals to the overly strong emphasis on biological issues in the nature-conservation system. There are currently two geoparks in Slovenia: the Idrija Geopark (Peljhan, Gorjup-Kavčič, and Režun 2009) and the (Austrian-Slovenian) Karavanke/Karawanken Geopark across the border (Bedjanič, Rojs, and Fajmut Štrucl 2012; Geopark … 2012). Another one is currently being designed: the cross-border (Slovenian-Italian) Kras/Carso Geopark. In contrast to protected areas, geoparks are not defined in Slovenian legislation. Their mission lies primarily in sustainable land management with an emphasis on sustainable tourism and promotion of the area. In Slovenia, geoparks are also a relatively recent phenomenon because the first (in Idrija) was only established in 2010 (Peljhan, Stupar, and Režun 2011, 4); this is why the two geoparks already established are not yet part of the international geopark network. Establishing geoparks is definitely a step in the right direction, but nonetheless they lack not only balance between the living and non-living components of nature, but also a uniform representation of material within non-living nature because the geomorphological ones are often left in the background.

The goal of evaluating geodiversity and geoheritage (Erhartič 2011) is for Slovenia to receive a more systematic – and especially more objective – method for verifying whether specific geoheritage »deserves« to be legally protected.

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ARTICLES

LATEST RESEARCH ON KARST WATERS IN SLOVENIA AND THEIR SIGNIFICANCE

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ABSTRACT
Latest research on karst waters in Slovenia and their significance
In this paper an overview on recent research on karst waters in Slovenia is presented. In recent years a great emphasis was given to the investigation of water flow and transport in karst aquifers and questions regarding the protection of karst water. In paper, the results of a series of studies, such as tracer tests, GIS methods, hydrological time series analysis are discussed, as well as their contribution to the scientific knowledge. The results of the studies show that only continuous research of karst waters with the use of different investigation techniques is a guarantee for efficient protection of karst water, which is becoming strategically important natural resource.

KEY WORDS
karst, karst aquifer, tracer test, time series analysis, water sources, vulnerability, protection of karst water, Slovenia

IZVLEČEK
Novejše študije voda na krasu in njihov pomen
V prispevku je predstavljen pregled raziskav kraških voda v Sloveniji v zadnjih nekaj letih. V tem obdobju izstopajo preučevanje toka in transporta snovi v kraških vodonosnikih ter vprašanja povezana z varovanjem kraških voda. V članku so predstavljeni rezultati raziskav, ki zajemajo sledilne poizkuse, uporabo GIS-ov in analize hidroloških časovnih vrst. Rezultati predstavljenih raziskav kažejo, da je zgolj zvezno preučevanje kraških voda z uporabo različnih raziskovalnih tehnik zagotovilo za učinkovito varovanje kraške podtalnice, ki postaja strateško pomembna naravna dobrina.

KLJUČNE BESEDE
kras, kraški vodonosnik, sledilni poizkus, analiza časovnih vrst, vodni viri, ranljivost, varovanje kraške podtalnice, Slovenija

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1 Introduction

In Slovenia karst areas mostly consist of thick carbonate rock sequences of Mesozoic age forming large karst massifs and plateaus that are intersected by lower karst areas, poljes and valleys. Karst areas cover about 44% of the state (Gams 2003) and contain large amounts of quality groundwater. Half of the country's needs for the drinking water supply are abstracted from karst aquifers. These areas are, however, very permeable and enable immediate infiltration of water into the system. In the underground a three dimensional flow net of underground conduits and voids is developed (White 2002; Ford and Williams 2007). Due to some other specific characteristics (absence of protective layers, concentrated recharge, high flow velocities through underground channels, absence of organisms that usually take nutrients on the surface, etc.), karst aquifers are extremely vulnerable to pollution.

Considering both, the importance of karst aquifers and their susceptibility to pollution, many studies focused on topics such as assessments of vulnerability, investigations of water flow and transport, as well as the protection of water sources. Studies included different field and other investigation techniques, such as tracer tests, GIS methods, hydrological time series analysis, etc. In this paper recent research achievements in Slovenia, performed mainly by the associates of the Karst Research Institute of Scientific Research Centre of the Slovenian Academy of Sciences and Arts and associates of Faculty of Humanities Koper University of Primorska are presented.

2 Water flow and transport of soluble substances in the Unica river basin

For efficient protection of karst waters against pollution it is essential to understand and consider the characteristics of water flow and transport of soluble substances in the underground and processes of their exchange with surface waters. The tracer tests were proved as one of the most suitable methods for such studies. Tracing with natural tracers involves detailed monitoring of natural parameters of karst waters in longer periods. In tracing with artificial tracers different substances are injected into the water system and their appearance is observed at selected points within the system (e.g., water caves, springs). In recent years, tracer tests were applied in several research projects on Slovene karst. Beside Rižana springs catchment area, the recharge area of the Malenščica (regionally important drinking water source) and Unica springs at the rim of the Planina polje has been most intensively studied (Fig. 1).

The study area is located in SW Slovenia. The springs are recharged by three hydrologically connected parts. The central part is the karst massif of Javorniki and Snežnik. At the western side it borders the Pivka river valley and at the eastern and northern side a string of karst poljes (the biggest among them is the Cerknica polje). In the Javorniki-Snežnik part, the underground flow is dominant, and in other two parts surface streams are present also. Surface streams are mainly recharged by karst waters, and after a certain distance of surface flow they sink again. To complement the already existing knowledge about the relations between these contribution areas (Gams 1965; Habič 1987; Kogovšek 1998; 1999; 2001a; 2001b), a monitoring net was installed in 2007 (3 rain-gauges and 9 data loggers for recording discharge, temperature – T, and electrical conductivity – EC). Additionally, two multi-tracer tests with artificial tracers were carried out.

High oscillations of water temperature at the springs indicate a significant share of secondary recharge from the surface water bodies (Fig. 2). By comparison of the occurrence of the peaks (maximum) or saddles (minimum) of the T curves of the Kotliči and Malenščica springs, the flow velocity in the karst system between them was estimated to 145–215 m/h (Kogovšek and Petrič 2010b). Similar values were calculated as a result of five tracer tests performed previously in this area. The T and EC curves of the Unica spring show an important influence of the recharge from the Pivka sinking stream, which is not characteristic for the Malenščica spring. In all springs the extreme T values are detected during high

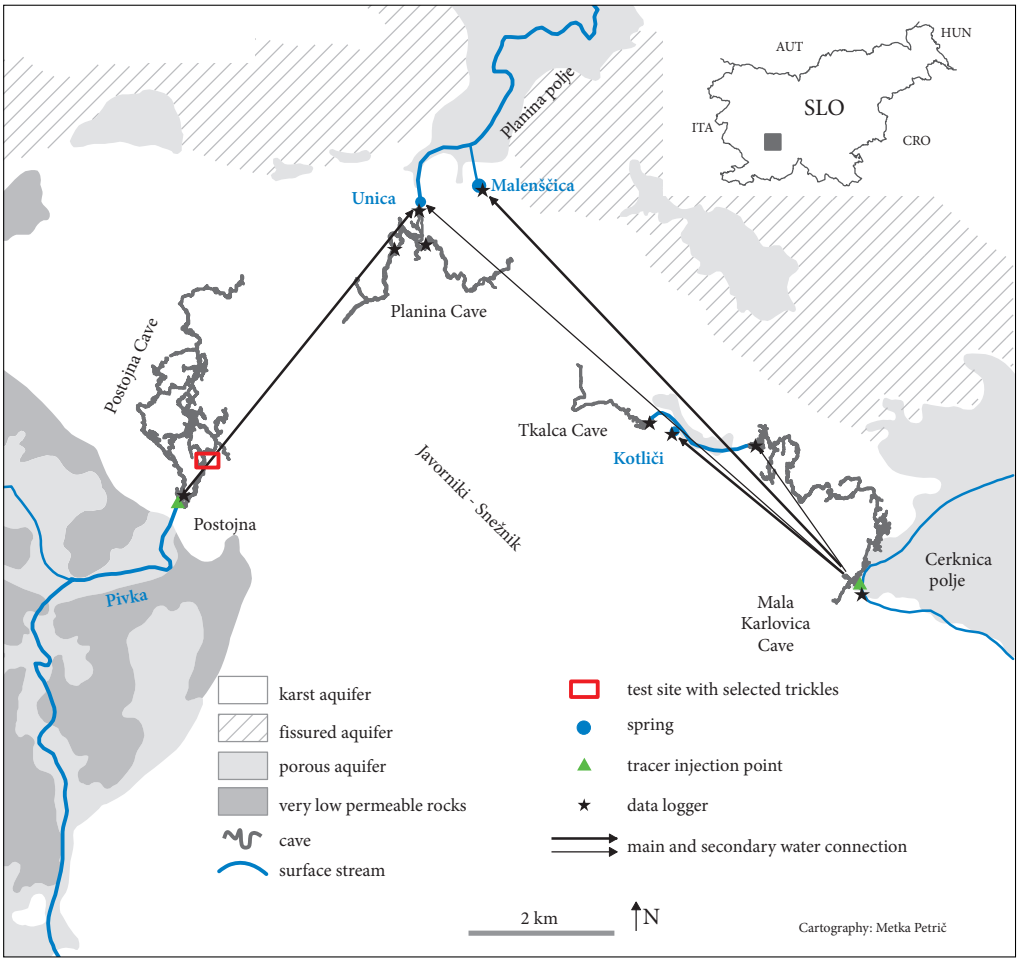


Figure 1: Hydrogeological map of the part of the Unica River catchment area.

waters as a reflection of a dominant recharge from the surface water bodies, while during low waters the recharge is slower and the retention time of water in the karst underground longer. At such conditions the share of primary recharge from the Javorniki-Snežnik karst aquifer is larger.

Artificial tracers were used in May and November 2008 to prove the main groundwater flow from the Mala Karlovica Cave at the Cerknica polje to the Kotliči spring and further on toward the Malenščica and Unica springs. The results are presented in Figs. 1 and 3 (Gabrovšek et al. 2010). During the second tracer test, the tracer was also injected into an oil collector which collects drainage water from the highway Ljubljana–Postojna to provide us with the characteristics of the contaminant flow from the karst surface.

Outflow from the collector infiltrates into the vadose zone (upper, unsaturated part of the aquifer). In the period without rainfall the flow towards the observed springs was slow and tracer was appearing in very low concentrations. Only the intensive rain pushed it more efficiently out of the system. At given hydrological conditions, the main direction of flow was toward the Unica spring and only low concentrations of tracer were recorded at the Malenščica spring.

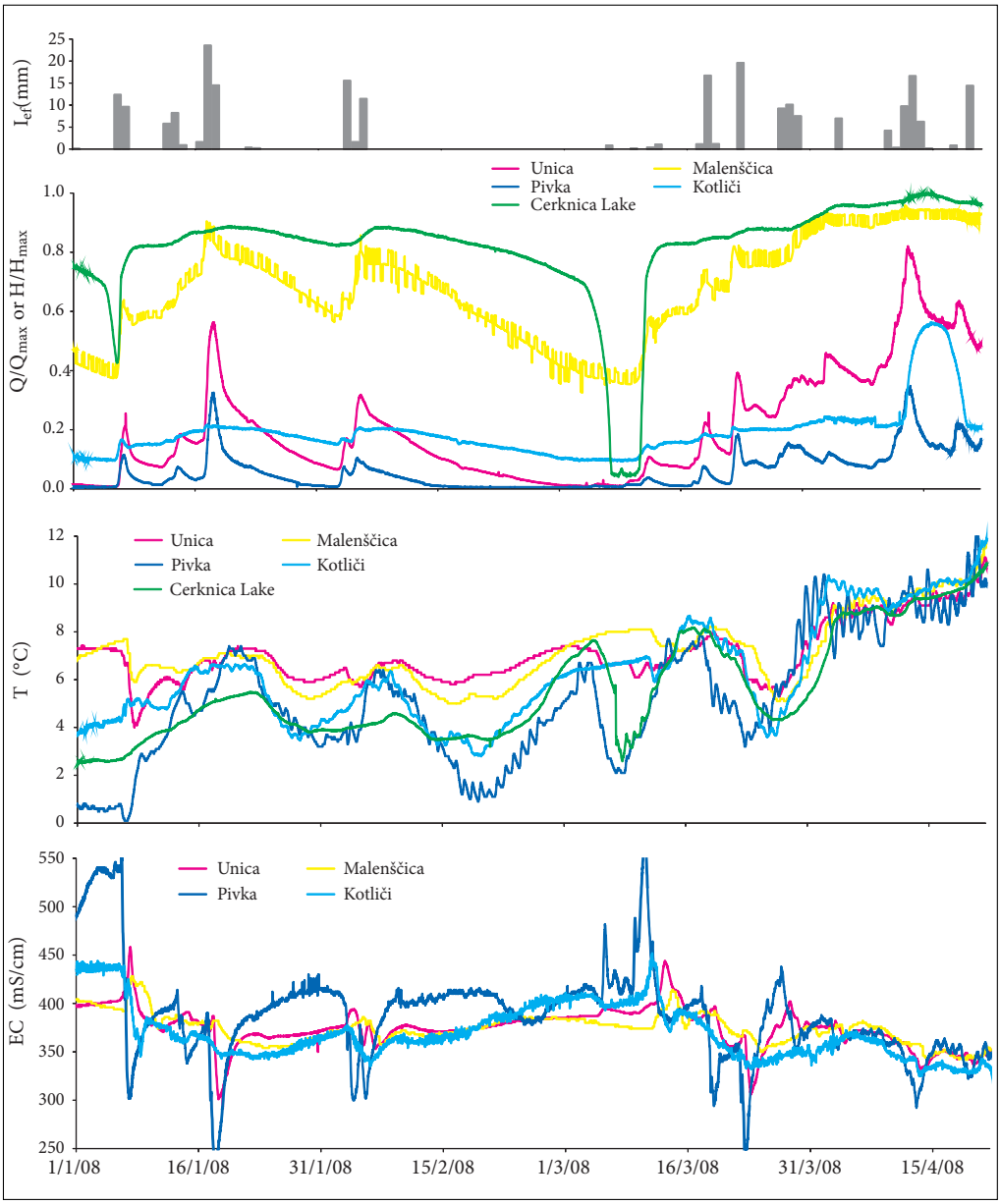


Figure 2: Effective infiltration and discharges or water levels (presented relatively to the maximum value for the two hydrological years), T and EC at selected monitoring points.

Percolation through the vadose zone is significantly slower than groundwater flow through karst conduits and it depends on various factors. These were studied by the monitoring of precipitation and discharge of selected trickles in the Postojna cave (Fig. 1) over successive hydrological years. It was established that the dynamics of percolation through the vadose zone is directly related to the quantity and

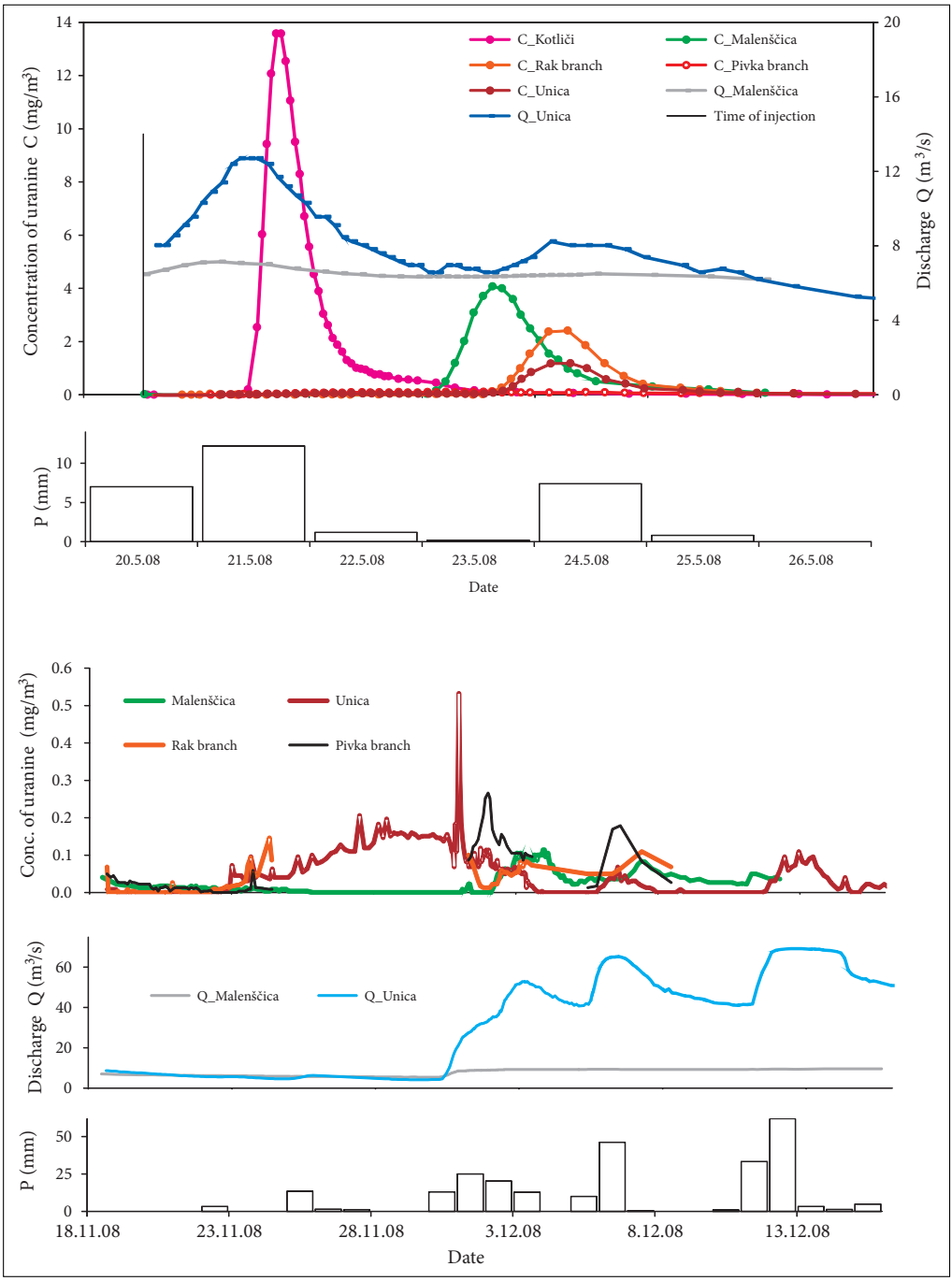


Figure 3: Uranine breakthrough curves, discharges and precipitation for tracer tests conducted (after Gabrovšek et al. 2010).

intensity of precipitation. The study also showed that continuous percolation occurs only with good saturation of soil and vadose zone (Kogovšek 2010).

The calculations of the annual volumes in three consecutive hydrological years show substantially different ratios between the annual quantity of water that infiltrates the vadose zone and the quantity of water that flows through it and supplies the deeper parts of the aquifer. This indicates that the process of recharging and discharging the vadose zone occurs in a longer period of several successive hydrological years. This was proven also by the results of isotopic analyses of oxygen that reflected residence-times from several months to one year and more (Kogovšek 2010). Therefore also the transfer of contaminants through the vadose zone is directly related to the dynamics of infiltrated precipitation. It is less intense in dry periods when discharges are minimal, and the most intense during the flood waves that follow longer dry periods. Artificial tracers additionally proved different retention times of infiltrated precipitation and contaminants in the variously permeable parts of the vadose zone (Kogovšek and Šebela 2004) and that even thin layer of soil and sediments on the surface are an important filter in the transfer of soluble substances (Kogovšek 2010).

3 Hydrological time series analysis as a tool for the study of karst aquifers: example of the Unica river basin

A monitoring net installed in the catchment of the Unica and Malenščica springs was also used for a detailed statistical analysis of the daily and hourly hydrological time series. Data were acquired and measured in hydrological years 1975 and 2008. Study comprised an univariate (r_x – correlation coefficient) and bivariate correlation (r_{xy} – cross-correlation coefficient) and spectral analysis of discharges, precipitation and the physical-chemical parameters of the Malenščica spring as well as other springs in its catchment (Kovačič 2010). The results confirmed the current knowledge and revealed some new information about the hydrogeological functioning of the Unica and Malenščica springs. The results bring also important methodological novelties.

The study has shown that the size of a catchment area can influence the memory effect of individual karst springs; typically, the memory effect of larger karst aquifers (e.g. Unica, Malenščica, Pivka, etc.) is greater and vice versa. In comparison with larger systems, the response of smaller karst springs to precipitation events is faster and more intense; however the duration of their pulse is shorter. The study has shown that in the karst aquifers with quick responses to precipitation events (fast and simultaneous recharge) via ponors the EC data sets can provide valuable information about hydrogeological behaviour of karst aquifers. On the other hand, the applicability of T time series is rather limited, because the T of water is not a conservative tracer and the interpretation of these time series is delicate in karst systems. Methodologically important is that the results of the cross-correlation analysis (r_{xy}) of hourly EC values between ponors and springs were in line with the results (underground tracer velocities) of the tracer test conducted in May 2008 (Gabrovšek et al. 2010; Kovačič 2010), which shows the usefulness of EC time series analyses as an alternative method to water tracing between ponors and related springs.

A comparative analysis of the time series analysis performed for the Malenščica and Unica springs in the successive hydrological years 1997–2002 reveals that the selection of the hydrological year can have strong effects on the results (e.g. different decorrelation lags, correlation and cross-correlation coefficients, etc). In this regard, in order to obtain a more general image of the functioning of a karst system in absolute terms, it is important to consider longer hydrological data sets.

Furthermore, not all karst aquifers characterized by a higher memory effect should be considered as poorly karstified. In this regard, caution needs to be used when classifying karst aquifers into groups only on the basis of the results of a time series analysis. It is essential that the results of time series analysis must be interpreted together with the results of other methods used in karst hydrology (Kovačič 2010).

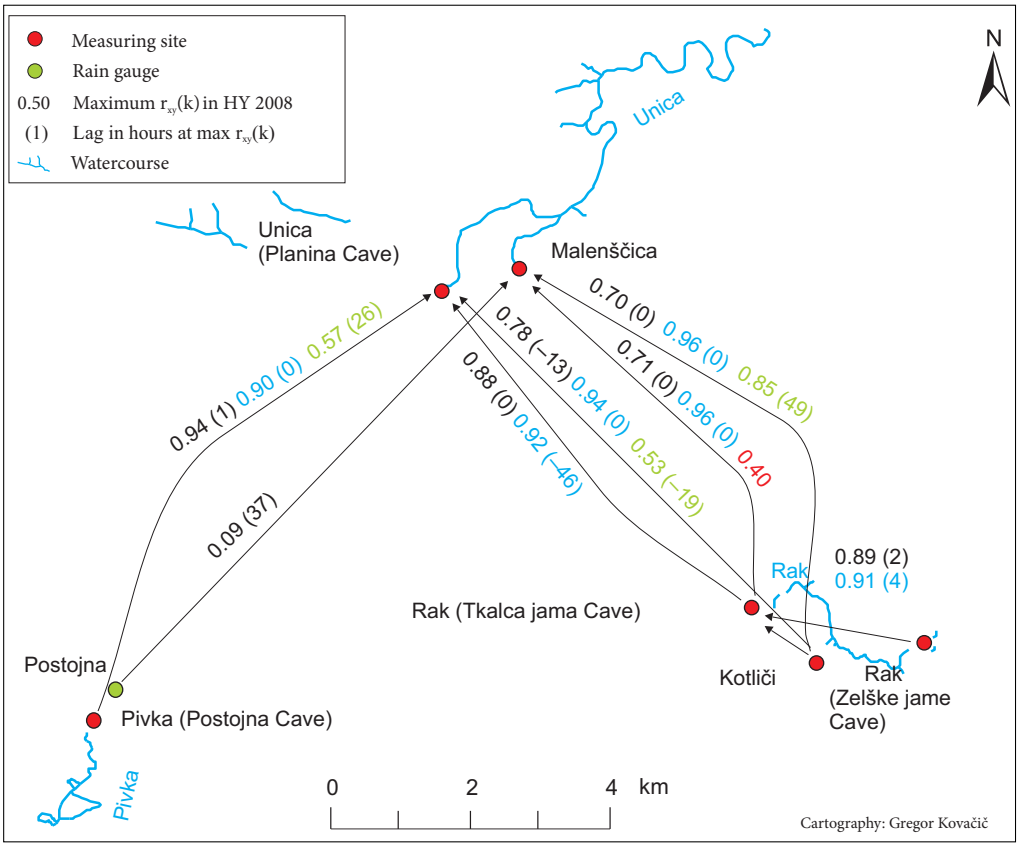


Figure 4: Cross-correlation coefficients for the hourly discharge (black), T (blue) and EC (green) time series in the hydrological year 2008 (after Kovačič 2010).

4 Drinking water sources and their protection

Generally, karst water sources quality and quantity are satisfactory, but they may be organically polluted or threatened by human activities. Due to inappropriately built roads and dumping sites the protection against chemical contamination is usually not assured.

Dumping is a serious threat to karst groundwater, due to the washing out of waste substances by precipitation and fast percolation of wastewater into the underground. This is explicitly uttered in case of landfills located on karst areas with very high intrinsic vulnerability (Zwahlen 2004; Ravbar and Kovačič 2006). A well-planned, long-term monitoring of negative influences on groundwater quality in their impact areas is therefore necessary to efficiently define and implement the protection measures. Additional to basic hydrogeological mapping, the tracer tests are a very useful method for selecting representative monitoring points and preparing a monitoring plan. In recent years, such approach was used for several landfills on Slovene karst (Petrič and Šebela 2005; Kogovšek and Petrič 2006; 2007; 2010a).

The tracer tests were carried out at the Mala Gora, Sežana and Mozelj landfills in the period 2004–2006. By tracer tests the main groundwater flow connections were defined and for each of them the maximal (regarding the first appearance of tracer) and dominant apparent flow velocities (regarding the first peak of the breakthrough curve) were calculated. Additionally, the recovery of injected tracers was assessed.

The springs with the main underground water connections should be selected as the monitoring points. High apparent velocities of flow toward the main springs and large shares of recovered tracers indicate very high vulnerability and a serious danger of pollution with harmful substances from the landfill. To increase the possibility of detecting the sources of pollution, it is sensible to adjust the time and frequency of sampling to hydrological conditions.

Twenty years long monitoring of pollutant transport through the vadose zone confirmed that the leaching even of minor contamination from the surface may take several decades before the original conditions are restored (Kogovšek 1997; 2010). This knowledge is the basis for the protection of springs, which can be influenced by different activities on karst surface (e.g., landfills, military training areas, petrochemical depot, roads and highways, railways, agriculture, petrol stations, illegal waste disposal dumps, etc.) Similarly, the water quality at karst springs can change a lot during different hydrological conditions. Abundant precipitation that follows dry periods flushes accumulated pollution through the recharge areas of karst springs, leading to the most intense transfer of contaminants (Kogovšek 2001b).

Numerous socio-economic processes increase the drinking water demand and thus enhance its utilization. The attitude towards water is extremely careless and wasteful, as it has been confirmed by the detailed research on individual's behavior towards drinking water (Veljanovski and Ravbar 2005). The study showed that an average inhabitant in SW Slovenia uses 130–150 L/day, the average monthly consumption of water in households was 12 m^3. The biggest quantities of water (i.e., 1.4 m^3/month) were used for splashing. For hygienic purposes, a household used 2.6 m^3/month and for washing the dishes and laundry 2.2 m^3/month. Unfortunately, drinking water is in addition used for cleaning cars and streets, and for irrigation.

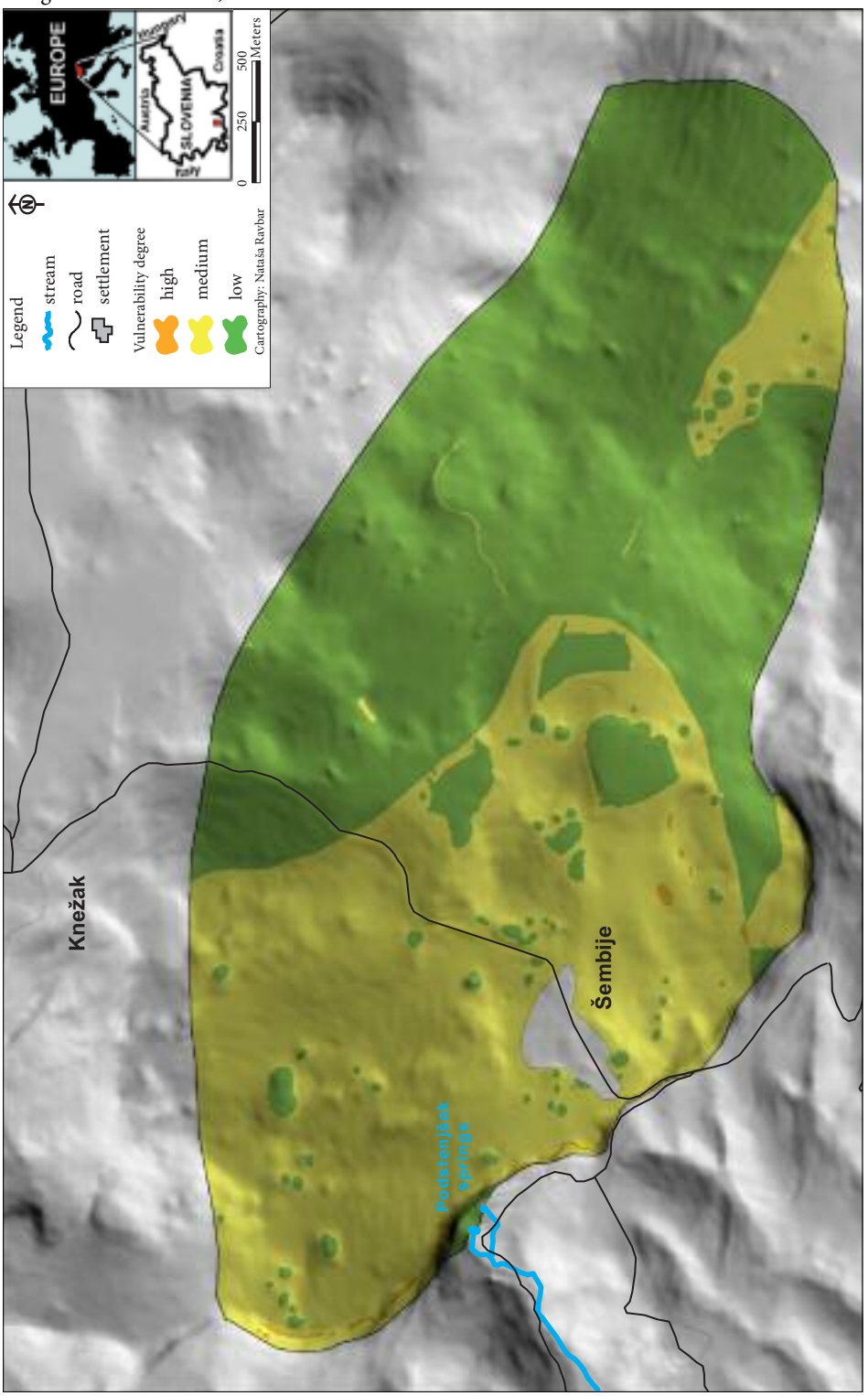
The study also showed (Veljanovski and Ravbar 2005) show that 60% of the asked thinks that the water consumption in their household is not big. Furthermore, the prices of water do not crucially impact the individual's attitude towards water. Even if the price of the water would rise for a quarter, 66% of the asked would not change their consumption attitude. However, two thirds of the asked is willing to pay more, if the protection of water sources would be higher.

Despite very high importance of karst water sources, their protection is frequently insufficient (Ravbar and Kovačič 2006). Due to very high susceptibility of karst aquifers to contamination, their water sources require appropriate managing. Unfortunately, in the acts of Slovene legislation, the special characteristics of water flow within karst regions are not very seriously taken into consideration in determining the criteria for karst water sources protection. In contrast, in some other countries (e.g., Ireland, Switzerland), the concept of groundwater vulnerability mapping has been successfully used for protection zoning and assessment of contamination risk is increasingly important in land use planning. European guidelines for making such assessments (Daly et al. 2002) were elaborated.

The recently proposed Slovene approach (Ravbar and Goldscheider 2007) follows these guidelines most comprehensively. The method includes the assessment of vulnerability and degree of hazard. These two assessments form the basis for calculating the contamination risk to groundwater or water sources. The final result of the vulnerability assessment can be transformed into the water protection zones.

The Slovene approach ranks among extremely sophisticated methods because its application does require a large amount of data, time, financial, and technical sources. It is the only one to offer the possibility of assessing the importance of groundwater or water sources on a basis of which it is possible to predict potential damage and elaborate a priority list of rehabilitation measures. Validity tests on the acquired results showed that compared with simpler methods the use of such a method is quite reasonable because it provides more reliable and less subjective results (Ravbar and Goldscheider 2009).

Figure 5: An example of vulnerability map for a local drinking water source in SW Slovenia. The map represents characteristics of groundwater flow in the saturated zone of the karst aquifer (after Ravbar and Goldscheider 2009). ►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Cartography: Nataša Ravbar
Knežak
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Podstenjšek springs

5 Conclusion

Karst springs are becoming economically more and more important due to its abundance (high flow rate springs up to some tens of m^3/s) and relatively high water quality not only in Slovenia, but also worldwide. However, karst aquifers pose many specific engineering and environmental problems, related to the presence of underground conduits and voids and the specifics of groundwater flow. The position of most of the underground water flow paths is often unknown, which makes the characterization of karst aquifers extremely difficult.

Studying the special character of karst therefore requires particular investigation approaches and techniques (e.g., speleological investigations, tracer tests, etc.; Drew and Goldscheider 2007). In this paper the newest achievements in this respect have been presented that are valuable contributions to further understanding of karst aquifers and their behaviour. The newest findings on the characteristics of water flow and transport of soluble substances, storage capacities etc. are important and should be utilized in further research and considered when monitoring karst water quality, implementing groundwater protection measures and optimizing future water exploitation.

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ARTICLES

KARSTOLOGY IN MOTORWAY CONSTRUCTION ON CLASSICAL KARST

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ABSTRACT
Karstology in motorway construction on Classical Karst
One of the major ongoing projects in Slovenia was to link the country with modern motorways. Almost half of Slovenia is karst and more than half of its supply of water comes from karst aquifers. Slovenia is the home of the Classical Karst region – Kras. Karstologists have been involved in planning and construction of motorways. We have acquired a great deal of information about surface karst phenomena and the epikarst, and where excavation work has cut deeper in the surface and in tunnels, about the vadose zone and the paleokarst. Development of the karst usually left important traces, above all in the numerous old caves. More than 350 new caves have been opened. During the planning we tried to avoid important karst phenomena as are collapse dolines, large dolines, caves and karst walls and by impermeable construction of a roadway we tried to prevent the pollution flowing from it into underground waters. During the construction works we researched newly discovered karst features and tried to preserve as many as possible.

KEY WORDS
motorway construction, karstological monitoring, karst, karst cave, Classical Karst (Kras), Slovenia

IZVLEČEK
Krasoslovje in gradnja avtocest na matičnem Krasu
Eden večjih projektov, ki potekajo v Sloveniji, je povezati državo s sodobnimi avtocestami. Skoraj polovica Slovenije je kraške in več kot polovica voda, s katerimi se oskrbujemo, je iz kraških vodonosnikov. Krasoslovci smo vključeni v načrtovanje in izgradnjo avtocest. Kjer so zemeljska dela posegla globlje v površje, smo pridobili vrsto spoznanj o površinskih kraških pojavih, epikrasu, v predorih pa o vadozni coni ter paleokrasu. Razvoj krasa pogosto pusti pomembne sledove nad in v številnih jamah. Med gradnjo avtoceste prek Krasa se je odprlo 350 novih jam. Med načrtovanjem se skuša izogniti pomembnim kraškim pojavom, kot so udornice, večje vrtače, jame in kraške stene. Z nepropustnimi cestišči pa skušajo preprečiti onesnaženje podzemne vode. Med gradnjo raziskujemo novo odkrite kraške pojave ter jih skušamo čim več ohraniti.

KLJUČNE BESEDE
gradnja avtocest, krasoslovna spremljava, kras, kraška jama, Kras, Slovenija

The article was submitted for publication on June 30, 2011.

1 Introduction

Over the last fifteen years the construction of modern motorways in Slovenia has been one of the major construction projects aimed at connecting important parts of the country and opening them to Europe. Almost half of Slovenia is karst and more than half of the water for the supply of the population comes from karst aquifers. Slovenia is home to the classical karst region of Kras that gave its name for this unique carbonate rock landscape to numerous world languages and is also the cradle of karstology. We need to better understand this fragile karst landscape and do everything to preserve it since it is an important part of our natural and cultural heritage.

Special attention is devoted to Kras, a karst plateau rising above the northeastern-most part of the Adriatic Sea that is bordered on the southwest by a vast flysch area with elevations exceeding 600 meters. Lying between 200 and 500 meters above sea level, the plateau covers 440 square kilometers and in a broad sense belongs to the External Dinarides. Only Cretaceous and Paleogenic carbonate rocks are found here. They are characterized by exceptionally varied limestone that mostly formed in relatively shallow sedimentation basins with lush fauna and flora. Originally, the plateau was surrounded and covered with flysch and therefore flooded. The role of vertical percolation was minimal. On the Kras plateau there are no sediment remains of the surface waters to explain the development of the plateau. The water table later dropped several hundred meters into the karst (Placer et al. 2010). At the contact between the carbonate rock and flysch, surface waters created characteristic contact karst. Today, all Kras rivers sink where they flow from flysch onto limestone bedrock and flow underground toward the springs of the Timava River in Italy. The largest stream is the Reka River, which sinks in the Škocjan Caves, while 65% percent is precipitation water. From the ecological standpoint, Kras has one of the most vulnerable natural systems in Slovenia.

For a number of years, karstologists have cooperated in construction of motorways in the Kras region (Kogovšek 1993, 1995b; Knez et al. 1994; Šebela and Mihevc 1995; Slabe 1996; 1997a; 1997b; 1998; Mihevc nad Zupan Hajna 1996; Mihevc 1996; 1999; Kogovšek et al. 1997; Mihevc et al. 1998; Šebela et al. 1999; Knez et al. 2003, 2004a; 2004b; Bosák et al. 2000; Knez and Slabe 1999; 2000; 2001; 2002; 2004a; 2004b; 2005; 2006; 2007). In the selection of motorway and railway routes, the main consideration is the integrity of the karst landscape; and therefore the chosen routes avoid the more important surface karst features (dolines, poljes, collapse dolines, karst walls) and already known caves. The removal of soil and vegetation from the karst surface and of course major earthworks such as the excavation of cuts and tunnels reveal karst features. Our task is to study these features as part of the natural heritage, advise on how to preserve them, and of course share our new findings with the builders. These findings are used to overcome construction obstacles.

Special attention is devoted to the impact of the construction and use of motorways on karst waters. Motorways should therefore be impermeable so that runoff water from the road is first gathered in oil collectors and then released clean onto the karst surface.

During the construction of motorways we also perform karstological monitoring. We study newly revealed karst phenomena as an important part of our natural heritage and advise on how to preserve them if the construction work allows it. At the same time our new findings are of great help to the construction companies. We have acquired a number of new findings on the formation and development of the karst surface, epikarst, and the perforation of the aquifer.

2 Exploring the karst surface and new caves during motorway construction

The karst surface is dissected by dolines, cave entrances and unroofed caves (Figure 1). Dolines are a sign of the current shaping of the surface by precipitation water that percolates vertically through it and passes through the vadose part of the aquifer to the underground water. Unroofed caves have a sim-

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Figure 1: Unroofed cave near Povir.

ilar form or are more oblong. These are old caves that appear on the surface due to the lowering of the karst surface and no longer have the upper part of their circumference.

The epikarst is crisscrossed with fissures that are more distinctive in Cretaceous limestone and less so in Paleogene limestone, and many of them open at the bottoms and slopes of dolines. In most cases they are filled with soil and their walls are dissected with subsoil rock relief forms.

More than 350 caves were opened on the 70-kilometer section of motorway built in Kras (Figure 2). Relative to the development of the aquifer, we distinguish between old caves through which watercourses flowed when the karst aquifer was surrounded and covered by flysch and shafts through which water vertically percolates from the permeable karst surface to the underground water. Some old caves are empty, almost two thirds of them are filled with sediments, and one third are unroofed caves. The deepest shaft found measured 109 meters (Figure 3). Due to the lowering of the karst surface, many shafts are now located just below the surface.

We studied all the caves, drew their plans, determined their shape, examined the rock relief, collected samples of sediments for paleomagnetic and pollen analyses, and sampled flowstone for mineralogical analyses and age determination.

Great attention has been devoted to unroofed caves since the occurrence of this phenomena turned out to be considerably higher than previously expected, and numerous articles on unroofed caves and the construction of new motorways are now available (Šebela 1995; Šebela and Mihevc 1995; Mihevc 1996; Mihevc and Zupan Hajna 1996; Slabe 1996; 1997a; 1997b; 1998; Kogovšek et al. 1997; Mihevc et al. 1998; Šebela et al. 1999; Knez and Slabe 2000; 2001; 2002; 2004a; 2004b; 2005; 2006; 2007). The shape of unroofed caves is the consequence of the type and shape of the cave and the development of the karst aquifer and its surface in various geological, geomorphological, climate, and hydrological conditions. The distinctiveness of the surface shape of an unroofed cave is dictated by the speed at which the sediment was washed out of the cave relative to the lowering of the surrounding surface (Knez and Slabe 2002). If the speed was low, we can often see just soil and vegetation or areas of sediments and

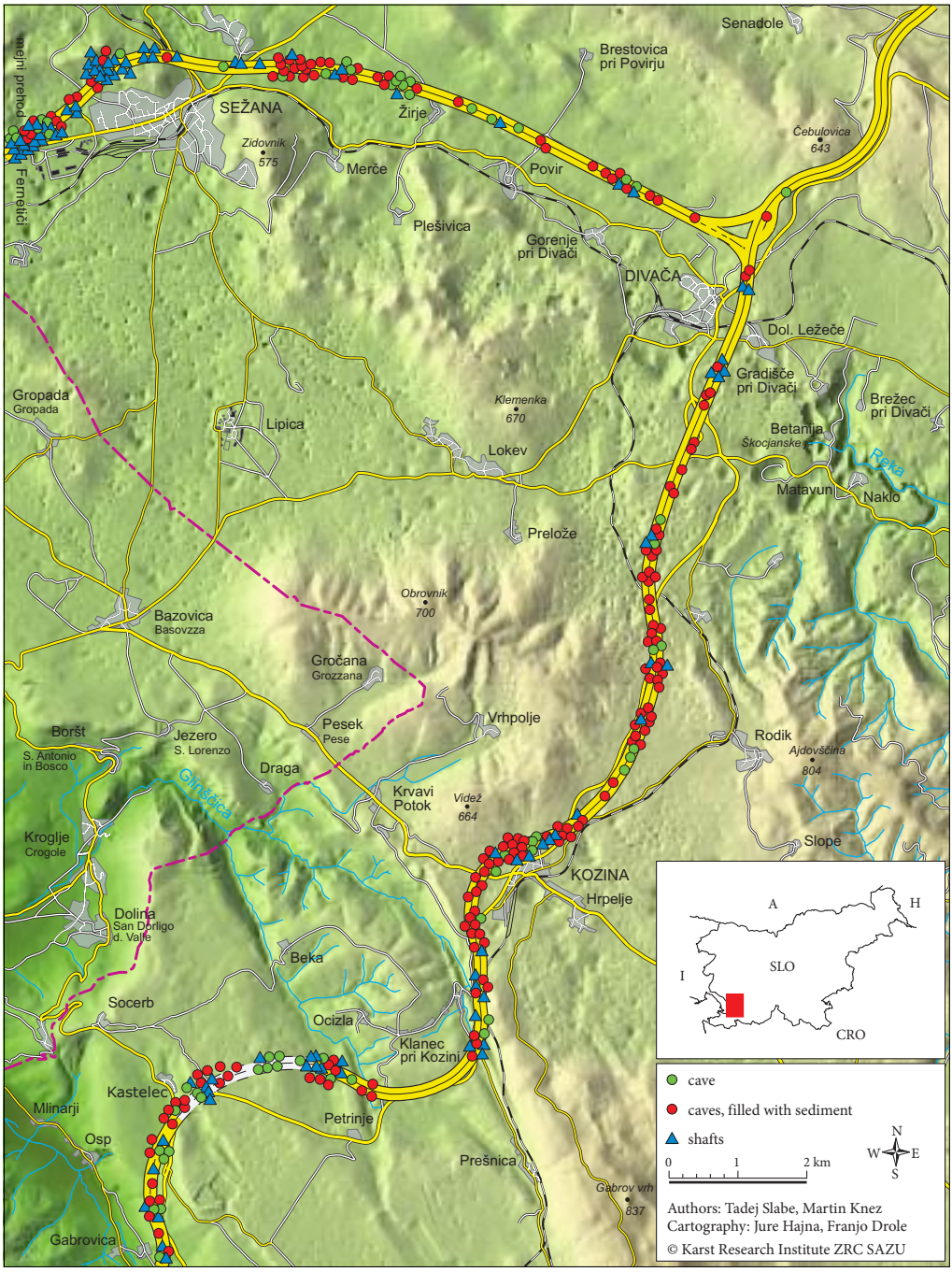

Figure 2: Caves discovered during motorway construction in southwest Slovenia.

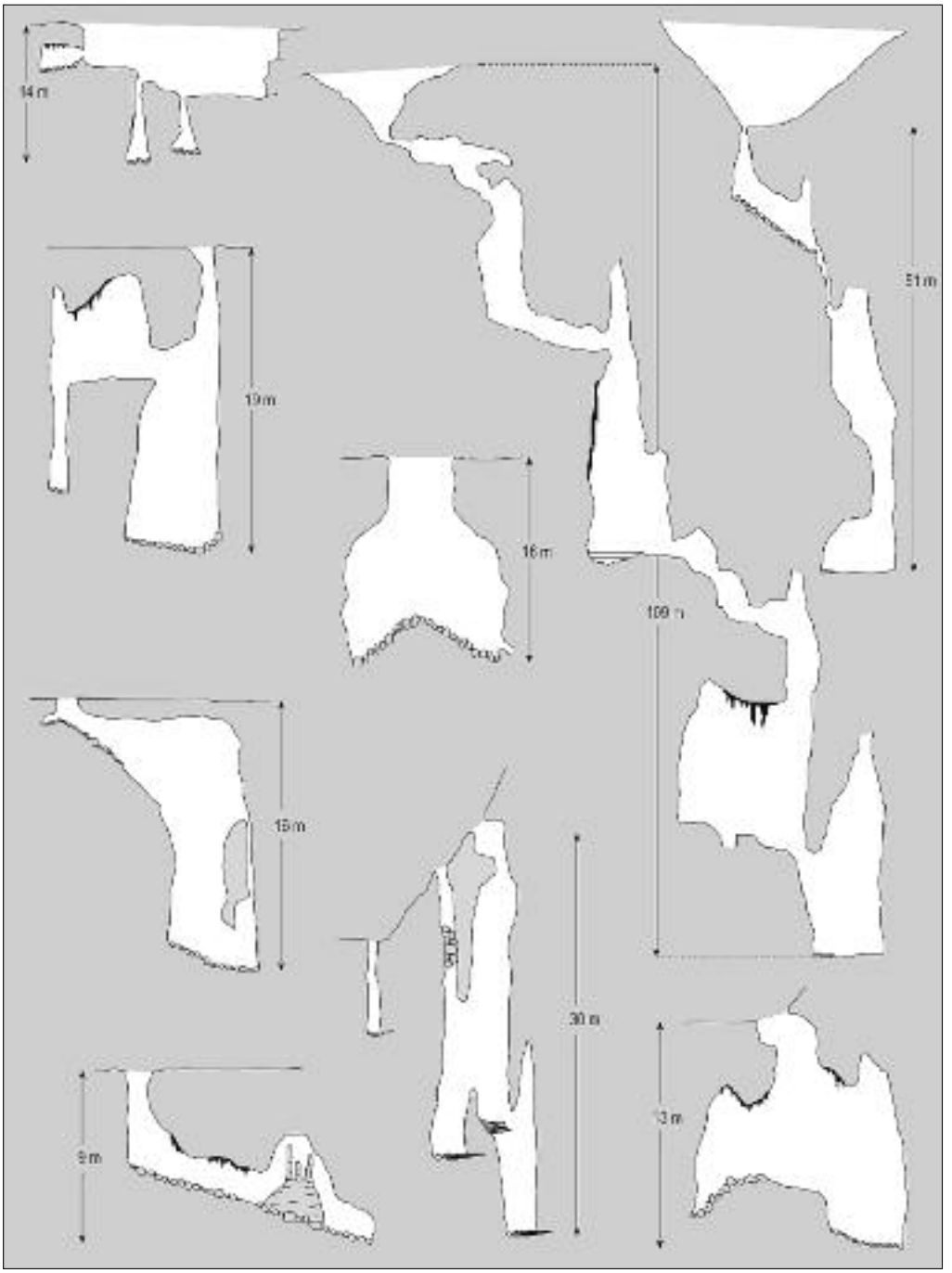

Figure 3: Cross-sections of different caves opened during the construction; their shape and size dictate further appropriate building works.

flowstone on the surface; where it was faster, unroofed caves on the karst surface resemble dolines, a string of dolines, or oblong depressions.

A large proportion of the caves were filled with sediments, in most cases fine-grained flysch sediments with intervening layers of gravel. Bosák et al. (2000) took sediment samples for paleomagnetic research from caves at Kozina and Divača and determined they originated in the Olduvai period. It was therefore concluded that the caves were filled after the Messinian crisis approximately 5.2 million years ago (Bosák et al. 2000).

Determining the age of the sediments (Bosák et al. 2000; Zupan Hajna et al. 2010) helps us understand the oldest periods of karstification and has proven that the oldest caves in Kras are much older than earlier karstologists thought.

3 Planning road construction

Perforation puts a special stamp on the construction of motorways in the Kras region. In addition to its varied development, Slovenia's karst is marked by tectonic and lithostratigraphic diversity and it is therefore difficult to determine in advance where caves will occur. As a rule, caves occur more frequently along the contacts of flysch with limestone. The perforation of the karst aquifer is therefore determined primarily on the basis of good and comprehensive knowledge of the karst and continuous intensive work in planning and constructing the motorways.

When planning motorways, the link between surface and underground karst features requires the karstological evaluation of the karst surface as well as the karst underground, the hydrological situation, and the presented variables. On all the motorway construction sites in Kras we encountered numerous karst phenomena including dolines, filled and empty caves, sections of old and current drainage systems through the karst. We are certain that a quality karstological study of the area where a road is planned enables the better selection of a route and is one of the basic starting points for planning motorway construction in this unique and vulnerable landscape.

We begin by assembling published literature, archives, and various unpublished studies to learn about the surface karst features, and thus identify dolines, collapse dolines, and other morphological features in particular. Through a field survey we establish the starting points for mapping the areas of the selected route. In the field, we evaluate different types of rock from the karstological aspect. On theme maps we present the known entrances to underground caves and supplement them with potential new entrances. We anticipate the branching of underground cave systems on the basis of surface mapping and explanations of the development of morphologically identified unroofed caves visible in the relief. On the basis of surface mapping we also consider possibilities for dumping waste material if necessary.

We know from experience that during construction every route crossing Kras will sooner or later encounter underground caves or parts of cave systems. To a certain degree we can predict the shape and type of caves using our knowledge of surface and underground phenomena. We trace the caves in the wider area of the traffic route, determine their type, position, and role in the aquifer, their shape, rock relief, the sediment and flowstone found in them, and present them on suitable maps. To make the maps easier to read, we present the previous data on the perforation of the aquifer and elaborate predictions with special emphasis on anticipated lithological and tectonic changes in the rock.

When necessary we perform tracing experiments during low and high waters (Kogovšek and Petrič 2007), primarily to determine the direction and velocity of underground flows in the wider area of the traffic route. With the results of field mapping and tracking experiments, we elaborate and upgrade the existing hydrogeological maps, build a database on the state of the environment, and assess the impact of the construction on karst waters.

Experience acquired tracing waters and accidental spillages of various substances on the karst surface drew attention to the great perforation of the karst aquifer, which the number of caves newly

discovered during construction confirmed. Maximum precautions must be employed during both the construction and use of roads. Daily traffic leaves numerous environmentally harmful substances on road surfaces (Kogovšek 1993), and mineral oils were found in stagnant waters in caves located near traffic routes (Knez et al. 1994; Kogovšek 1995a; 1995b; Gabrovšek and Peric 2007). Due to these findings and the persistence of karstologists, motorways are made to be impermeable. Pipes and gutters along the roads lead to wastewater collectors. Untreated water should never reach the permeable karst surface and the specifications for drainage systems must meet this requirement.

The basic guidelines for planning traffic routes include:

- the selection of a route shall be based on a comprehensive assessment of the karst with emphasis on local features;
- the selected traffic route shall avoid specific exceptional karst features;
- the conservation of karst aquifers shall be one of the priority goals of planning.

4 Preserving as many karst caves as possible

Caves are opened when vegetation and soil is removed from the surface, and a large number of caves were opened during the excavation of cuts. Blasting caused their roofs to collapse, and cross sections of passages were preserved in embankments. The most shafts were opened at the bottoms of dolines when the soil and alluvia were removed.

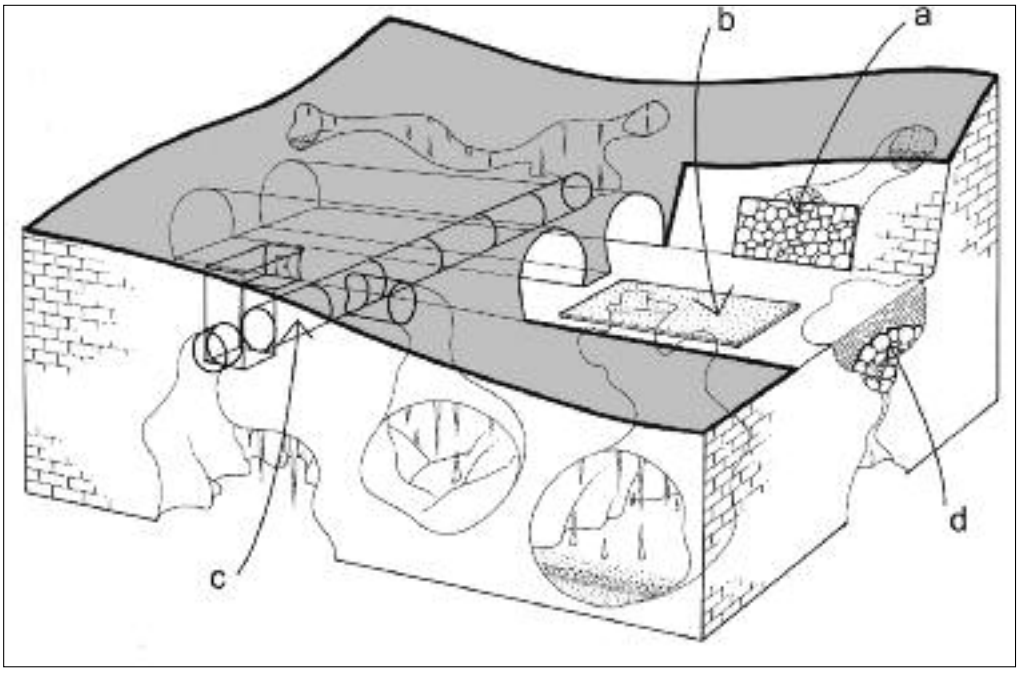

Figure 4: Preservation of caves: a) in road cuts the caves are hidden behind rocky scarps, b) the caves lying below the road with narrow mouth and if their rim is not too much damaged by blasting are covered by concrete lids, c) in the side of the tunnel pipe there is a special door leading to the caves; below traffic belt caves are connected with large concrete pipes, d) karst openings (bottom of dolines, tops of shafts) are often reinforced by arches of big rocks poured over by concrete.

FERUCCIO HRVATIN

Figure 5: Preserved cave in Kastelec tunnel.

The shafts were easiest to preserve and concrete plates were used to close the smaller entrances (Figure 4). It was similarly possible to preserve old caves with solid circumferences but caves located in fractured rock or opened during blasting had to be filled. Rock walls were used to close caves crossed by road cuts with entrances on embankments. Their circumferences were fractured to such an extent that they were unsuitable for visiting, and water could wash clay from caves filled with sediments and deposit it on the roads (Figure 4). We extrapolated the further extent of the caves on the basis of their shapes and the geological conditions, which is especially useful for road builders. One well preserved cave was left open for travellers crossing the border with Italy to visit. The most interesting and best preserved caves were completely secured and made accessible for visiting even though they were located under the motorway or even wound around a tunnel as with the Kastelec tunnel (Figures 4, 5). They are accessible via concrete culverts closed at the roadside and in the tunnel with a door.

5 Conclusion

It is clear that the cooperation of karstologists in the construction of motorways in the Kras region has brought positive results. It is important that karstologists participate in the planning and construction of motorways and later that they monitor the impact of the motorways on the environment, that is, throughout the entire process of encroachment on the vulnerable karst landscape. This logical cooperation helps preserve natural heritage and increase our basic knowledge about the formation and development of karst and about the construction of motorways in this unique environment. There are many types of karst and each requires a unique approach, which calls for permanent and continuous cooperation between road builders and karstologists. Over the last fifteen years, the cooperation between

the planners and builders of motorways and karstologists has resulted in rich knowledge used in the planning and implementation of other encroachments in karst areas.

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ARTICLES

CLIMATE RESEARCH ON SLOVENIAN TERRITORY IN PRE-INSTRUMENTAL PERIOD: WEATHER AND CLIMATE IN THE 17TH CENTURY

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ABSTRACT
Climate research on Slovenian territory in pre-instrumental period: weather and climate in the 17th Century
Climate and weather conditions in the Slovenian lands from the time before regular and continuous meteorological measurements began are but poorly known. Investigations in this field began as late as the beginning of the 17th century; particularly the second half of this century, when the polymath Janez Vajkard (Johann Weichard) Valvasor and the Ljubljana chronicler Janez Gregor Dolničar (Thalnitscher) were active, is one of the periods which is sufficiently documented in historical sources as concerns the weather and the climate of the time. In spite of certain limitations in using these sources, by means of additional information it is possible to present satisfactorily the weather and the climate of that time and their effects in social environment.

KEY WORDS
climate in Holocene, climate in pre-instrumental period, Little Ice Age, Maunder minimum, weather disasters, Janez Vajkard (Johann Weichard) Valvasor, Janez Gregor Dolničar (Thalnitscher), Slovenia

IZVLEČEK
Raziskovanje podnebja v predinstrumentalnem obdobju na Slovenskem: vreme in podnebje v 17. stoletju
Podnebne in vremenske razmere na Slovenskem so pred začetkom rednih in kontinuiranih meteoroloških meritev slabo poznane. Raziskave na tem področju so šele v začetku. Sedemnajsto stoletje, še posebej njegova druga polovica, ko sta delovala Janez Vajkard Valvasor in ljubljanski kronist Janez Gregor Dolničar, je eno od obdobij, za katero imamo zadovoljivo pokritost z zgodovinskimi viri o tedanjem vremenu in podnebju. Kljub določenim omejitvam pri uporabi teh virov, lahko z uporabo dodatnih informacij zadovoljivo predstavimo tedanje vreme in podnebje ter njegove posledice v družbenem okolju.

KLJUČNE BESEDE
podnebje v holocenu, podnebje v pred instrumentalnem obdobju, mala ledena doba, Maunderjev minimum, vremenske ujme, Janez Vajkard Valvasor, Janez Gregor Dolničar, Slovenija

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1 Introduction

Climate changes on the Slovenian territory until the mid-19th century, when meteorological stations in Ljubljana and in the nearby cross-border areas – in Trieste and Zagreb – began to operate continuously, is poorly known, except for the general trends which apply whether to the Mediterranean and Central Europe or the whole of Europe (Ogrin 2005). Studies dealing with climate in Slovenia in pre-instrumental period are very few. Little is known about the weather and climate conditions and responses to them in natural and social environment in individual climate periods, e.g. in the medieval warm period or in the Little Ice Age. One of older studies in this field places the origin of the Triglav glacier in the time of one of the climaxes of the Little Ice Age (Šifrer 1963), and another is the presumption that towards the end of the medieval warm period, i.e. in the time of the secondary, high-altitude colonization of Slovenian territory, the highest-lying farms emerged in the mountainous world, of which many were later abandoned (Gams 1998, 117). The best explained are the circumstances in the southwest part of Slovenia which is under the influence of Mediterranean climate. A chronicle of exceptional weather and climate events for this part was made for the period from the 7th century until 1850 (Ogrin 1994; 1995), and analysed on its basis was the frequency of dry and wet years from the 14th through 19th centuries (Ogrin 2002), harsh winters, particularly those when damage was done to olives by frosts (Ogrin 2007b), and severe storms and their effects (Ogrin 2007a). In recent time some dendrochronological and dendroclimatological studies have also been made which can be helpful in the reconstruction of summer temperatures in particular and precipitations in Slovenian mountainous world (Levanič 2005; 2006; 2007; Levanič and Čufar 1998) and in southeast Slovenia (Čufar et al. 2008). Two diploma theses should also be mentioned, done by the students of departments of geography and history at the Faculty of Arts of the University of Ljubljana. One deals with the weather and climate in Carniola (Si. *Kranjska*; Ger. *Krain*) from the 14th to the 18th centuries with a special emphasis on the records in Janez Vajkard Valvasor's *The Glory of the Duchy of Carniola* (Levec 2009), and the other discusses the influence of the Little Ice Age on agrarian settling in the select cases in the valley of Upper Savinjska dolina (Zwitter 2010).

To study the climate of the past has several meanings. Outstanding among these is the enhancement of climate recollection, especially of those weather and climate events which reached the level of natural disasters. Namely, we are inclined to forget the events that are unpleasant for us. When they recur after a certain period of time we are naturally taken by surprise and tend to declare on such occasions that this is something extraordinary which has never happened in the past (»not even our oldest people can remember something like this«). But even a brief survey of climate and weather events of the past quickly reveals that this is not true and proves that our knowledge of weather and climate history is insufficient. This knowledge is also important in view of evaluating the currently changing climate and extraordinary weather events related to it. To make a proper assessment also of the human role in it, and in the making of climate projections for the following decades of the 21st century, it is necessary to know the past climate conditions as well, when human impact on the environment was essentially lower. Unfortunately, when doing so, we often have to face deficient data on weather and climate in the past, particularly for the period prior to regular and systematic measurements.

2 Methodology

The objective of this paper is to cast light by means of historical sources on weather and climate events on the Slovenian territory in the 17th century. In view of climate history this century belongs to the second half of the Little Ice Age, i.e. the rather cold period the beginning of which is mainly set in the mid-15th century and its end in the mid-19th century. The Little Ice Age was a regional climate change which spread over the northern hemisphere, mainly Europe and east parts of North America. As two

possible causes are stated: lower activity of the Sun and the increased frequency and intensity of volcanic eruptions. It was an unevenly cold period, with considerable climate variability and with uneven developments in different parts of Europe. It was less explicit south of the Alps, since the central ridge of the Alps hinders the intrusions of cold air masses from the north. In comparison with the mid-20th century, the average annual temperature in Europe were lower by 1 to 1.5 °C, winters were very cold and dry (January temperatures were lower by 2 to 4 °C), and precipitation amount was lower by up to 10%. There were three cooling climaxes: the first in the second half of the 16th century, the second (Maunder minimum) between 1645 and 1715, and the third from the mid-1730s to the mid-1780s. Because of long and harsh winters troubles in agriculture were frequent, alpine glaciers reached the lowest level after the last glaciation, rivers were frozen and also the sea in the English Channel (Le Manche) and along the coast of the Netherlands and water in Venetian lagunas (Flohn, Fantechi 1984; Shindell 2009, 520–522, 550–551).

The choice of the 17th century for the study of climate conditions was not made by chance. Paleoclimatic reconstructions of the last 500 years of pre-instrumental period, which ends in Europe mainly in the 18th or the 19th century, are based on the analysis of historical sources which directly or indirectly speak about the past weather and climate. These records are typical for their low resolution data as a rule and distributed thinly so that they do not provide for complete climate reconstructions. Belonging to direct sources are e.g. diverse descriptions of climate and weather in chorographies and records of exceptional weather events in various chronicles by means of which we can most often establish the frequency of individual events in a certain spell of time (e.g. frosts, draughts, severe storms, and the like). By mak-

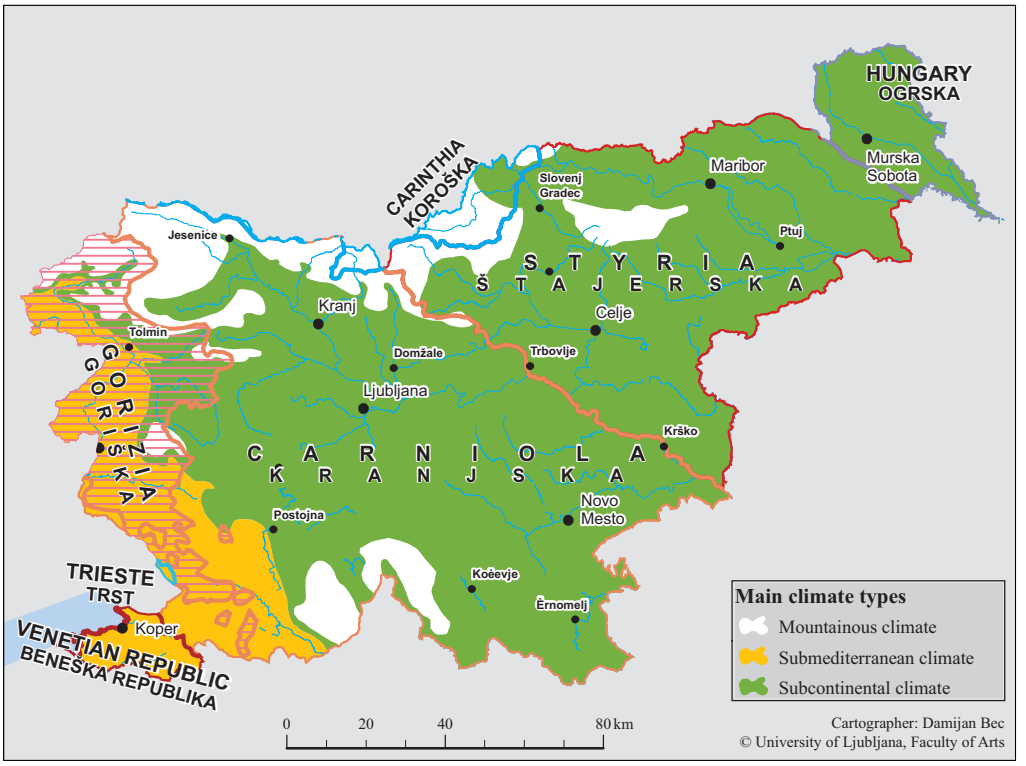

Figure 1: Borders of present-day Slovenia and of Carniola in the 17th century and climate division of Slovenia.

ing use of indirect sources we can make conclusions about the past weather and climate by means of their effects (phenological data, data on crops, fluctuation of prices of food products). We can also make use of the data on the fluctuation of glaciers, both from historical sources and from the reconstruction of the onetime state which can be obtained by means of analysing moraine material and investigating lichens. One of the more relevant methods is the dendroclimatological method, in which climate conditions are deduced from tree-ring series.

The trouble with historical sources to be used for the reconstruction of climate is that, in general, the farther to the past we go the fewer they are, they are less reliable and their verification is more difficult. The 17th century is one of the periods for which sufficient historical sources exist for the territory of present-day Slovenia, which renders possible a basic insight at least into the weather and climate events of that time. Towards the end of the 17th century *The Glory of the Duchy of Carniola* was published, a work by Janez Vajkard Valvasor (1641–1693), a Carniolan polymath (Valvasor 1689; partial translation to Slovenian: Valvasor 1984, Slovenian translation of entire Tomes 1 and 2: Valvasor 2009; 2010). Following the tradition of similar works of the time, the author gives a comprehensive description of Carniola, a historical province that stretched over the major, mainly central, part of Slovenia of today (Figure 1). At the beginning of Book three he describes general climate characteristics of Carniola, while in the continuation he pays greater attention to exceptional weather events, mainly those which had negative impact on agricultural products. Valvasor's description of exceptional weather events was used for establishing chronology of these events in the 17th century and at the beginning of the 18th century, i.e. to the end of the Maunder minimum. One of the basic sources for the chronology were also the weather data provided by the Ljubljana chronicler Janez Gregor Dolničar (1655–1719) for the 1660–1718 period (Pučnik 1980, 56–59). To complement the chronicle we made use of applicable data from the chronicle of exceptional weather and climate events for the sub-Mediterranean part of Slovenia (Ogrin 1994; 1995), from the church chronicle of the parish Rečica ob Savinji (Novak 1999, 111–112), from the chronicle of crops and natural disasters of Središče ob Dravi in (Slovenian) Styria (Si. *Štajerska*; Ger. *Steiermark*) (Kovačič 1910, reprint 1986), and from the history of poor crops, famines and high costs of living on the Dravsko polje plain (Slekovec 1885, 120–123). We are well aware that the chronicle is not perfect and that primary sources still exist which could further complement it. Nevertheless it offers an insight into the characteristics of occurrence of exceptional weather events of that time and their consequences.

3 Definitions of weather conditions and climate in 17th-century Carniola according to Valvasor

3.1 General designations of climate and characteristics of the four seasons

The present climate divisions of Slovenia (Ogrin 1996; Ogrin and Plut 2009, 88–91) point out to the contact between and interlacing of three types of climate on its territory: the mountainous, the Mediterranean and the continental (Figure 1). All three are characteristic for their atypicalness if compared to genuine mountainous, Mediterranean or continental climates, but the principal features of these three are combined in them, so they are often pre-fixed by »sub« (sub-Mediterranean, subcontinental). However, underlined are great spatial and temporal unsteadiness and variability of the climate elements' characteristics. In Valvasor's time, Carniola encompassed part of the Alpine world, practically the entire central and south-eastern part of present-day Slovenia, where subcontinental climate features prevail, and in its southwest, part of lands by the Maditerranean. Hence it is not surprising that in his description of general climate conditions in Carniola Valvasor pointed out both the variety of climate and its changeability: »*Although Carniola is not exactly a big country, it is possible to observe such great differences in its climate as nowhere else. The air is relatively mild but also rather changeable:*

it tends to change not only with time but also with place and landscape; therefore certain crops, particularly fruit, grow ripe much earlier in one place than in another, … although the distance between such places is often no longer than a day's or two days' walk« (Valvasor 1689, Book III, 306; Slovenian translation: Valvasor 2009).

In his description of the seasons' characteristics, Valvasor reports on winters that in the time when his work was written, i.e. in the second half of the 17th century, they were not harsh: *»The winter is not really harsh – on the contrary – it is rather mild and bearable. It is true that snowfall is frequent, but the snow does not lie long but melts soon«* (Valvasor 1689, Book III, 307; Slovenian translation: Valvasor 2009). He further mentions great differences between various parts of Carniola: *»However, as regards the cold there are considerable differences in Carniola, since in Highland Carniola (Oberkrain) it can still be freezing cold and snow can still lie deep, while in Lowland Carniola (Unterkrain) it melts and everything begins to bud, and in Istria and around the nature is already in bloom«* (Valvasor 1689, Book III, 307; Slovenian translation: Valvasor 2009).

From the present viewpoint, Valvasor's definition of winters as being mild and bearable does not agree with the general characteristics of the Little Ice Age, to which also the latter half of the 17th century belonged, and with the fact that between 1645 and 1715 the so-called Maunder minimum lasted, when cold years with harsh and long winters occurred. Valvasor's statement that 17th-century winters were not really severe may have resulted from the then prevailing comprehension of harsh winters as normal, since from around 1655 to around 1710 harsh winters were predominant in Central Europe (Pfister 1995). In spite of different regional unfolding of the Little Ice Age there is no evidence that winters in Slovenia in the latter half of the 17th century were milder than in the neighbouring countries. Just the opposite: it is evident from various chronological records (Table 1) that from the year 1645 until the publication of the Glory of the Duchy of Carniola there were at least five bitter winters with frosts (1648, 1653/54, 1660, 1683/84, and 1684/85). These were followed by a series of at least five harsh win-

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Figure 2: List of charges of the Krofič farm in 1698. The text bottom right says that the farm has become desolate due to repeated poor harvests, and the serf has incurred debt to the landlord (Zwitter 2010, 92; Source: Archives of the monastery at St. Paul in the valley Lavanttal, Austria; St. Paul HS 63/7, Provenienzgr. Eberndorf, Stiftregister 1696).

ters at the very beginning of the 18th century (1708/09, 1710/11, 1712/13, 1714/15, and 1715/16); as the harshest of them – even as one of the worst in the last 500 years in the bigger part of Europe (Xoplaki et al. 2001, 598) – the winter of 1708/09 is stated. It is rather unlikely as well that Valvasor's characterization of winters was influenced by the situation in the first half of the 17th century, which means before he was born, when according to Pfister (2004), winters in Central Europe were slightly milder between the years 1615 and 1655.

Unfavourable conditions in the colder half of the year are also corroborated by poor cereal harvests in Carniola during the Maunder minimum in the years 1675, 1677, 1685, 1695, 1696, 1708 and 1709 (Šorn 1950, 172; Valenčič 1977, 20–22, 122–124). Necessary for a good year of winter crops are a sufficiently wet autumn, a not too harsh and too long winter, sufficient precipitation in spring and not too wet weather during ripening and harvest time. In the case of spring cereals a long winter causes belated first sowing which results in late ripening at higher altitudes, or the cereals cannot ripen at all due to early colds. It is favourable for such altitudes that early autumn is dry and warm. Bad weather conditions and the resulting poor harvests and the constantly increasing taxes were, according to Šorn (1950), the main reasons for peasant uprisings in the early 18th century. At that time the economic situation of numerous peasants seriously aggravated due to a series of poor harvests; therefore many of them abandoned their lands and homes and went abroad (Šorn 1950). Zwitter (2010) also states that it is possible to detect influence – not great and not lasting – of the Early-Modern-Time Little Ice Age on agrarian settling in the case of farms at high altitudes in Solčavsko region in the eastern section of the Slovenian Alps. At the climax of the Maunder minimum climatic conditions were in many a place so unfavourable that several farms were abandoned (Figure 2).

It is evident from climate reconstructions for Central Europe that springs were mainly cool in the 17th and the first half of the 18th century, summers were changeable, rather cool in the early and late century and very cool in the first half of the 18th century. However, in the mid century a series of above-average hot summers occurred (Glaser 2001, 94). Pfister (1995, 92–117) mentions cool springs to have taken place particularly in the 1690s and the 1740s. Our chronicle reports as hot (and dry) summers only the summers of 1616 and 1644, as dry (at least in the Littoral) also the summer of 1660. Bad growing conditions at the beginning of the 18th century, that means below-average temperatures from May to August (and short vegetation period), are possibly indicated also by larch chronology for the upper forest line in the south-eastern Alps (Levanič 2005, 2007). In his description of summer climatic conditions Valvasor was obviously influenced by the middle of the century, when he says: »*In summertime Carniola enjoys cosy, temperate warmth*« (Valvasor 1689, Book III, 310; Slovenian translation: Valvasor 2009). But once again he points out great differences between the Alpine part of Carniola and the lower-lying lands on the south-east and in the vicinity of the sea: »*Highland Carniola (Oberkrain) has almost cool air early in the morning, because it lies high and snow-covered mountains rise above it. However, in the direction towards Croatia it is very warm or even hot. On the Kras (Karst) and in Istria the sun burns strongly and heats unbearably. Otherwise, rainfall and frequent hail considerably weaken and soothe the torridness; likewise, the snow-covered peaks play their role, because fresh and cool air or wind always breezes from them, which lessens the heat*« (Valvasor 1689, Book III, 307; Slovenian translation: Valvasor 2009).

3.2 Severe storms

Judging from attention that Valvasor pays to storms and accompanying phenomena, hail in particular, it is possible to assume that the main characteristic of the warm half of the year in his time was great frequency of storms and their resultant great damage. He mentions that hardly a day passes in Carniola without lightning and thunder, that the Littoral and the mountainous world receive more storms, and that in the neighbouring Carinthia and Styria there is likewise a lot of hail, yet less than in Carniola. He explains that this natural disaster affects zones of different width (from a shooting range to one mile) which can be more than seven miles long, which could mean over 50 kilometres (Vilfan 1954). But it

Table 1: Classification of weather hazards in the Slovenian lands in the 17th century and during the Maunder minimum based on chronicle records (Valvasor 1689; Slekovec 1885, 122; Kovačič 1910; Pučnik 1980, 56–59; Ogrin 1994, 1995; Novak 1999, 111–112; Levec 2009).

Harsh winters: 1608/09, 1634/35, 1648, 1653/54, 1660, 1683/84, 1684/85, 1708/09, 1710/11, 1712/13, 1714/15, 1715/16	**Mild winters:** 1627/28, 1681/82, 1702, 1704/05, 1707/08, 1709/10
Hot and dry summers: 1616, 1644, 1660, 1701, 1704, 1705, 1708	**Rainy years:** 1627, 1631, 1654, 1703, 1706, 1707, 1710, 1711, 1713, 1714, 1715
Severe storms (with hail, strong wind): 1613, 1622, 1628, 1636, 1637, 1644, 1650, 1654, 1657, 1665, 1672, 1677, 1683, 1685, 1686, 1688, 1691, 1693, 1698, 1700, 1701, 1708, 1710	**Locust invasions:** 1611, 1644
Floods: 1628, 1631, 1633, 1635, 1688, 1702, 1703, 1707, 1710, 1714	**Famines, high costs of living:** 1612, 1628, 1629, 1654, 1675, 1685, 1686, 1705, 1711

never ravages throughout the country. It happens that it devastates the one and the same zone two or three successive years, and it likewise affects the same areas several times a year. Sometimes the pellets that fall from the clouds are as big as a hazel, sometimes as big as a fist, »*sometimes the hail cover is three or four fingers thick and lies until the next day*« (Valvasor 1689, Book III, 311; Slovenian translation: Valvasor 2009).

Valvasor reports that storms cause great damage in Carniola. Hail ruins not only the crops but also trees and cattle: »*From time to time hail falls so intensely, ferociously and is accompanied by such fierce wind so that even the strongest trees, so to say, fall and lie all contorted by wind which blows in so powerful gusts and so ferociously. Carniola would possibly be a true core of happy and fertile lands if hail did not reduce its happiness so considerably: if we calculate the damage it causes, it is so great that usually a fifth of fruit trees and other plants are ruined every year, which certainly curtails the country for much more*« (Valvasor 1689, Book III, 311; Slovenian translation: Valvasor 2009). He observes that this does not entail price rise of agricultural products, because storms with hail usually affect only smaller areas. However, he points out the grim fate of poor people, because hail ruins the little they possess, particularly if this natural disaster strikes in two or more successive years: »*When a storm completely beats down winter crops, such as wheat, rye and the like, and then beats to the ground summer wheat, buckwheat, millet, beans, peas, lentils, and other crops, then poor peasants are in great distress and fall into poverty. … Whoever is struck feels it gravely, especially hardworking peasants who are thus driven into such distress and poverty that they suffer food shortage and together with their family they suffer misery. They expect with hope the next year. If these poor villagers … are stricken as badly and devastatingly again, … they are forced to grind tree bark to make bread of it*« (Valvasor 1689, Book III, 321; Slovenian translation: Valvasor 2009).

If Valvasor's reports on severe storms and records in chronicles are reliable, it is possible to assume that storm frequency in the 17th century (and similarly in the 18th century) was comparable to the present state, when higher rate of these weather extremes is mainly attributed to global warming of the atmosphere. Comparison between a record in the 17th-century weather chronicle (Table 1) and the chronicle for the 20th century composed by Trontelj (1997) and complemented for the final three years of the century in the journal Ujma (Šipec 1999; 2001) shows that in the second half of the 17th century eight major severe storms occurred in Ljubljana and its neighbourhood, while in the latter half of the 20th century there were nine. It is interesting that the styles of recording the damage and the consequences

of these weather hazards today and 200–300 years ago are very similar. It is also clear from the records that the storm characteristics and the kind of damage done have not essentially changed by now. Only the people's very existence is not jeopardized as much as it used to be once.

3.3 Other weather-related and climate characteristics

Other weather-related and climate characteristics of Carniola are given less attention in Valvasor's descriptions. As it is emphasized today, in his opinion, too, Carniola is sufficiently wet: »*Carniola is not thirsty for rain, because rainfall often gently waters the land, even when it is least expected*« (Valvasor 1689, Book III, 309; Slovenian translation: Valvasor 2009). He mentions sporadic periods of drought, when rain does not fall even for a fortnight, and heavy passing showers in summer and also in autumn which cause high water level of rivers. In his description of climatic characteristics floods are not extra mentioned. However, it is clear from chronicle records that in the 17th century there were at least five in central Slovenia (1628, 1631, 1633, 1635, 1688). In the case of snow he underlines its unreliability and the fact that snow cover is usually not thick and does not last long, while in the Littoral snow falls seldom and lies but for a short time. He presents the lower section of Ljubljana Basin, including the city of Ljubljana, as the foggiest part of Carniola. He believes that this fog is dangerous to health, because it causes cough and catarrh, but he quotes a certain physician who claims the opposite: »*that frequent and thick fog is a mild harm to the townspeople of Ljubljana because of a lot of fire and smoke, which purifies the air*« (Valvasor 1689, Book III, 309; Slovenian translation: Valvasor 2009). It is of course dif-

Figure 3: Valvasor's depiction of bora on Gabrk ridge as it knocks down a horse and a man (Valvasor 1984, 49).

ficult to agree with this statement nowadays. He says that Upper Carniola (Si. *Gorenjska*; Ger. *Oberkrain*) has but little fog while hoarfrost is more frequent there: »*Early in the morning, when there is hoarfrost, everything is white like a whitewashed wall. Hoarfrost often continues for three successive days, which harms seriously buckwheat in the field, so that the price of cereals goes up immediately. The inhabitants receive this pale visitor shaking their heads and watching anxiously, seeing in it a white shroud of the field*« (Valvasor 1689, Book III, 309; Slovenian translation: Rupel 1969).

In the case of windiness there are no essential differences between Valvasor's notes and the present state. Valvasor, too, ascertains that Carniola is not too heavily exposed to winds; that the winds are not constant but very changeable. As to Inner Carniola (Si. *Notranjska*; Ger. *Innerkrain*), he mentions that stronger and colder winds can blow from the east and that in summer gusty winds appear during storms. As the windiest areas he outlines the Kras (Karst), Pivka and Istria, where the winds are so cold, »*that they cut deep to the heart. … In Kras (Karst) and Pivka the wind blows extremely strongly especially in winter, when the east wind whistles and sweeps so fiercely that neither people nor animals can go forth when it strikes with all its might and blows out its anger from its fully puffed out cheeks. It can continue like this for two, three, four or five days or even more. Its gale force can knock a man or a horse to the ground; therefore those who want not to be knocked down or swept from the ground when the wind has been, so to say, unleashed should stay at home. Not only foliage is swept but also sand and stones; its whistling is so shrill that ears begin to ache. It is called bora and it comes approximately from the east. When it blows with all its might/… no man can resist it and it is then impossible to go on foot or on horseback across Gabrk ridge and through Senožeče to Trieste or from Trieste to Senožeče …*« (Valvasor 1689, Book III, 308; Valvasor 1689, Book IV; Slovenian translation: Valvasor 1984; 2009).

There was another pest related to weather and climate that troubled the inhabitants of Carniola but is unknown today in our country: invasions of migratory locusts (*Locusta migratoria*). Although in general the 17th century was not particularly favourable for locusts, due to the Little Ice Age, they infested the land at least twice, i.e. in 1611 and 1644. The last locust invasions on the present-day Slovenian territory were reported in the 18th century, reliably in the years 1720 (Ogrin 1995, 295) and 1782 (Slekovec 1885, 123). Valvasor noted on the locust invasion of 1611: »*It was a year of a particularly high yield of wine. But a disaster stroke again. Swarms of locusts came flying like clouds from the Croatian border. When they left, everything looked as if having been burnt and mown down*« (Valvasor 1689, Book XV, 551; Slovenian translation: Levec 2009). As concerns the invasion of locusts of 1644, we learn that it was related to hot and dry weather at the beginning of summer (Ogrin 1995, 290).

The locusts that repeatedly infested the territory of present-day Slovenia came from Asia Minor. In favourable weather they propagated immensely and evolved from the individual phase of life to the collective phase. In dry and sufficiently warm weather they spread in search for food along the Danube to the Pannonian Basin, from where they migrated to different parts of Europe, thus they also crossed the Dinaric passes on the present-day Slovenian territory and continued towards Italy. They usually came in summer, most often in August. Because their flying capacity is not exactly great, proper winds are required for their spreading (Camuffo and Enzi 1991). Because east winds are not particularly frequent in summer at our latitude nowadays and they do not blow for a longer spell at a time, it is possible to claim hypothetically that in the past, at least in the time of locust invasions, the wind-scheme was slightly different than it is today. A question arises whether, due to the anticipated warming of climate, prolonged warm half of the year and increased possibility of longer periods of drought, more favourable conditions for locust invasions in our lands will occur again in the 21st century.

4 Conclusion

It is a lucky coincidence that we have two sources from the 17th century, offering a lot of information about the weather and climate of the time on the Slovenian territory: Valvasor's »Glory of the Duchy

of Carniola« and Dolničar's Ljubljana chronicle. Valvasor's descriptions of weather and climate are not based on technical measurements and observations but just on occasional visual observations by the author and his informers. Certain explanations (and descriptions) are inadequate from the viewpoint of contemporary science, therefore we only took into consideration those which seemed acceptable to us. The two basic sources are not concordant in relation to all of the events. A certain degree of inaccuracy can be attributed to Valvasor which calls for additional precaution in the use of this source. Even though the two authors were contemporaries, they only rarely described the same events. This makes us conclude that there were possibly more events than just those about which the two chroniclers obtained information from the information sources of the time. In spite of all deficiencies we believe that – through a synthesis of all data, by elimination of those explanations which are non-professional, comparison with climate reconstructions made by means of other methods and reconstructions for neighbouring countries – we can establish a sufficiently reliable picture about the climate conditions of that time and their social consequences. It is possible to conclude on the basis of chronology of exceptional weather events that there were also periods of greater frequency of individual events. Between the years 1700 and 1720, springs and summers with lot of rain were frequent in the Slovenian lands, while in the middle of the century summers were warm, and winters were harsh between 1630 and 1650 and during the Maunder minimum period, 1680–1716. During that time, very mild winters also occurred in between harsh winters. Throughout the 17th century there were very many severe storms in the warm half of the year. In spite of the fact that the 17th century belongs to the second half of the Little Ice Age, it is evident from the sources that it was a rather varied period as to the climate and weather, with a great concentration of exceptional weather events which had significant impact on the life of the people of the time and their social circumstances.

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ARTICLES

MASS MOVEMENT SUSCEPTIBILITY MAPS IN SLOVENIA: THE CURRENT STATE

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ABSTRACT
Mass movement susceptibility maps in Slovenia: The current state
Mass movement susceptibility maps offer a quick and effective way to determine areas that people should not exploit or where it is known that any development would require special construction and other measures. In recent years, such maps have been made for landslides, rockfalls, and debris flows at the national scale for Slovenia, and the first maps for municipalities have also been created. This article presents the current state of production of such maps in Slovenia.

KEY WORDS
geography, natural disasters, mass movement, prevention, susceptibility maps, Slovenia

IZVLEČEK
Zemljevidi nevarnosti za večje pobočne procese v Sloveniji: trenutno stanje
Zemljevidi nevarnosti za večje pobočne procese omogočajo hitro in učinkoviti določanje območij, ki se jim je bolje izogniti oziroma na katerih je kakršenkoli poseg povezan z posebnimi gradbenimi ali drugimi ukrepi. V zadnjih letih so bili v Sloveniji v državnem merilu izdelani zemljevidi nevarnosti zaradi zemeljskih plazov, skalnih podorov in drobirskih tokov. Poleg tega so bili izdelani tudi prvi tovrstni zemljevidi za občine. Predstavljeno je trenutno stanje na področju izdelovanja tovrstnih zemljevidov v Sloveniji.

KLJUČNE BESEDE
geografija, naravne nesreče, pobočni procesi, preventiva, zemljevidi nevarnosti, Slovenija

The article was submitted for publication on August 14, 2011.

1 Introduction

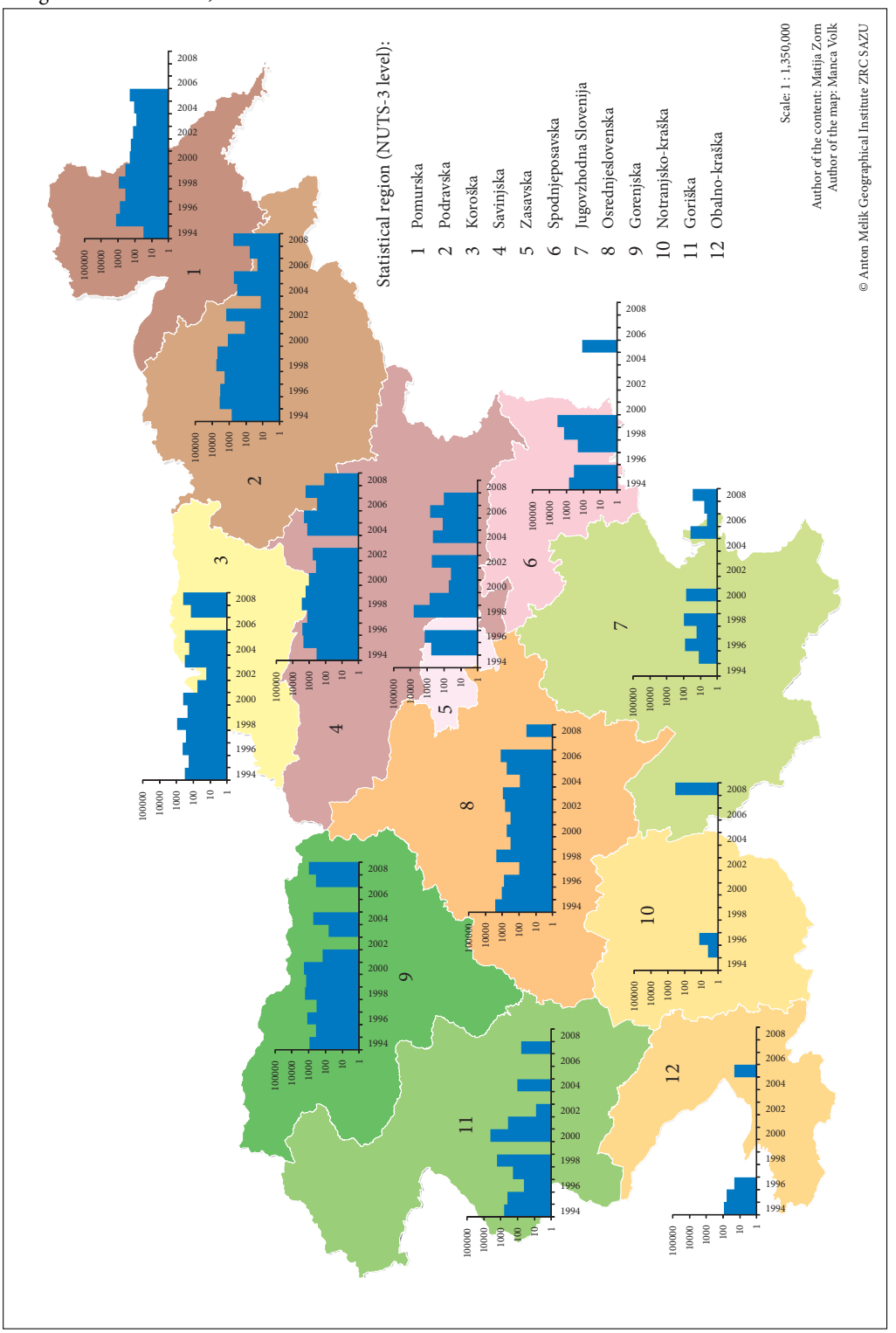
Mass movement is a geographical constant in certain areas in Slovenia, and in the past some writers have used expressions such as *slippage-prone region* or *landslide-prone region* for certain parts of the country (see sources in Zorn and Komac 2011a). Nonetheless, spatial planning encounters difficulties in such areas because these geomorphic processes are still considered to be interfering factors rather than component parts of them.

On average, the landslide hazard is the greatest in Slovenian alpine (and pre-alpine) regions, where areas most susceptible to landslides cover more than 20% of the entire area. In the Pannonian regions, the most landslide-prone areas cover around 10% of the area, and in Mediterranean regions around 8%. The areas least threatened by landslides are the (predominantly) limestone Dinaric regions, where the areas most susceptible to landslides represent around 7% of the area (Zorn and Komac 2008a; Komac and Zorn 2009). From 1994 to 2008, damage caused by landslides and avalanches amounted to 0.033% of GDP, or nearly 8% of the annual damage due to natural disasters (Figure 1; Zorn and Komac 2011a; 2011b; 2011c). With regard to this damage, landslides and avalanches are ranked fifth, behind drought (nearly 26% of average annual loss due to natural disasters), hail (just over 20%), flooding (nearly 19%), and strong winds (just over 12%).

This article presents the efforts made with regard to mass movement prevention after the adoption of the Waters Act (Zakon o vodah 2002) and some other intervention acts (e.g., Act on the Measures to be Taken to Repair the Damage Caused by Certain Large-Scale Landslides in 2000 and 2001; Zakon o ukrepih … 2002), and after the occurrence of some major landslides (e.g., the Stovžje landslide above Log pod Mangartom: 2,500,000 m^3 (in 2000), the Slano blato landslide near Ajdovščina: 1,000,000 m^3 (in 2000), the Koseč landslide above Kobarid: 675,000 m^3 (in 2001); Zorn and Komac 2008, 36).

Article 83 of the Waters Act (Zakon o vodah 2002) defines areas threatened by hydro-geomorphic processes and stipulates that these areas should be classified into various hazard categories. This can be achieved by producing susceptibility maps, which are one of the basic methods of mass movement prevention. However, the problem is that there is no uniform methodology for producing these types of maps (neither between various disciplines nor within the disciplines themselves). Specifically, the Waters Act (Zakon o vodah 2002) does not define this methodology and leaves it to a different legal document, which has not been adopted yet.

In Slovenia, national funds are primarily used for recovery, and less so for prevention. It would certainly be good if a greater portion of these funds could be earmarked for prevention; only 15% of the funds that were used from 2002 to 2010 alone to clean up seven major landslides (approximately € 30.5 million; Koliko denarja … 2011) would, in theory, have been sufficient to produce quality mass-movement susceptibility maps for all of Slovenia's municipalities (Komac and Zorn 2005, 92). Such maps are also defined in Article 57 of the Spatial Management Act (Zakon o urejanju prostora 2002), which also legislates the presentation of threatened areas. This is also prescribed by Article 87 of the Spatial Planning Act (Zakon o prostorskem načrtovanju 2007).


Statistical region (NUTS-3 level):
1 Pomurska
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3 Koroška
4 Savinjska
5 Zasavska
6 Spodnjeposavska
7 Jugovzhodna Slovenija
8 Osrednjeslovenska
9 Gorenjska
10 Notranjsko-kraška
11 Goriška
12 Obalno-kraška
Scale: 1 : 1,350,000
Author of the content: Matija Zorn
Author of the map: Manca Volk
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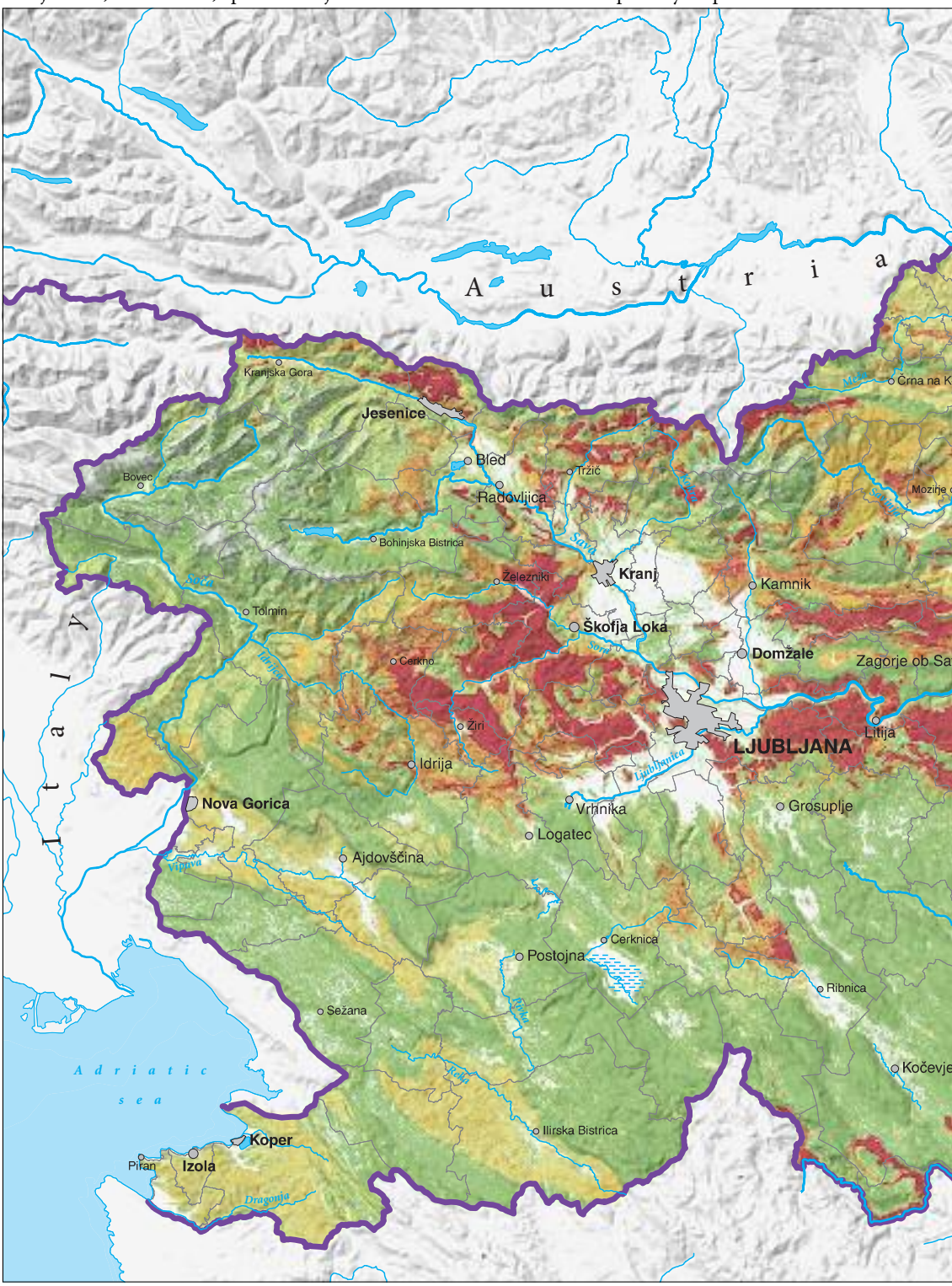
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Litija
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Nova Gorica
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Ajdovščina
Cerknica
Postojna
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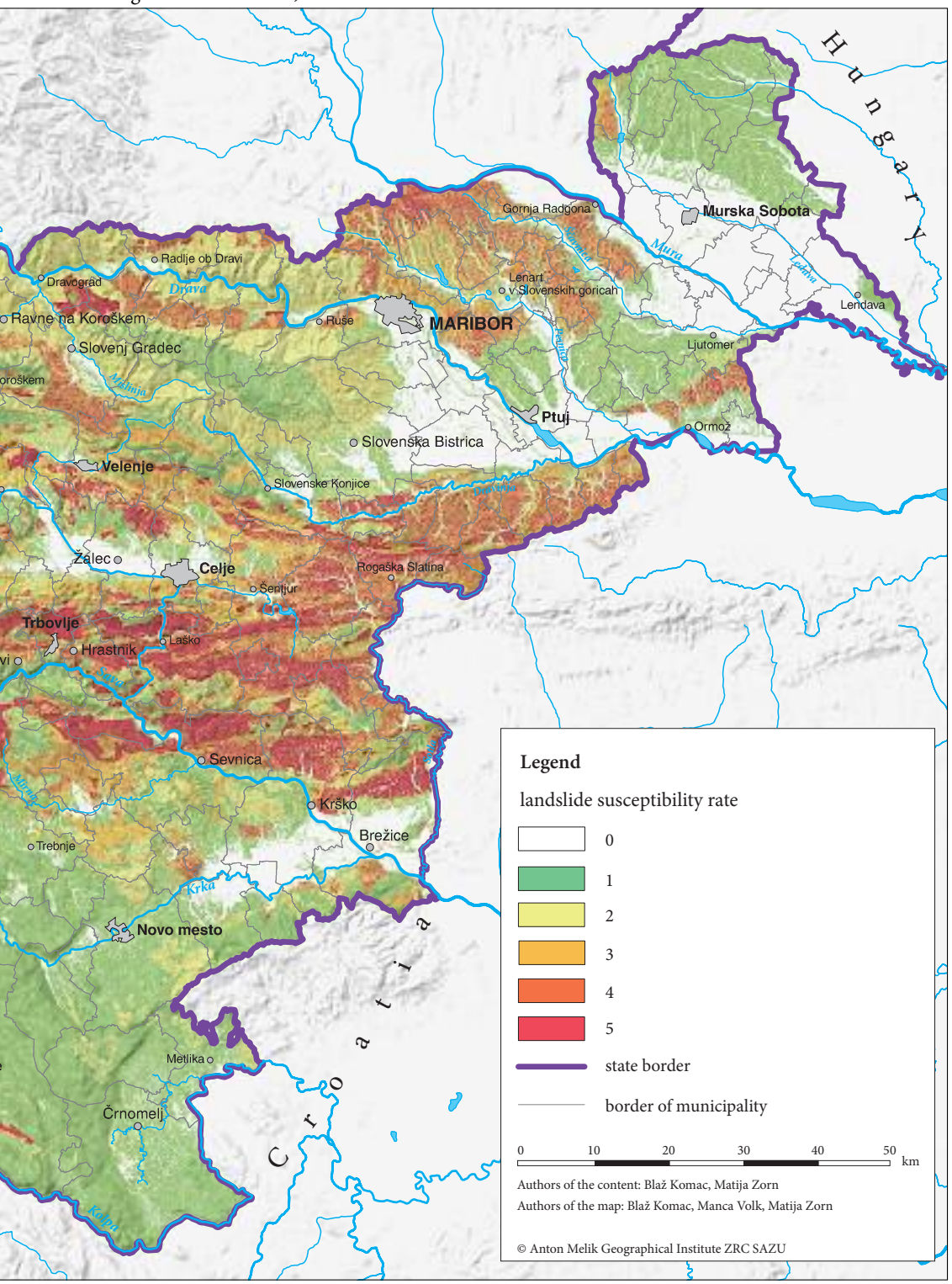
Hungary
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Gornja Radgona
Radlje ob Dravi
Dravograd
Ravne na Koroškem
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MARIBOR
Lenart v Slovenskih goricah
Lendava
Ljutomer
Ormož
Ptuj
Slovenska Bistrica
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Slovenske Konjice
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Trbovlje
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Laško
Sevnica
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Brežice
Trebnje
Novo mesto
Metlika
Črnomelj
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Mura
Ščavnica
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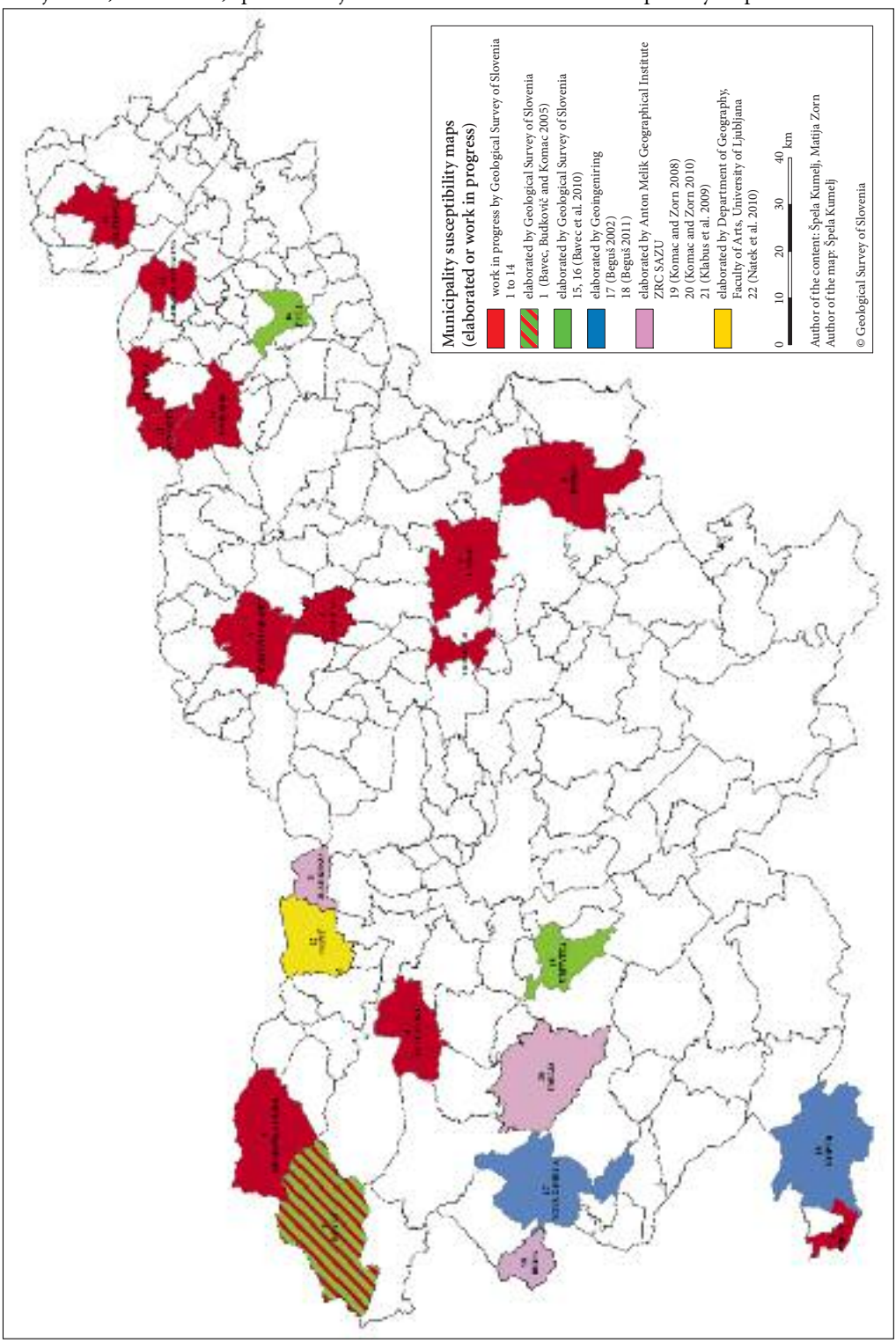
Ledava
Meža
Savinja
Sotla
Krka
Kolpa
Legend
landslide susceptibility rate
0
1
2
3
4
5
state border
border of municipality
0 10 20 30 40 50 km
Authors of the content: Blaž Komac, Matija Zorn
Authors of the map: Blaž Komac, Manca Volk, Matija Zorn
© Anton Melik Geographical Institute ZRC SAZU


Municipality susceptibility maps
(elaborated or work in progress)
work in progress by Geological Survey of Slovenia
1 to 14
elaborated by Geological Survey of Slovenia
1 (Bavec, Budkovič and Komac 2005)
elaborated by Geological Survey of Slovenia
15, 16 (Bavec et al. 2010)
elaborated by Geoingeniring
17 (Beguš 2002)
18 (Beguš 2011)
elaborated by Anton Melik Geographical Institute ZRC SAZU
19 (Komac and Zorn 2008)
20 (Komac and Zorn 2010)
21 (Klabus et al. 2009)
elaborated by Department of Geography, Faculty of Arts, University of Ljubljana
22 (Natek et al. 2010)
0 10 20 30 40 km
Author of the content: Špela Kumelj, Matija Zorn
Author of the map: Špela Kumelj
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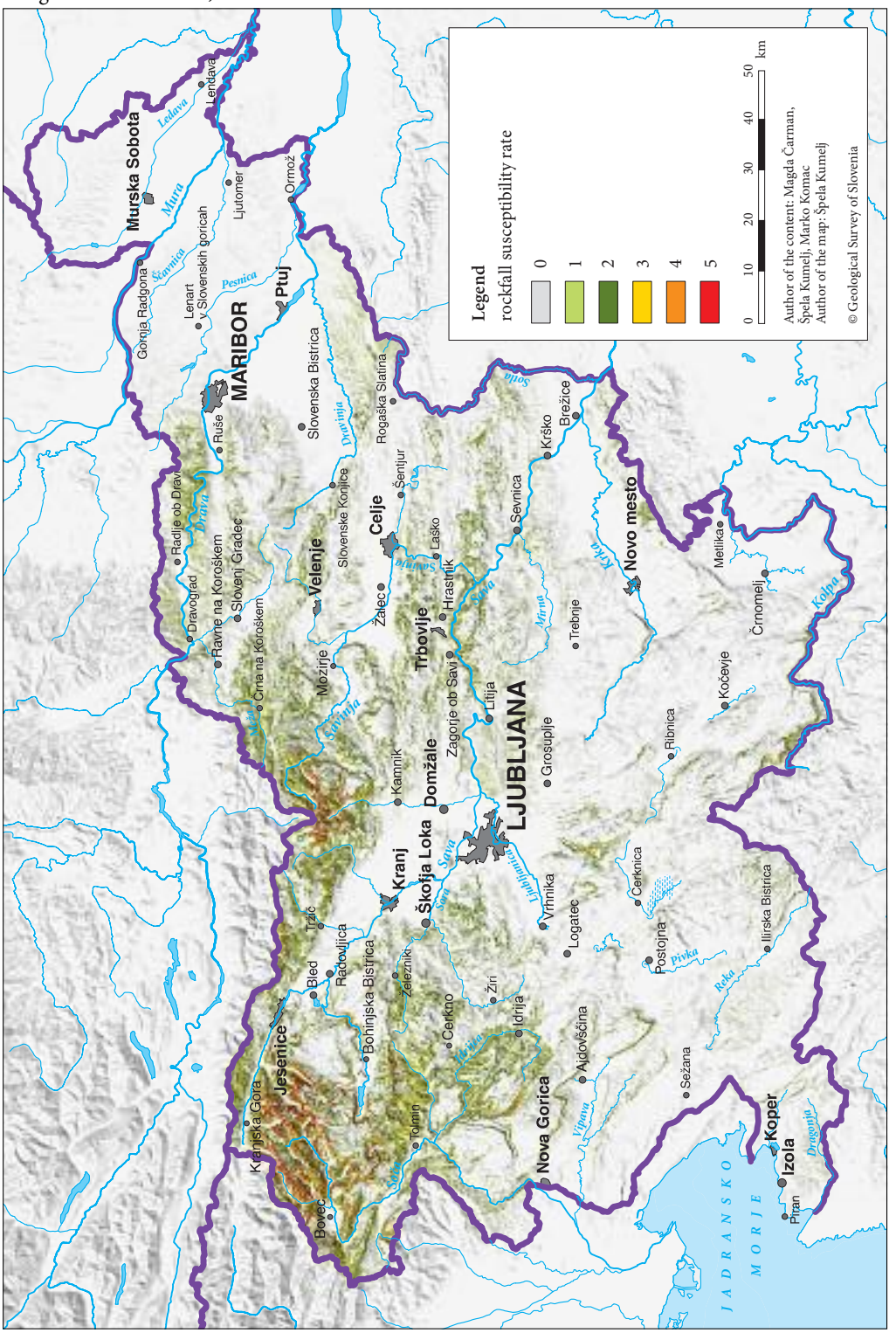
Legend
rockfall susceptibility rate
0
1
2
3
4
5
0 10 20 30 40 50 km
Author of the content: Magda Čarman, Špela Kumelj, Marko Komac
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Murska Sobota
Lendava
Ljutomer
Ormož
Ptuj
MARIBOR
Gornja Radgona
Lenart v Slovenskih goricah
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Črna na Koroškem
Ravne na Koroškem
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Dravograd
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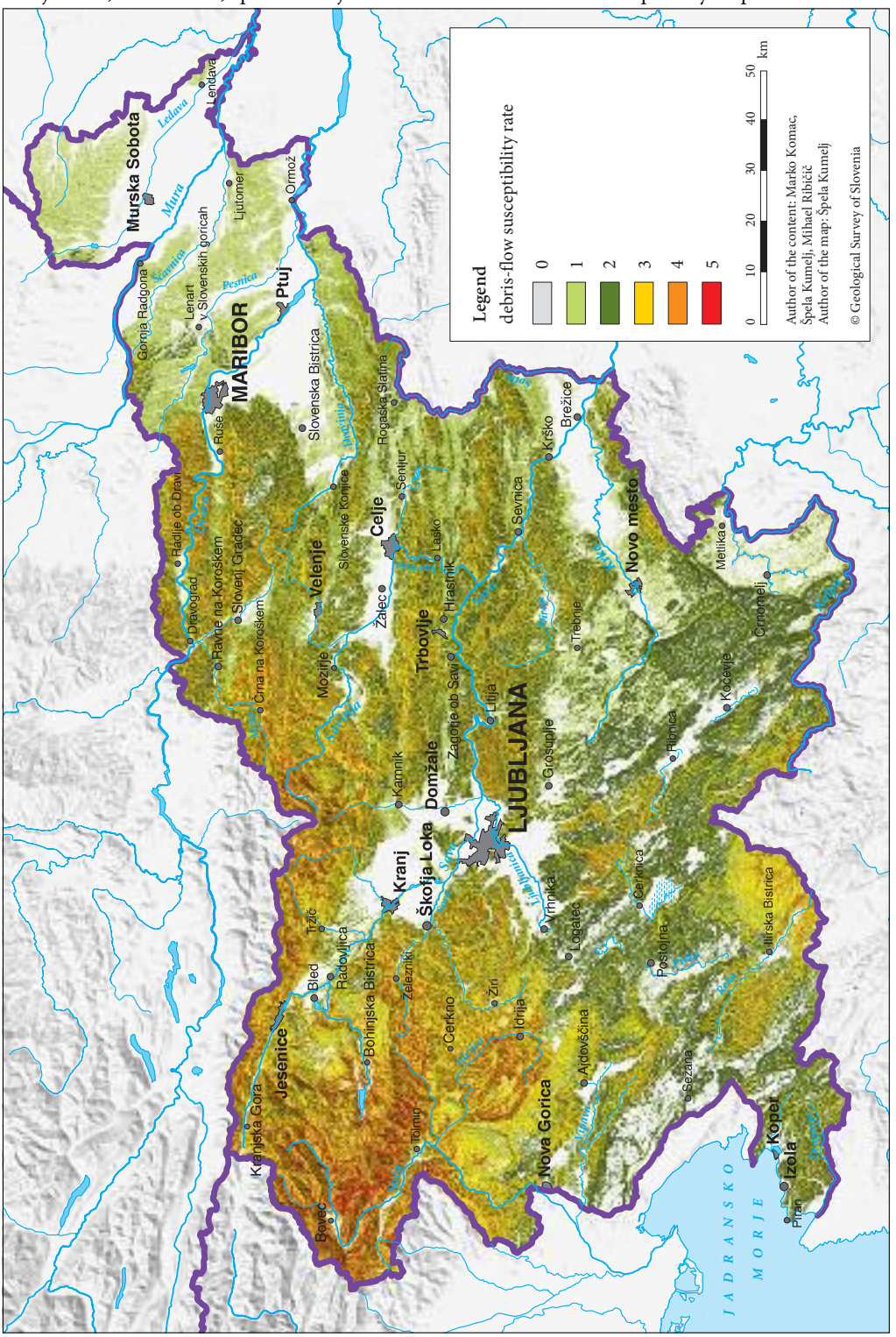
Soča
Idrijca
Tolminka


Legend
debris-flow susceptibility rate
0
1
2
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0 10 20 30 40 50 km
Author of the content: Marko Komac, Špela Kumelj, Mihael Ribičič
Author of the map: Špela Kumelj
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Legend
landslide susceptibility rate
0
1
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landslide
settlement
watercourse
important road
border of Idrija Municipality
0 1 2 4 6 8 km
Authors of the content: Blaž Komac, Matija Zorn
Authors of the map: Blaž Komac, Manca Volk, Matija Zorn
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Idrija

2 Mass movement susceptibility maps in Slovenia

Mass-movement susceptibility maps (Figures 3–6) offer a quick and effective way to determine areas that people should not exploit or where it is known that any development would demand special construction and other measures. In Slovenia these maps are produced using geographical information system methodology, which includes digital elevation models (with 25 × 25 m grid resolution for the national scale, 12.5 × 12.5 m grid resolution for the regional scale, and more detailed grid resolution for the local scale (e.g., a 5 × 5 m grid; e.g., Jež et al. 2011)), several physical geographical landscape elements (e.g., lithology with tectonics, surface inclination, dip of strata, surface derivations (slope, curvature, aspect, energy potential), land use, maximum 24-hour precipitation, distance from watercourses, and the energy potential of the waters), and in the case of landslides also the National Landslide Database. Considering physical geographical landscape elements, the data differ in terms of their presentation method, they can be vector- or raster-based, and they are often not homogenous because they have been collected by various people or institutions that followed the rules or methods selected to varying extents. This can significantly reduce the model's accuracy. Data on actual mass movement (predominantly landslides) are collected in the National Landslide Database (Nacionalna 2006; Komac et al. 2008). This database was established in mid-2005, but unfortunately has not been updated since. It contains information on about 6,602 mass movements (approximately 0.33 per km^2), of which 3,257 are precisely spatially located. The vector data include information about relative location (to roads, buildings) and absolute location (Gauss-Krüger coordinates), information about the width, length, and depth of landslides, and information about their activity. It also includes information about sources of information and damage caused by landslides.

To develop a uniform methodology for producing these types of maps, in the past the Ministry of Defense financed two applied research projects:
1) Methodology for Defining Risk Areas and Dividing Land into Risk Zones (Mikoš et al. 2004);
2) Debris-Flow Risk Assessment (Mikoš et al. 2008).

Because to date a uniform methodology still has not been adopted, the developers of these types of maps have a relatively free hand in selecting the methodology. Given the public procurement rules in Slovenia, where map developers are usually selected only based on the price rather than the effectiveness of methodology, the quality can vary significantly.

In Slovenia deterministic, statistical, and probabilistic methods have already been used to produce landslide, rockfall, or debris-flow susceptibility maps (e.g., Zorn and Komac 2008a; 2009; Ciglič et al. 2010). At the national level, we have already produced susceptibility maps for landslides (Figures 3; e.g., Komac and Ribičič 2008; Zorn and Komac 2008a), rockfalls (Figure 5; e.g., Zorn and Komac 2004, 74; Čarman et al. 2011) and debris flow (Figure 6; Komac, Kumelj, and Ribičič 2010). For developing landslide susceptibility maps, known landslide locations were used for statistical analyses in relation to physical geographical landscape elements (Komac and Ribičič 2008; Zorn and Komac 2008a). In cases of debris-flow and rockfall susceptibility maps, the classification of the physical geographical landscape elements and their weights in the model were chosen on the basis of literature, expert knowledge, and a small number of historical events (because there are no databases on debris-flow and rockfall events; Komac, Kumelj, and Ribičič 2010; Čarman et al. 2011).

These are large-scale maps and therefore they are not suitable for spatial planning at the local level. Unfortunately, there are few municipal maps that are suitable for these needs (Figure 2). The burden of producing these types of maps lies with the municipalities (Zakon o urejanju … 2002), which do not have sufficient funds and knowledge to produce them. The production of municipal susceptibility maps would cost tens of thousands of euros per municipality or more (depending on the size of the municipality; Bukovec 2005, 18; Komac, Pavšek, and Zorn 2007, 263). Of the 212 Slovenian municipalities, to date only a few have funded the production of maps on their own (e.g., Nova Gorica, Jezersko, Tržič, Ptuj, and Vrhnika). In the Municipality of Vrhnika, the cost of map production was estimated at nearly

€ 25,000, or approximately € 220/km^2 (Sprememba … 2009, 10/3). By comparison, in Switzerland the production of a geomorphological processes map alone, which serves as the basis for producing susceptibility maps, costs approximately € 3,000/km^2 (Raetzo 2004).

After the last few natural disasters (e.g., floods and landslides in 2007, 2008, and 2010), the government has also realized that a number of Slovenian municipalities need these types of maps and has thus approved a project for producing mass movement susceptibility maps for fourteen selected municipalities as well as water-erosion susceptibility maps for eleven municipalities, and avalanche susceptibility maps for four municipalities (Figure 2). This value of project is estimated at approximately € 700,000 (Tematsko … 2011, 9), of which approximately two-thirds has been earmarked for mass movement maps. Based on these funds, the average costs of producing mass-movement susceptibility maps are approximately € 34,000 per average size of the fourteen municipalities, or approximately € 230/km^2. With this project, which is planned for completion by the end of 2012, 10% of Slovenia's territory will be covered by these types of maps. Including the maps already produced, one-sixth of the country will be covered by at least one type of mass movement susceptibility map (Figure 2).

3 Conclusion

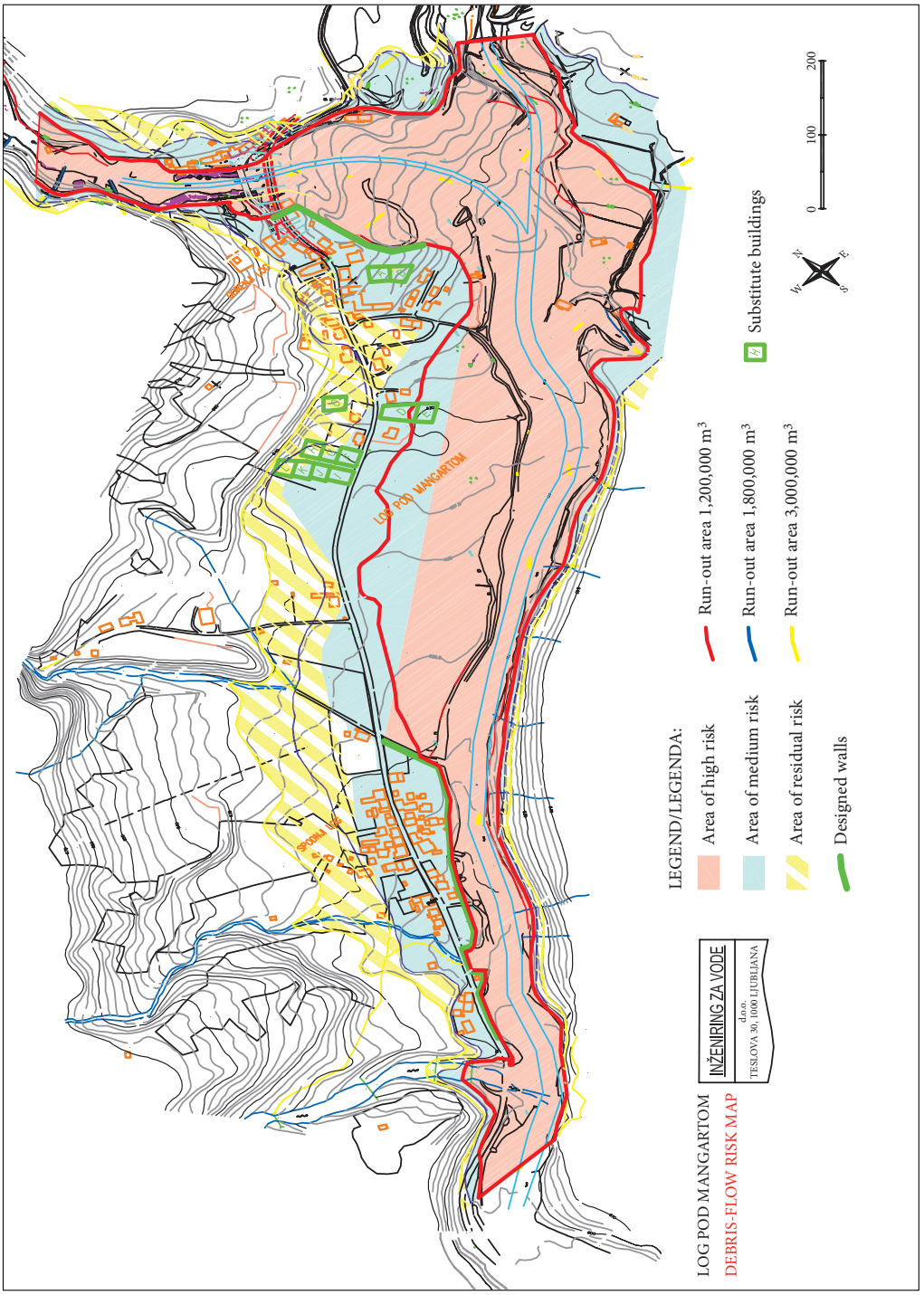
In many Alpine countries, susceptibility maps are one of the basic prevention approaches to managing hydro-geomorphic natural hazards (Komac and Zorn 2005; Zorn and Komac 2006). They show the degree of natural-process hazard or the level of society's threat from them. The better the knowledge of past events in a specific area, the better the maps and the more accurate the assessment of the importance of individual physical geographical landscape elements during the production process.

Modern cartographic methods and geographic information systems can be used to assess the spatial distribution of natural hazard areas with a relatively degree of certainty. The maps enable (depending on the scale) spatial planning at the national, regional, and municipal levels, in which in the long run settlement and other human activities are directed to specific areas and restricted or prohibited in others. However, in Slovenia these types of models are not supported by dynamic elements such those used in weather and water outflow forecasts (Arattano et al. 2010), and also not connected with insurance companies. The only detailed mass movement risk map produced in Slovenia to date that has also taken into account the dynamic elements is the risk map in Log pod Mangartom (Figure 7) after the devastating debris flow in November 2000 (Zorn and Komac 2008b).

Based on the data presented above, in Slovenia the costs of producing mass movement susceptibility maps amount to approximately € 230/km^2. Because landslides threaten approximately 20% of the country's territory (Zorn and Komac 2008), nearly € 1 million would be spent on producing susceptibility maps for these areas alone; this is approximately 1% of the direct damage (€ 99 million; Zorn and Komac 2011) caused by landslides and avalanches in recent years (1994–2008). To include the entire country, one would need a full € 4.5 million, or just under 5% of the direct damage caused by landslides and avalanches in recent years. In (more) landslide-prone areas, the average direct annual damage caused by landslides amounts to approximately € 24,000/km^2, and approximately € 4,800/km^2 for all of Slovenia. In comparison, Siegel (1996) reports that the ratio between the savings due to prevention and the funds invested in recovery ranges from 1 : 10 to as much as 1 : 2,000.

Among other things, Slovenian geographers are striving for these maps to be not only important parts of natural disaster prevention activities, but also part of the society's orientation to both risk management and risk governance, as well as the culture of sustainable coexistence with natural disasters. A great deal about the possible ways society can adapt to natural disasters can already be learned from

Figure 7: Debris-flow risk map of Log pod Mangartom, with run-out areas of debris flows shown, and classification into risk areas, originally given at a scale of 1 : 2,000 (Mikoš, Fazarinc, and Majes 2007, 182). ►


LOG POD MANGARTOM
DEBRIS-FLOW RISK MAP
INŽENIRING ZA VODE
d.o.o.
TESLOVA 30, 1000 LJUBLJANA
LEGEND/LEGENDA:
Area of high risk
Area of medium risk
Area of residual risk
Designed walls
Run-out area 1,200,000 m3
Run-out area 1,800,000 m3
Run-out area 3,000,000 m3
Substitute buildings
0
100
200
N
E
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W
LOG POD MANGARTOM
SPODNJA VAS

Slovenian history. In the Alpine regions alone, an entire range of methods and measures is known that not only made it possible for people to live in (sometimes) hostile regions, but also made their lives there considerably easier.

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ARTICLES

NEW POSSIBILITIES FOR ASSESSING THE DAMAGE CAUSED BY NATURAL DISASTERS IN SLOVENIA – THE CASE OF THE REAL ESTATE RECORD

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ABSTRACT
New possibilities for assessing the damage caused by natural disasters in Slovenia – The case of the Real Estate Record
This article presents the suitability of the Real Estate Record – a web application of the Surveying and Mapping Authority of the Republic of Slovenia – for assessing the damage caused by natural disasters. We performed an analysis for the village of Čezsoča, which was devastated by an earthquake in 1998 (M 5.6). We compared the data on earthquake damage with the data on the real-estate value. Such comparisons make it possible to establish the damage potential of future natural disasters.

KEY WORDS
geography, natural disasters, damage, prevention, Real Estate Record, Čezsoča, Slovenia

IZVLEČEK
Nove možnosti preučevanja škod ob naravnih nesrečah v Sloveniji – na primeru registra nepremičnin
Predstavljena je uporabnost registra nepremičnin – spletne aplikacije Geodetske uprave Republike Slovenije, ki vsebuje tudi vrednost nepremičnin – za preučevanje škod ob naravnih nesrečah. Za vas Čezsoča, ki jo je prizadel potres leta 1998 (M 5,6) je bila narejena analiza, v kateri smo primerjali podatke o škodi zaradi potresa in podatke o vrednosti nepremičnin. Tovrstne primerjave omogočajo ugotavljanje škodnega potenciala za prihodnje naravne nesreče.

KLJUČNE BESEDE
geografija, naravne nesreče, škoda, preventiva, register nepremičnin, Čezsoča, Slovenija

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1 Introduction

The term »natural disaster« denotes natural phenomena and processes in a landscape that affect society to the extent that they cause damage to it. Direct damage occurs during the disaster itself (e.g. damaged buildings and infrastructure, destroyed crops), whereas indirect damage is caused in other areas and can be considerably greater (e.g. lost income due to disrupted industrial production, agriculture, commerce, and power supply). Some authors (Guha-Sapir, Hargitt and Hoyois 2004) also refer to secondary damage, which is financial in nature and connected with lost budget funds, changed interest rates, and debt.

The damage caused by natural disasters is increasing around the globe (McBean 2004, 177; Löw and Wirtz 2010, 47), not only because of their potentially higher frequency, but also by the increased vulnerability of society. The greater vulnerability of society is connected with a rapid increase in population, the settlement of hazardous locations that were empty until only recently, more frequent increases in population density, and a larger share of urban population. Greater vulnerability is influenced by increasing property and real-estate prices, a more diverse and modern (expensive) infrastructure, and especially human alienation from the natural environment. There is also a resulting lack of knowledge of natural processes, leading to underestimating or even denying them (Zorn and Komac 2011, 12).

Damage to real estate and infrastructure is a substantial part of the damage caused by natural disasters. The greatest damage to real estate in Slovenia may be caused by earthquakes, followed by floods, thunderstorms, and some other rarely occurring natural disasters. The data on damage to public infrastructure are publicly available, whereas the data on the resources for renovation work on damaged real estate are only rarely publicly available (Orožen Adamič and Hrvatin 2001). The generalised market value of real estate in Slovenia is set at approximately € 140 billion (Mikoš 2012). The process of assessing damage is a complex one. In Slovenia, it is usually carried out after a natural disaster has occurred. If we want to evaluate damage from natural disasters or their economic impact, we have to know the economic value of the real estate that has been damaged. In Slovenia, data on the generalised market value of real estate have been available since 2011 (Internet 2). This enables an evaluation of the greatest possible damage to real estate in an area. Consequently, it is possible to produce models for damage assessment in case of different natural disasters or different scenarios on the grounds of the assessment of real estate value in combination with the data on damage from natural disasters. This paper presents such an analysis with the case of the village of Čezsoča near Bovec, Slovenia. We compared the data on damage from the 1998 earthquake and the data on real estate value from Real Estate Register.

2 Damage caused by natural disasters in Slovenia between 1994 and 2008

Slovenian literature most often states that the damage caused by natural disasters amounts from 0.6 to 3.0% of the annual GDP if there is no major disaster. With greater catastrophes, this share is higher; for example, in 1976 damage caused by the earthquakes in the Upper Soča Valley and a few other natural disasters was estimated at approximately 7% of GDP, and in the 1990 floods in the Savinja River Basin the damage amounted to more than 20% of GDP. These figures are fairly high and also include indirect damage caused by these disasters (Zorn and Komac 2011, 9). According to the Slovenian Statistical Office, the direct damage caused by natural disasters between 1994 and 2008 amounted to an annual average of 0.37% of GDP (Figure 1).

The last major disaster affecting Slovenia was the September 2010 floods (Komac and Zorn 2011). They affected 60% of Slovenian municipalities (137), and the total damage was estimated at more than € 240 million (including VAT), which exceeded the 0.3% of planned inflows in the 2010 national budget. For comparison, the damage caused by the 1990 floods mentioned above was estimated at more than € 500 million (Zorn and Komac 2011, 13).

Floods commonly appear in Slovenia. In the previous 15 years, floods (Komac, Natek and Zorn 2008) have caused an average of 15% of the total damage due to natural disasters in the country. The following years have stood out in this regard: 1994 (31.3%), 1995 (18.1%), 1998 (51.9%), 1999 (12.1%), 2004 (15.2%), and 2007 (64.8%). In the period discussed, **fires** caused substantial damage in 2002 (18.1%) and 2004 (24.5%). During the period discussed, **drought** caused substantial damage in 1997 (16.3%), 2000 (70.2%), 2001 (56.7%), 2003 (83.3%), 2006 (60.4%), and 2007 (13.4%). **Heavy wind** caused over 10% of all damage due to natural disasters in Slovenia in 1994 (26.1%), 1995 (37.5%), 1997 (26.6%), 2002 (15.6%), 2005 (31.4%), 2007 (12.7%), and 2008 (19.6%). During the period discussed, **hail** did not caused more than 10% of overall damage due to natural disasters in only four years (1998, 2000, 2003, 2007). In the other years the damage was 1994 (16.5%), 1995 (16.3%), 1996 (12.4%), 1997 (17.4%), 1999 (11.6%), 2001 (12%), 2002 (20.6%), 2004 (38.7%), 2005 (55.6%), 2006 (23%), and 2008 (75.2%). Among the natural disasters in Slovenia, **frost and freezing rain** cause the least damage; thus they only proved to be problematic (causing more than 10% of damage due to natural disasters) in 1996 (37.6%), 1997 (27%), and 2001 (23.6%). Unfortunately, the Slovenian Statistical Office collects data on **landslides and avalanches** as one type of disaster, although these are two completely different processes. Given that avalanches mostly only threaten local infrastructure, the majority of the damage listed includes damage caused by landslides. According to these data, landslides and avalanches caused more than 10% of overall damage due to natural disasters in 1994 (10.2%), 1995 (16%), 1996 (22.4%), 1998 (14.1%), 1999 (32.1%), and 2002 (17.8%). Two powerful **earthquakes** struck Slovenia during the period discussed and caused substantial damage: 18% (in 1998) and 13% (in 2004) of the total damage (Figure 2) caused by natural disasters in Slovenia as a whole (Figure 1; Zorn and Komac 2011).

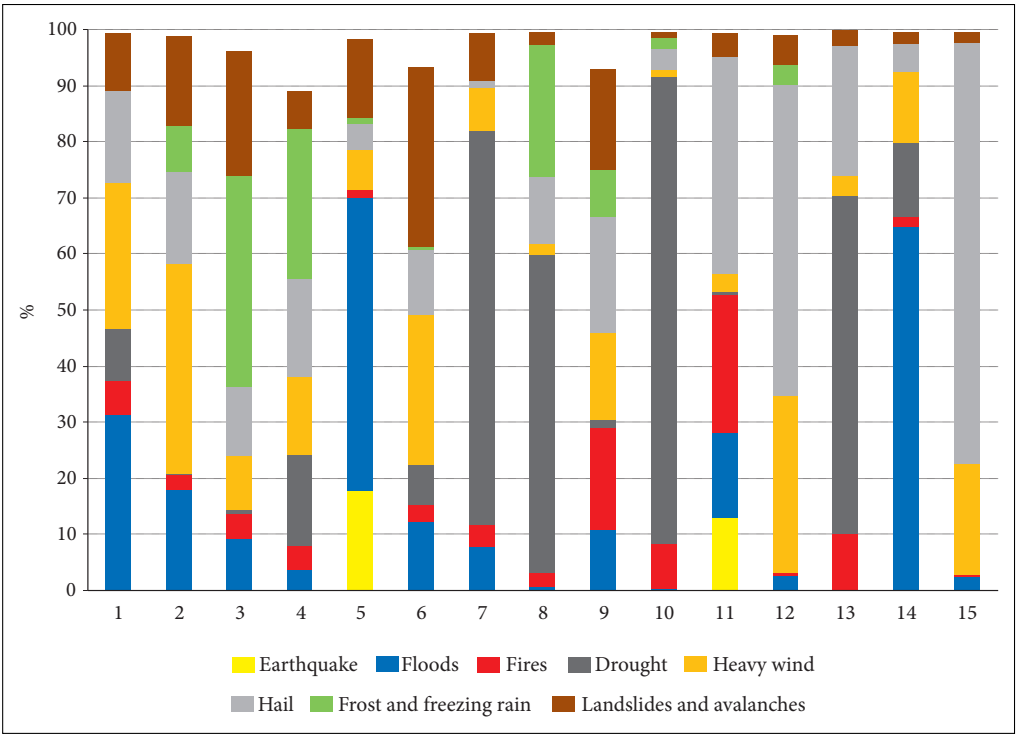


Figure 1: Direct damage caused by natural disasters in Slovenia from 1994 to 2008 by shares of annual GDP (Ocenjena … 2010).

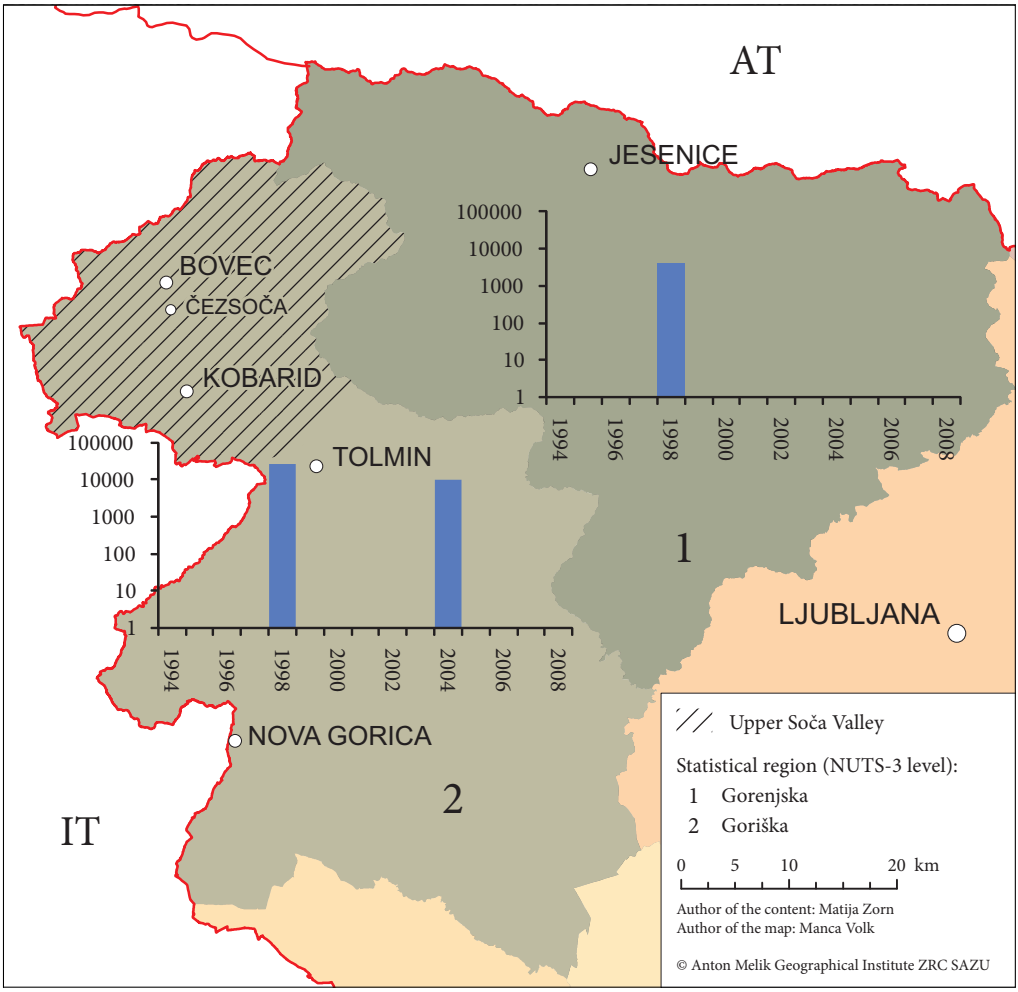


Figure 2: Damage (€ 000) due to earthquakes in Slovenia by statistical regions from 1994 to 2008 (Zorn and Komac 2011, 16).

3 Damage caused by the 1998 earthquakes in the Upper Soča Valley

The Upper Soča Valley is a region in western Slovenia. It is an Alpine region characterized by high mountain karst relief (up to 2800 m a.s.l.), big altitude differences (more than 2000 m) high precipitation (about 4000 mm annually) and torrential waters.

The **earthquake** that struck the Upper Soča Valley on April 12, 1998 (M 5.6) was the first strong earthquake to hit the region since the Furlanese earthquake in 1976 (M 6.5). Its epicentre was in the karst region south east of Bovec. Its magnitude reached its highest levels in the villages of Magozd, Drežniške Ravne, Lepena, and Tolminske Ravne. The area where the earthquake reached or exceeded a magnitude of 7 on the EMS scale had a diameter of about 22 kilometres (Geipel 1982; Vidrih 2008; Vidrih, Ribičič and Suhadolc 2001).

This earthquake also caused considerable **changes in nature**. A few hundred rockfalls and a few landslides were triggered during the earthquake. The largest rockfalls were recorded below Mount Lemež in the Lepena Valley, on the south-western slope of Mount Krn, in Polog above Tolmin, and at the source of the Tolminka River (Zorn 2002). The earthquake greatly accelerated normal geomorphic proceses. Average annual sediment production in the discussed area amounts to about 1400 m^3/km^2. However, earthquake-induced rockfalls and rainfall-induced landslides may release sediment in excess of about 125,000 m^3/km^2 annually (Mikoš, Fazarinc and Ribičič 2006), which is about twelve times higher than an average sediment production.

In the area, 2,543 houses were **affected** by the earthquake. The majority of them were in Bovec (473), Čezsoča (108), Kobarid (107), Jesenice (103), Soča (96), Tolmin (80), Drežnica (63), Kal-Koritnica (56), Trenta (53), Drežniške Ravne (51), and Poljubinj (51) (Orožen Adamič and Hrvatin 2001).

The earthquake caused considerable **damage** to residential, industrial, and commercial premises and to the infrastructure and cultural heritage sites from WWI in the Soča, Tolminka and Sava Bohinjka valleys. The settlements that were hit by the earthquake stand on Quarternary glacial and fluvial sediments, or on flysch and rubble slopes. The danger of soil-structure resonance is considerable in the area. The damage to houses in some parts of the Bovec basin was enhanced by site amplification and soil-structure resonance (Gosar et al. 2001; Gosar 2007). The damage was recorded in the sixteen of Slovenia's then 192 municipalities, which cover 15% of Slovenia, and in 224 of the 516 settlements in the Upper Soča Valley. In 39 settlements of the Upper Soča Valley, 20% to 40% of the houses were damaged. In Drežniške Ravne and Jezerca, all the houses were damaged (100%), followed by Magozd (96%), Krn (93%), Koseč (91%), Lepena (90%), and Bovec (81%). In eighteen settlements, damage was only evident to the infrastructure network or elsewhere. The damage was the greatest in the Bovec municipality where it reached € 3,230 per individual inhabitant. The damage calculated per inhabitant exceeded € 15,000 in the settlements of Zabrdo, Bavšica, Krn, Magozd and Ukanc and reached € 9,713 in Čezsoča and € 6,005 in Bovec.

During **reconstruction** special attention was devoted to increasing the earthquake safety of old buildings. The highest reconstruction costs by far were assessed in the town of Bovec (€ 10,021,338). In the neighbouring village Čezsoča, which ranked second according to damage, the reconstruction costs was less than one third of this amount (€ 3,205,247) (Orožen Adamič and Hrvatin 2001). The problem of reconstruction is well illustrated by the fact that 43% of the demolished buildings had been rebuilt following the 1976 Furlanese earthquake in the period between 1976 and 1980 (Ribičič, Vidrih and Godec 2000). Similar problems were encountered during the 2004 earthquake (M 4.9) when many buildings were damaged because of faulty reconstruction after the 1998 earthquake (Pipan 2011, 28).

4 Damage assessments according to real estate valuation on the example of Čezsoča village

The Čezsoča village is situated in the Bovec basin south of the town of Bovec. It is situated on the Pleistocene plain and the terraces of the Soča River. According to the data of the Statistical Survey of Slovenia (SI-Stat … 2012) 343 people live in 150 households. As noted above, the village was seriously hit by the 1998 earthquake.

The data on the damage caused by the earthquake were collected and analysed based on previous work of the Department of Natural Hazards of the Anton Melik Geographical Institute ZRC SAZU (Orožen Adamič and Hrvatin 2001). The data on the damage caused by the earthquake were compared to the generalised market value of real estate. In order to make the comparison possible, the data on damage caused by the 1998 earthquake were first translated from the then Slovenian national currency (Tolar, SIT) to Euros (€) and then revalorized according to the data of the Statistical Survey of Slovenia (SI-Stat … 2012). Only then could they be compared to the data on the generalised market values of the properties that were obtained from the web application of the the Surveying and Mapping Authority

Figure 3: Real Estate Register provides generalised market property value of real estates in Slovenia (Internet 1).

of the Republic of Slovenia (Si: *register nepremičnin*) (Internet 1). The evaluation of real estate was made for all the territory of the Republic of Slovenia for the purposes of the taxation; the results of the evaluation are public (Figure 3). In order to obtain correct assessments, different models of real estate valuation according to the type of property were used to calculate their values (Prostor … 2012). If we compare these data with the data on actual damage, it is possible to produce assessments on the potential damage of future disasters (Mikoš 2012; see also Kumelj and Geršak 2011; Bründl et al. 2010).

We analysed the data on earthquake damage and generalised market value for 94 houses, i.e. app. 60% of houses in the settlement. Only properties with available data on damage as well as value could be assessed.

The damage on all houses in the village amounted to almost one third of the overall generalised market value (28%). The damage was about € 1,654,000, while the generalised market value of the properties was € 5,882,000.

The average property market value was € 62,582 and average damage caused by the 1998 earthquake was € 17,406. The minimum property market value was € 11,978 and the maximum € 265,477. The minimum damage caused by the 1998 earthquake was € 514 and the maximum as high as € 139,060. Average generalised property value is about € 380/m^2, while average damage was about € 100/m^2. The amount of damage per area unit depends on the number of floors in a building; in four-floor buildings it is almost a third greater than in single-floor buildings (Figure 5).

It should be noted that property value is positively correlated to the age of buildings ($r = 0.72$, $p = 0.0005$) and to the type (stone, brick, concrete) of building material ($r = 0.29$, $p = 0.0025$), while the correlation with the type of the building (individual, duplex, apartment block) is low and negative ($r = –0.12$, $p = 0.04$). Damage is positively correlated to age of buildings ($r = 0.29$, $p = 0.0025$) and with the type of building material ($r = 0.23$, $p = 0.0025$), but correlations were low. The older the building is, the higher is the expected damage potential. The damage was the highest in prefabricated buildings and the lowest in the buildings built of bricks (Figure 4).

Half of the buildings that were damaged by the earthquake were built before 1940, especially in the decades after WWI (1920–1930) and during and after WWII (1940–1950) (Figure 6). The damage caused by earthquake is generally higher for younger buildings (exceeding € 150/m^2) and lower for older buildings (in the range between 50 and € 100/m^2) (Figure 7).

*Table 1: The data used in the study (Legend: * Building material: (1) brick, (2) concrete, (3) stone, (4) other materials, (5) combination of different materials, (6) prefabricated materials; ** Type of the building: (1) individual building, (2) duplex, (3) semi-detached building, (4) edge semi-detached building.*

Value of the property (€; 2012)	Damage (SIT; 1998)	Damage (€; 1998)	Damage (€, revalo-rised; 2012)	Area of the property (m^2)	Generalised market value per m^2	Damage per m^2	Damage / Generalised market value	Number of floors	Age of the building	Building material*	Type of the building**
11,978	1,045,700.31	4,364	7,881	94.8	126	83	65.8	2	87	3	1
13,079	1,608,543.24	6,712	12,122	125.1	105	97	92.7	2	112	3	1
18,550	666,734.05	2,782	5,025	60	309	84	27.1	2	92	3	1
19,647	1,623,132.90	6,773	12,232	108.6	181	113	62.3	2	92	3	4
21,067	979,888.55	4,089	7,385	104.8	201	70	35.1	2	91	3	4
22,331	2,528,300.82	10,550	19,054	202.7	110	94	85.3	2	71	8	1
23,925	2,113,916.18	8,821	15,931	91.4	262	174	66.6	2	92	3	3
24,379	2,156,990.06	9,001	16,256	122.3	199	133	66.7	3	122	3	1
25,171	2,016,721.39	8,416	15,199	119.4	211	127	60.4	2	85	3	1
25,716	2,280,241.49	9,515	17,185	96.9	265	177	66.8	2	91	3	2
26,360	236,600.40	987	1,783	77.9	338	23	6.8	2	112	3	3
26,815	5,218,939.40	21,778	39,332	239.5	112	164	146.7	3	64	8	1
28,124	400,387.69	1,671	3,017	90.5	311	33	10.7	2	112	3	1
29,702	991,638.39	4,138	7,473	149.6	199	50	25.2	2	181	3	3
30,770	1,109,090.01	4,628	8,358	132.4	232	63	27.2	2	90	3	1
31,528	994,669.98	4,151	7,496	99.7	316	75	23.8	2	65	3	4
32,159	2,943,039.00	12,281	22,180	189.3	170	117	69.0	2	132	3	1
32,161	2,071,418.07	8,644	15,611	96.1	335	162	48.5	2	112	3	3
33,117	299,570.81	1,250	2,258	73.4	451	31	6.8	3	94	5	1
33,654	609,819.21	2,545	4,596	208.5	161	22	13.7	2	90	3	1
33,837	1,630,877.23	6,806	12,291	124	273	99	36.3	2	142	8	1
35,092	361,626.65	1,509	2,725	130	270	21	7.8	2	112	3	1
36,374	2,523,420.08	10,530	19,017	89.9	405	212	52.3	2	92	3	1
36,604	1,260,755.64	5,261	9,501	122.6	299	77	26.0	2	89	3	1
36,975	2,333,418.70	9,737	17,585	77.5	477	227	47.6	2	2	7	3
37,864	2,238,165.91	9,340	16,868	102.2	370	165	44.5	2	112	3	1

38,828	299,438.44	1,250	2,257	114.1	340	20	5.8	2	77	3	2
38,932	1,104,702.01	4,610	8,325	103.2	377	81	21.4	2	71	8	1
39,097	3,486,596.00	14,549	26,276	164.2	238	160	67.2	2	92	3	1
39,743	1,568,730.33	6,546	11,822	122.2	325	97	29.7	2	81	3	1
40,007	1,727,772.00	7,210	13,021	121.2	330	107	32.5	3	100	3	1
40,045	1,006,136.21	4,199	7,583	112.8	355	67	18.9	2	71	8	1
40,406	497,485.54	2,076	3,749	177.2	228	21	9.3	2	91	3	1
40,466	2,373,462.00	9,904	17,887	130	311	138	44.2	1	90	3	1
41,724	1,476,308.33	6,161	11,126	112	373	99	26.7	2	92	3	1
41,906	916,217.06	3,823	6,905	112.7	372	61	16.5	2	71	8	1
42,053	436,306.89	1,821	3,288	148.4	283	22	7.8	2	87	8	2
42,554	1,363,558.39	5,690	10,276	152.2	280	68	24.1	2	90	3	1
43,424	405,867.00	1,694	3,059	104	418	29	7.0	2	72	3	1
43,873	85,236.36	356	642	135	325	5	1.5	2	84	3	3
45,943	2,281,065.23	9,519	17,191	200.1	230	86	37.4	2	92	3	1
46,724	682,714.63	2,849	5,145	148.2	315	35	11.0	2	71	5	1
47,486	4,074,350.48	17,002	30,706	133	357	231	64.7	3	71	8	1
48,063	858,575.88	3,583	6,470	231	208	28	13.5	2	142	3	1
48,107	2,459,160.25	10,262	18,533	181.6	265	102	38.5	2	72	2	1
48,520	402,080.99	1,678	3,030	180.5	269	17	6.2	3	65	3	4
49,455	1,416,330.00	5,910	10,674	154.8	319	69	21.6	2	71	8	1
49,641	1,933,878.49	8,070	14,574	140.4	354	104	29.4	2	90	3	1
50,366	1,785,658.90	7,451	13,457	157.6	320	85	26.7	2	71	3	1
51,160	1,475,163.78	6,156	11,117	201.1	254	55	21.7	2	38	1	1
51,357	711,573.03	2,970	5,363	147.6	348	36	10.4	2	71	8	1
51,366	1,698,383.00	7,087	12,800	102.8	500	125	24.9	2	90	3	1
52,789	2,773,491.57	11,574	20,902	145.1	364	144	39.6	0	17	8	1
54,107	1,853,291.36	7,734	13,967	198.5	273	70	25.8	2	143	3	1
54,150	2,787,939.06	11,634	21,011	260.8	208	81	38.8	2	64	3	1
55,699	1,104,886.49	4,611	8,327	137.3	406	61	14.9	3	71	5	4
59,562	2,500,744.71	10,435	18,846	170.7	349	110	31.6	2	84	3	3
59,941	2,279,344.19	9,512	17,178	194.5	308	88	28.7	2	92	3	1
61,715	1,291,331.26	5,389	9,732	108.8	567	89	15.8	2	5	7	1
62,701	2,397,382.00	10,004	18,067	158	397	114	28.8	2	71	3	3

62,875	2,315,758.41	9,663	17,452	192.7	326	91	27.8	2	74	3	1
63,637	275,074.81	1,148	2,073	219.9	289	9	3.3	3	62	1	4
65,143	6,084,309.53	25,389	45,853	173.2	376	265	70.4	3	44	1	1
65,561	1,684,650.90	7,030	12,696	74.8	876	170	19.4	2	5	1	1
67,009	934,210.88	3,898	7,040	316	212	22	10.5	3	116	3	1
67,586	337,831.42	1,410	2,546	83.1	813	31	3.8	2	6	7	3
69,640	906,040.46	3,780	6,828	216.8	321	31	9.8	2	82	8	1
69,980	1,217,998.84	5,083	9,179	108.4	646	85	13.1	2	5	7	1
71,969	3,619,028.00	15,102	27,274	164.7	437	166	37.9	2	7	5	1
72,597	104,950.35	438	791	160.5	452	5	1.1	2	49	3	1
77,733	5,315,923.00	22,183	40,062	166.3	467	241	51.5	2	9	8	1
78,219	883,490.33	3,687	6,658	89.9	870	74	8.5	2	6	7	1
79,660	1,839,497.05	7,676	13,863	100	797	139	17.4	2	8	7	1
82,296	2,314,209.69	9,658	17,441	200	411	87	21.2	3	100	5	1
84,390	369,448.00	1,542	2,784	271.4	311	10	3.3	4	92	3	1
84,907	150,349.11	627	1,133	170.8	497	7	1.3	2	32	1	1
87,780	4,480,682.00	18,698	33,768	128.3	684	263	38.5	2	33	8	1
88,445	1,823,106.77	7,608	13,739	119	743	115	15.5	2	5	7	1
89,948	2,436,625.80	10,168	18,363	113.6	792	162	20.4	2	3	7	1
94,283	7,593,163.00	31,686	57,224	127	742	451	60.7	2	7	7	1
99,186	4,035,074.00	16,838	30,410	144.1	688	211	30.7	2	6	1	1
103,393	11,434,380.04	47,715	86,173	309	335	279	83.3	3	92	5	1
105,829	2,939,042.96	12,264	22,150	151.7	698	146	20.9	3	5	7	1
106,102	1,664,509.79	6,946	12,544	174.4	608	72	11.8	3	6	2	1
107,868	7,878,468.00	32,877	59,375	232.1	465	256	55.0	4	61	5	3
108,848	68,255.02	285	514	402.7	270	1	0.5	3	71	3	3
109,251	2,985,842.46	12,460	22,502	179.4	609	125	20.6	3	6	5	1
116,113	13,035,357.00	54,396	98,238	327.6	354	300	84.6	3	12	8	1
119,909	207,282.61	865	1,562	239.1	502	7	1.3	3	27	1	1
120,427	1,587,691.48	6,626	11,965	253	476	47	9.9	2	66	3	1
192,446	5,895,649.95	24,602	44,431	478.1	403	93	23.1	2	152	3	1
203,090	3,132,530.67	13,072	23,608	700	290	34	11.6	3	22	8	1
252,267	18,451,968.00	76,999	139,060	1250.1	202	111	55.1	3	71	1	1
265,477	3,348,765.00	13,974	25,237	330.7	803	76	9.5	2	6	7	1

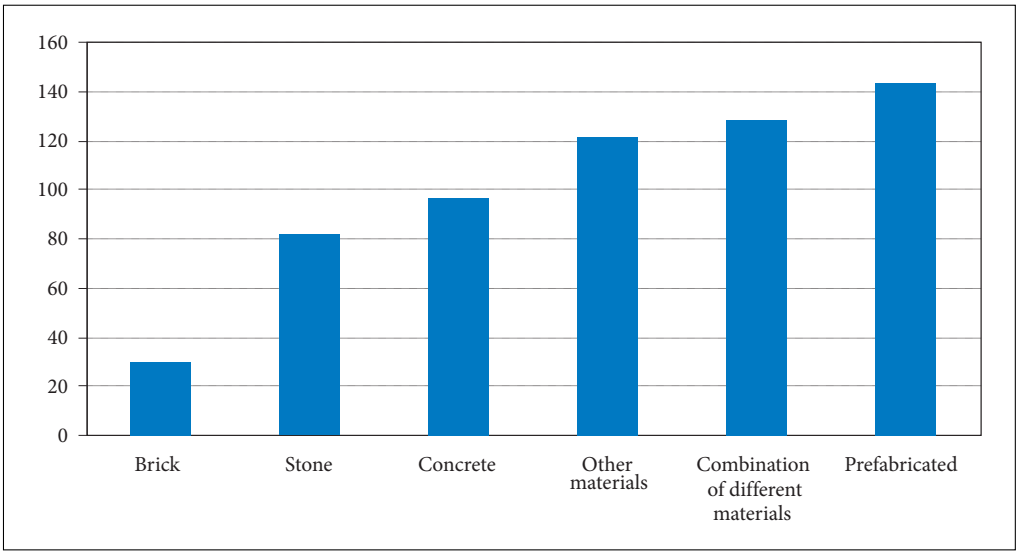


Figure 4: Damage to buildings (€/m²) according to type of building material.

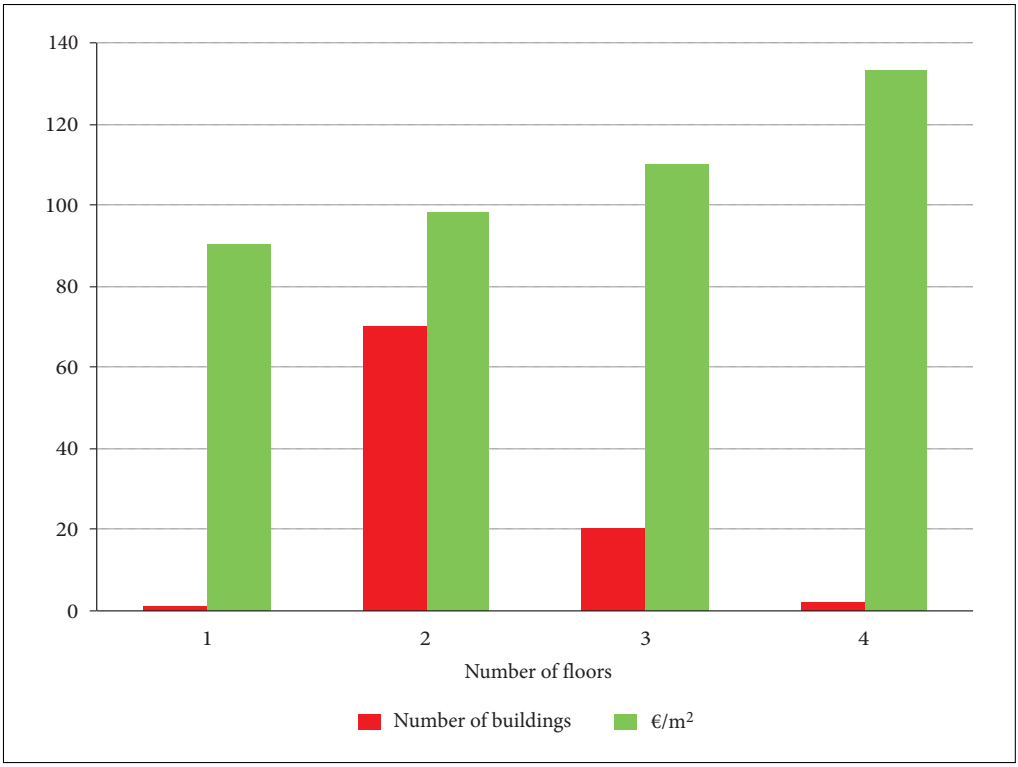


Figure 5: Number of buildings according to damage per number of floors in the building.

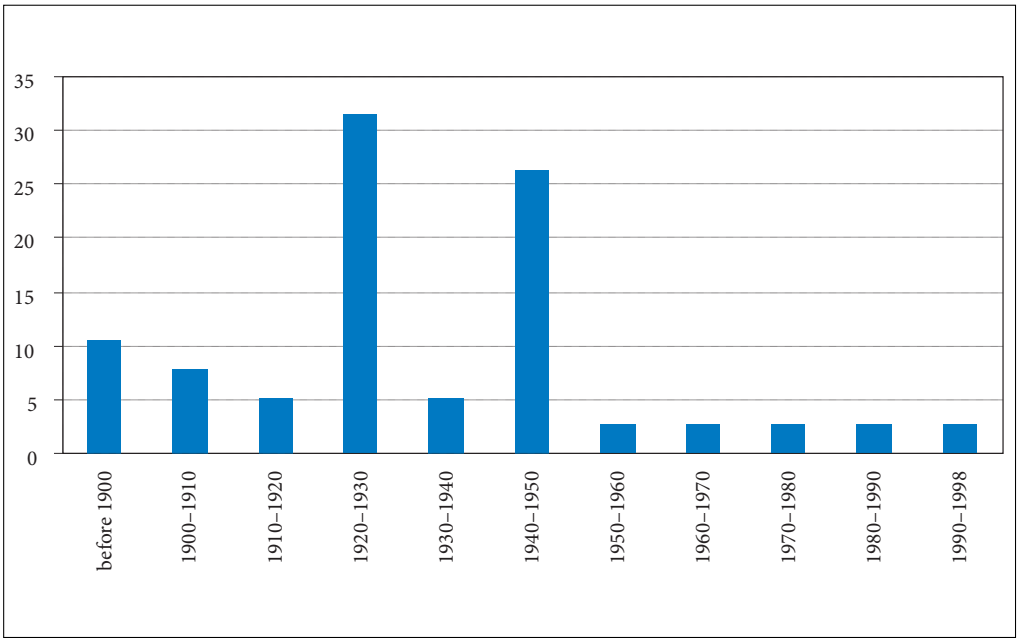


Figure 6: Share (%) of buildings, damaged by the 1998 earthquake, according to their age.

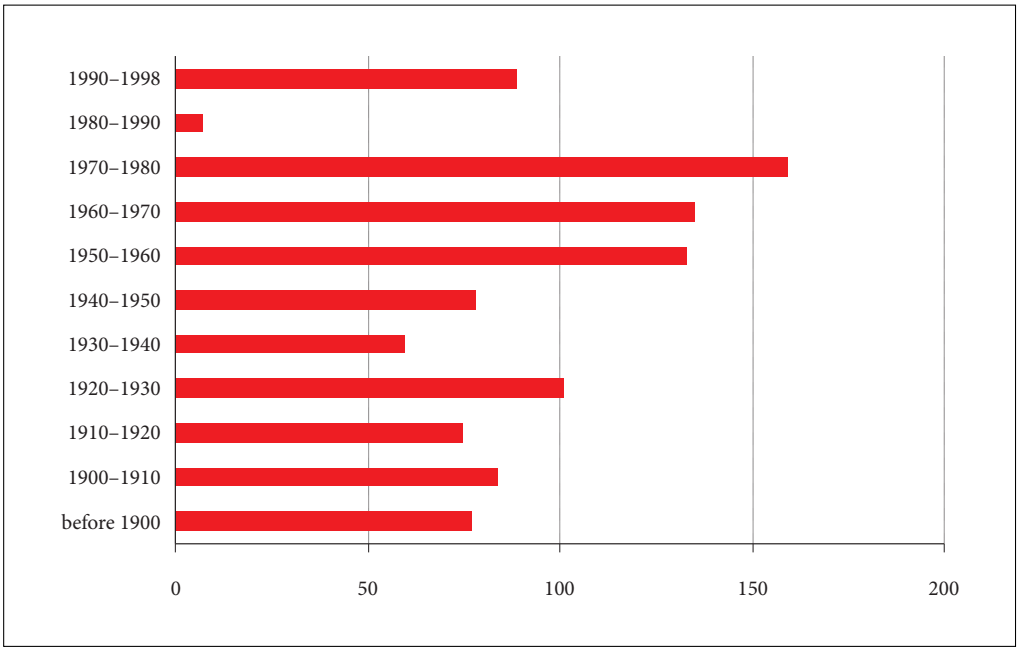
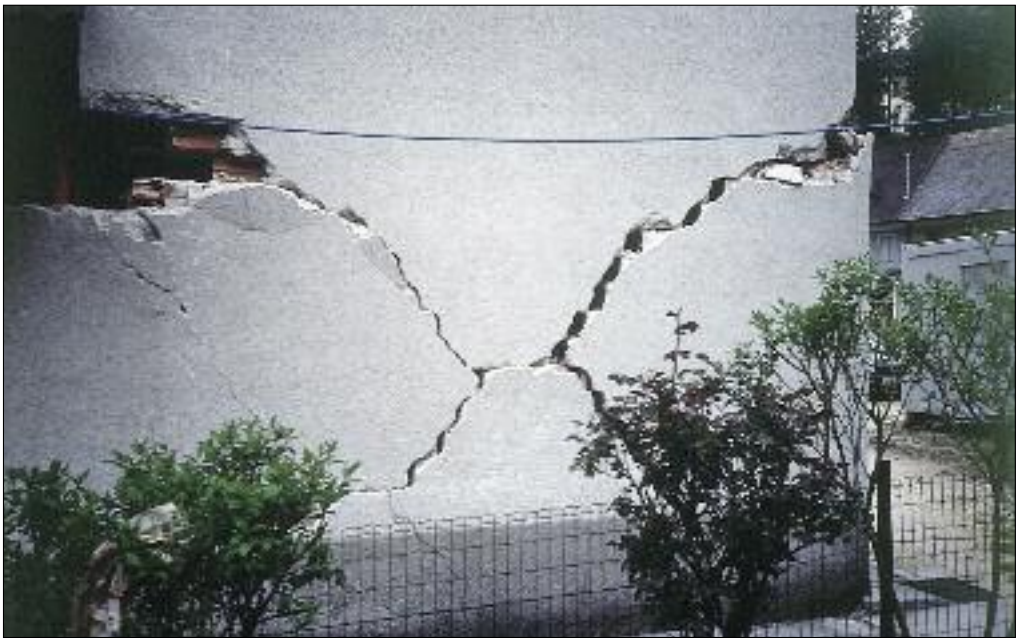


Figure 7: Damage per square metre (€/m²) according to age of the buildings, damaged by the 1998 earthquake.



MATIJA ZORN

Figure 8: Typical damage on buildings caused by the 1998 earthquake in the town of Bovec.

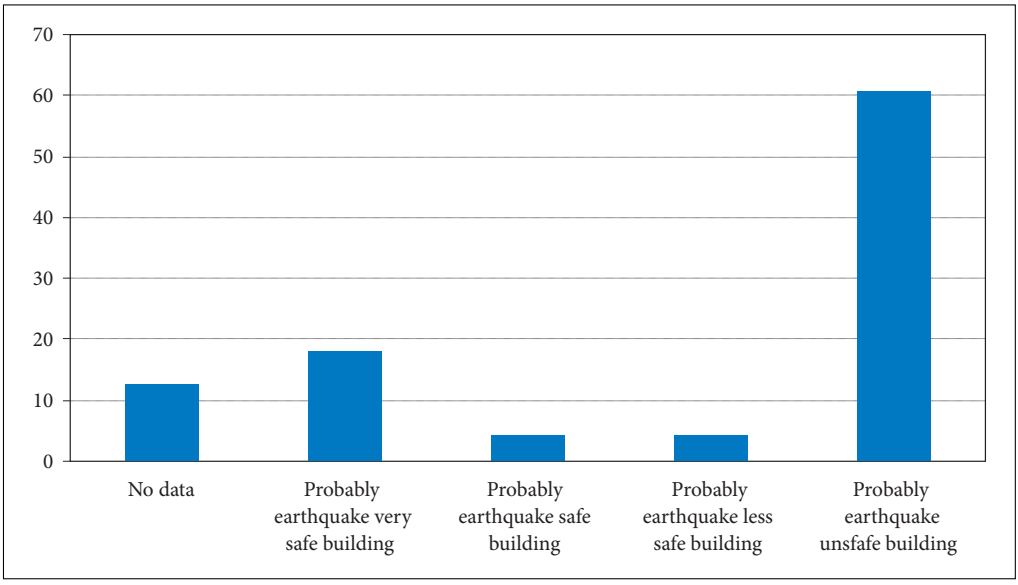
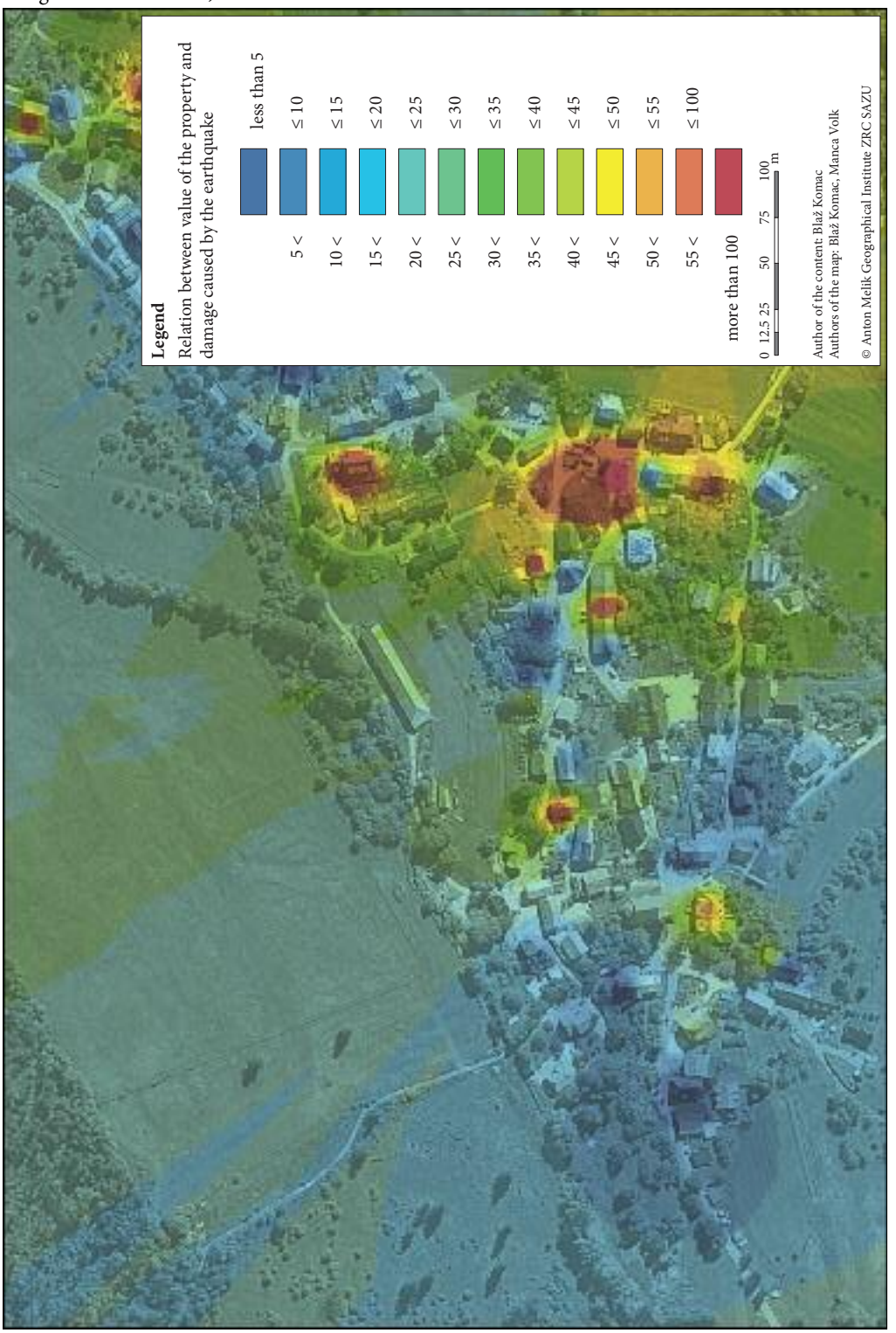


Figure 9: Assessment of buildings in the Čezsoča village according to their earthquake safety was done by the method proposed by Kilar and Kušar (2009).

Figure 10: The relation between value of the property and damage caused by the 1998 earthquake in the Čezsoča village. ►


Legend
Relation between value of the property and damage caused by the earthquake
less than 5
≤ 10
≤ 15
≤ 20
≤ 25
≤ 30
≤ 35
≤ 40
≤ 45
≤ 50
≤ 55
≤ 100
5 <
10 <
15 <
20 <
25 <
30 <
35 <
40 <
45 <
50 <
55 <
more than 100
0 12.5 25 50 75 100 m
Author of the content: Blaž Komac
Authors of the map: Blaž Komac, Manca Volk
© Anton Melik Geographical Institute ZRC SAZU

5 Conclusion

In many regions natural disasters are a geographical constant (Komac 2009); therefore, they can be understood from both natural-geographical and social-geographical perspectives. Studying natural disasters may be considered one of the key-geographical topics. Globally, natural disasters have claimed an average of 75,000 lives a year over the past decade and caused approximately $100 billion of damage a year (Zorn and Komac 2011, 27). In Slovenia, damage due to natural disasters amounted to an average of 0.37% of annual GDP during this period. A large part of this figure is due to earthquakes.

Earthquakes are strong natural processes that may hit large areas and affect large number of people. In the territory of Slovenia, large earthquakes were recorded in 1348, 1511, 1895, 1917, 1956, 1963, 1974, 1976, 1977, 1982, 1995, 1998, 2004 and 2005. In the Upper Soča Valley, seven strong earthquakes (1918, 1942, 1944, 1968, 1976, 1998, 2004) were recorded in the 20th century alone (Vidrih 2008).

Even though earthquakes are not unexpected, people rarely prepare for them with the proper reconstruction of their buildings in advance. The dwellings are usually reconstructed after larger events. In Slovenia, this was supported by state financing in 1976, 1998, and 2004 (Pipan 2011).

On the example of the 1998 earthquake we showed that it is possible to assess the damage on the basis of available data which was done by the method proposed by Kilar and Kušar (2009; Figure 9) and with the help of an open-access database (the Real Estate Register) of the the Surveying and Mapping Authority of the Republic of Slovenia. It is shown that damage depends most on the age of buildings. This information is partly due to the characteristics of the property value model and partly due to the relation between age of the building and the quality of building.

In the modern world, in which capital plays a key role, good knowledge of damage costs is crucial in advocating prevention. According to an estimate by the World Bank and the U.S. Geological Survey, the global economic damage caused by natural disasters during the 1990s could have been $280 billion lower if $40 billion (only 14%) had been invested in advance in natural disaster prevention and preparedness (Guha-Sapir, Hargitt and Hoyois 2004).

In Slovenia, only scant attention is paid to prevention in natural disaster management, despite the fact that the 2002 Water Act established the obligation to prepare hazard maps and establish damage potential for hydro-geomorphological natural disasters. Our aim is to put an increased emphasis on prevention with the aid of the Real Estate Register, which was established in 2011 and provides data on real estate value. The registry makes it possible to make new and more realistic calculations and models (Figure 10) of potential damages for future natural disasters on the national, regional or local scales.

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ARTICLES

ENVIRONMENTAL AWARENESS IN SLOVENIA THROUGH RESIDENTS' RELATIONSHIP TO WASTE

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ABSTRACT
Environmental awareness in Slovenia through residents' relationship to waste
The development of ecological thinking among Slovenian geographers goes back less than half a century. A high level of environmental awareness is a condition for people's environmentally friendly behavior. In turn, proper informedness about the environment is a precondition for awareness, and it seems that in Slovenia in the last decade people's informedness about environmental problems and sustainable living has increased. People are expressing greater inclination toward environmental protection, but for only a minority is a healthy and orderly living environment also a value that they are really willing to do something for in practice.

KEY WORDS
informedness, awareness, value, environmental protection, waste, Slovenia

IZVLEČEK
Okoljska ozaveščenost v Sloveniji skozi odnos prebivalcev do odpadkov
Razvoj okoljske misli med slovenskimi geografi sega manj kot pol stoletja v preteklost. Visoka okoljska ozaveščenost je pogoj za okolju prijazno vedenje ljudi. Ustrezna informiranost o okolju pa je predpogoj za ozaveščenost in zdi se, da smo v Sloveniji v zadnjem desetletju povečali stopnjo informiranosti o okoljskih problemih in trajnostnem načinu življenja med ljudmi. Ljudje na ravni stališč izražajo večjo naklonjenost do varstva okolja, vendar pa le manjšini pomeni zdravo in urejeno življenjsko okolje tudi vrednoto, za katero so resnično pripravljeni nekaj narediti.

KLJUČNE BESEDE
informiranost, ozaveščenost, vrednota, varstvo okolja, odpadki, Slovenija

The article was submitted for publication on August 24, 2011.

1 Introduction

The industrial revolution introduced not only products that made people's lives easier, but also large-scale pollution. By definition, pollution is the human introduction of substances and energy into the environment that likely represent a threat to human health, that are harmful to living organisms and ecosystems, that cause damage to buildings or infrastructure, or that interfere with the proper use of the environment (Holdgate 1979). It is too late if one starts tackling these problems and seeking solutions only when they become obvious (Waring and Glendon 1998). With suitable environmental awareness, people can significantly reduce intentional environmental damage.

Environmental protection, as understood today, is activity by human society characteristic from the beginning of the second half of the twentieth century onwards. In the most general sense, this is a concern for preserving the still unspoiled environment and for improving the environment that is already affected, and perhaps even overburdened. It is primarily based on the changing relationship of man to the environment. The history of geographical research on environmental pollution and on influences and consequences has been brief in the global sense, and even more so in Slovenia.

In the early 1970s, Slovenian geographers started emphasizing the significance of environmental protection and its features. Initially they drew attention to excessive environmental contamination by individual processes (Orožen Adamič 1970; Zelena … 1972). Later Radinja (1974) emphasized protection and management of the entire environment with its natural and manmade elements. Ilešič (1979) was one of those to primarily emphasize nature protection within environmental protection. Plut's book *Slovenija – zelena dežela ali pustinja* (Slovenia: A Green Land or a Desert; Plut 1987) draws attention to deterioration of the environment in Slovenia and to the spatial-ecological contradictions of social development. A year later the same author published the volume *Belokranjske vode* (Waters of White Carniola; Plut 1988), which comprehensively presented the problem of pollution of the Krupa River with polychlorinated biphenyls (PCBs). Informing the public of this pollution problem in an important water source and along with this the threat to human health was the greatest milestone or trigger for starting to draw public attention to environmental pollution in Slovenia (Polajnar Horvat 2009). At the end of the twentieth century, Slovenian geographers started emphasizing the inevitable transition from an anthropocentric understanding of the environment to an eco-centric one as well as sustainable development (Plut 1997), and this idea is still being followed today.

An especially important link in environmental protection is people, with their behavior and relationship to the environment. Environmental awareness depends on many factors, the influence of which is exceptionally complex because of the way they interact with one another and exert joint effects. The factors that affect environmental consciousness and the human relationship to the environment were first dealt with by Špes (1998), the first female Slovenian geographer to study environmental degradation as a factor of urban landscape differentiation and the influences of a degraded environment on people. Šterbenk (1998) wrote about environmental protection and environmental awareness among the population living in a coal-mining area. In recent years, Smrekar (2006; 2011) has dealt with seeking an environmentally aware body that could represent a core for expanding the idea of environmental protection as a whole and also its individual features.

With economic growth, the use of natural resources also increases, resulting in increased production of larger quantities of waste. Although waste is an important source of pollution and a threat to all elements of the environment, normative regulations for waste management have long been one of the most poorly regulated areas of environmental protection in Slovenia. The reasons can be sought in the social relationship to waste and the way it is handled (Viler Kovačič 2001). The situation has been improving, in any case, since 1993, when the Environmental Protection Act was adopted. The implementation of this law provided a new approach to solving the problem of environmental protection in general and also the problem of waste management, which is increasingly more pressing. With acces-

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Figure 1: Illegal dumps remain an unresolved environmental problem in Slovenia.

sion to the European Union, the legislative framework was substantially improved. In any case, this is not sufficient; all stakeholders must be informed, educated, and made aware.

Approximately seven million tons of waste was produced in Slovenia in 2008, of which 13% was municipal waste, in which removal (dumping) is still the most common form of treatment. In 2008, 29% of municipal waste was reprocessed; the majority of this was recycled (95%). The quantity of municipal waste collected from 2003 to 2009 increased from 402 kg per person to 449 kg per person, which was somewhat less than in 2008 (453 kg), when the peak amount to date was recorded. Despite the increase in the quantity of municipal waste produced, Slovenia is still considerably below the European average because in 2007 the 27 EU countries produced an average of 522 kg of waste per person. In the majority of these countries the quantity of municipal waste is growing (Internet 1).

A very pressing, unsupervised, and still almost completely untamed problem is that of illegal dumps (Figures 1 and 2). In 2010, the society Ecologists without Borders prepared the first comprehensive digital list of illegal dumps in the entire country, and updated this in 2011, recording 10,883 with a total volume of 283,190 m^3 covering 379.9 ha (Kranjc 2011). Those carrying out the survey estimated that approximately two-fifths of this waste is construction material. Construction waste is often a time bomb because it also conceals hazardous waste (e.g., roofing and material for wiring, plumbing, and fixtures) that constitute a significant direct threat to the environment, especially to soil and water. In 2010, 270,000 people participated in a volunteer effort that removed 70,000 m^3 of primarily municipal waste from 7,000 dumps. This is the equivalent of ten soccer fields filled to a height of one meter (Smrekar 2010). They hardly dealt with construction waste at all, and it is the illegal dumping of construction waste that represents one of the major problems that is currently nearly impossible to solve.

In the EU recently, in addition to the effective collection and separation of municipal waste, the waste-management hierarchy has seen increasingly greater emphasis on preventing the production of waste. In Slovenia this is still in the initial stage because changes are necessary in both the manufacture of products as well as in their sale and consumption, which is a condition for suitable environmental awareness among the population.

We carried out a waste-related study in four selected municipalities to determine how many people are environmentally friendly and to what degree. Often the population's lack of environmental awareness is shown by the many illegal dumps threatening the environment.

2 Methods and areas

The findings presented in this article are the result of an extensive survey (Smrekar and Breg 2008), which was based on fieldwork carried out in 2008. The subjective method of direct interviewing answers many questions for us: how the local population understands the environment it lives in, degrades it, perceives its degradation, accepts changes, and is willing to react to them and actively contribute to improving the state of the environment.

This article presents questions at three levels (from the abstract to actual practice) because we wished to cancel out the tendency toward socially desirable answers that can often be seen at lower levels. Methodological checking by sociologists shows that those interviewed often report a higher frequency of desirable behavior (e.g., going to libraries and voting) than in reality, or a lower frequency of behavior that could damage their image (e.g., drinking alcohol; Malnar 2002). For the sake of comparison and presenting the findings in a broader European context, part of the questions were taken from a questionnaire by the project International Social Survey Program: Environment (ISSP 2002).

The adult population included in the survey came from four regions; 400 surveys were conducted in the City of Ljubljana, and 200 each in the municipalities of Bohinj, Logatec, and Sežana. Illegal dumping is a major problem in the City of Ljubljana, a moderate one in the municipalities of Sežana and Logatec, and negligible in Bohinj. The entire sample therefore included 1,000 people. Sampling is necessary because it is not realistic to try to interview the entire population (Kalton and Vehovar 2001). Each municipality was divided into several parts and a planned number of interviews conducted in them, which avoided the problem of excessive spatial concentration.

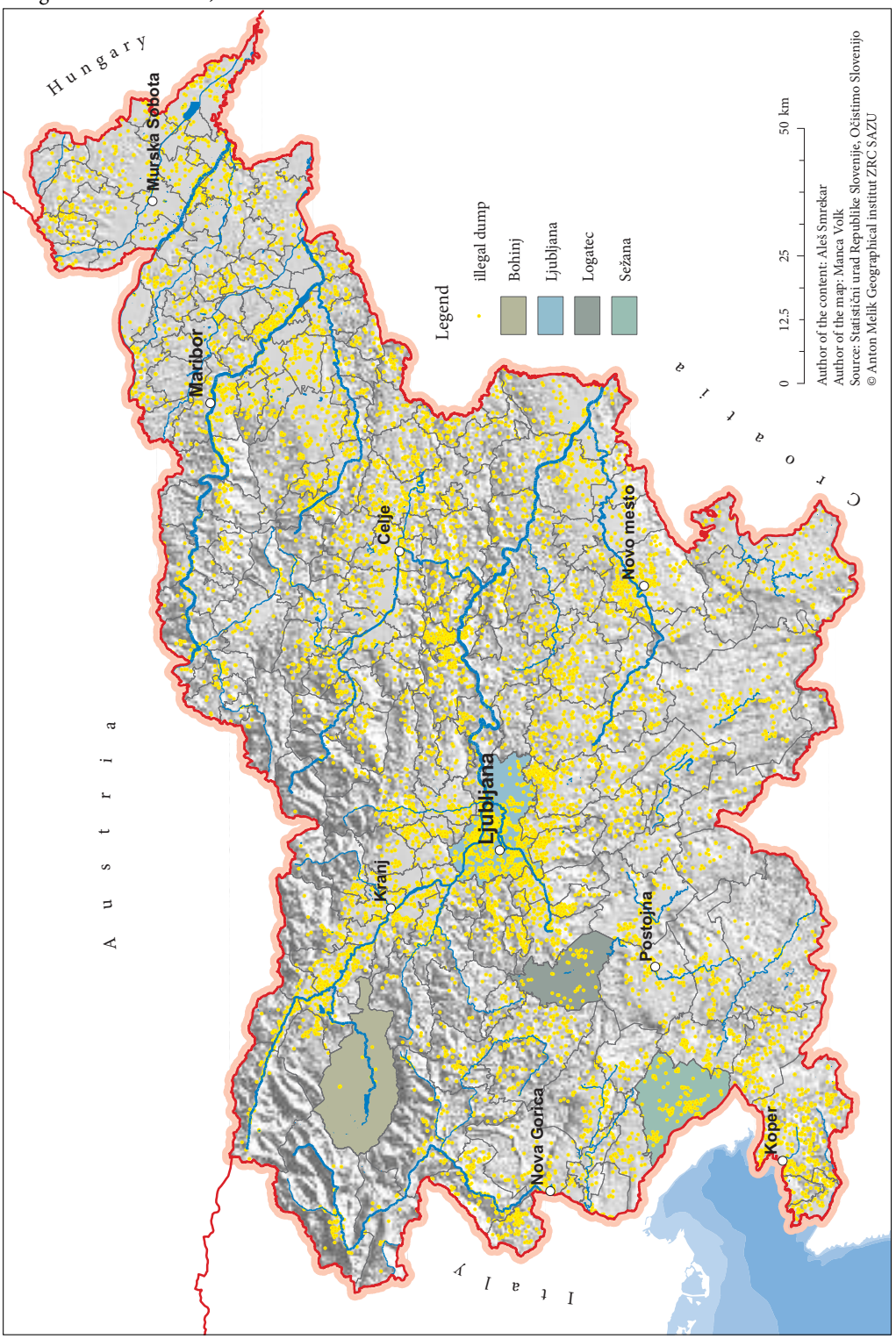
In selecting our interviewees, we followed three demographic criteria: age, sex, and education. Based on these criteria, we achieved a representative sample. The results of the field interviews were entered into a digital database and statistically processed using Excel and SPSS.

The City of Ljubljana largely lies at the intersection of Alpine hills and a valley. This is the most populous municipality in Slovenia. The municipal center, Ljubljana, is also the capital of the country. The municipality is also important for the surrounding countryside from the perspective of business, education, culture, and administration.

The Municipality of Logatec lies in the heart of Inner Carniola (Si. *Notranjska*) at the intersection of the Alpine and Dinaric areas. Its development is driven by the wood, paperboard, and other industries and services. Much of the population is young because many of the settlements are increasingly bedroom communities somewhat over 30 kilometers from Ljubljana.

The majority of the Municipality of Bohinj lies in the heart of the Julian Alps, in Triglav National Park, the only national park in Slovenia. Most of the settlements are in the two Bohinj valleys, with a total length of just over 20 km and a width of no more than 5 km. The main economic activity is tourism (e.g., walking, hiking, swimming in the lake, and skiing) with 300,000 overnight stays per year.

Figure 2: Selected municipalities and locations of illegal dumps in Slovenia. ►


Hungary
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Celje
Novo mesto
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Nova Gorica
Koper
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Italy
Croatia
Legend
illegal dump
Bohinj
Ljubljana
Logatec
Sežana
0
12,5
25
50 km
Author of the content: Aleš Smrekar
Author of the map: Manca Volk
Source: Statistični urad Republike Slovenije, Očistimo Slovenijo
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The Municipality of Sežana is on the border with Italy; in addition to the Karst-Mediterranean character of the land, this location offers good development potentials, especially for tourism (e.g., casinos and the stud farm in Lipica). The population is increasingly aging.

Table 1: Municipalities studied in figures (Internet 2; Internet 3).

Data / municipality	Bohinj	Ljubljana	Logatec	Sežana	Slovenia
Area (km^2)	334	275	173	217	20,273
Population (2009)	5,263	278,314	12,956	12,828	2,042,335
Number of people employed	2,222	117,968	5,859	5,697	858,171
Average gross monthly salary per employee (€)	1,081.91	1,727.99	1,326.58	1,363.36	1,438.96
Number of illegal dumps	9	1,027	50	167	10,883

3 Willingness to participate in environmental conservation

This article presents only part of a broader study (Smrekar and Breg 2008) that answers questions about the population's relationship to the environment and its behavior in handling waste. Three levels of questions were used to present the difference between environmentally (un)friendly behavior in the abstract and in reality.

In principle, people support environmental protection without reservations, and so we gave those polled very general and agreeable statements. We intentionally wrote grammatically negative statements, such as »There's no point in trying your best to take care of the environment if others don't do so too« (Figure 3). The average answer scored 2.1. If the results of this statement are converted into positive

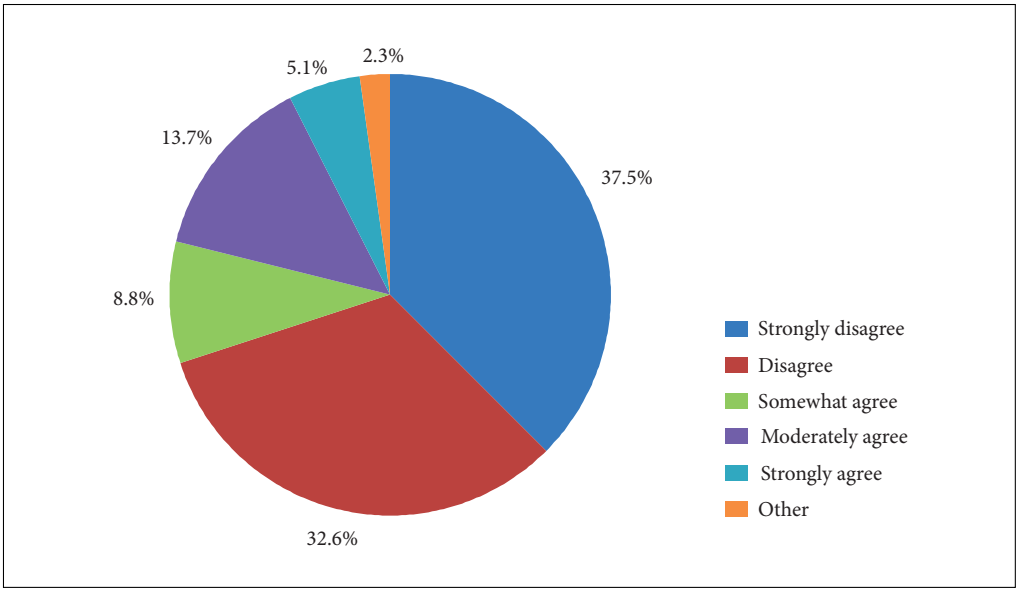

Figure 3: Respondents' agreement with the statement: »There's no point in trying your best to take care of the environment if others don't do so too« (n = 1000).

responses, this yields a score of 3.9 on a five-point scale, which in principle shows very good support for protecting the environment. The relative majority, a full 38.4%, chose the response »Strongly disagree – 1,« followed by »Disagree – 2« with 33.0%, in contrast to only 5.1% with »Strongly agree – 5.«

According to the results of the survey, the most environmentally friendly attitude was expressed in Logatec (1.7), followed by Ljubljana (2.1) and Sežana (2.3); the results for Bohinj stood out somewhat, at 2.6.

In comparing the responses »Strongly disagree – 1« and »Disagree – 2« between groups with various levels of education, we noted a considerable similarity in the responses from the population with an elementary school, vocational, and secondary-school education (approximately two-thirds of responses at 1 and 2), whereas the most highly educated stood out significantly (approximately three-quarters).

It is recognized that in Europe in general as well as in Slovenia, the level of environmental informedness has been growing over the years, and so it is not surprising that those surveyed in the greater Ljubljana area in 2004 (Smrekar 2006) answered the same question at an average of 2.4, but four years earlier those surveyed across all of Slovenia (ISSP 2002) answered with an average of 3.1. The average of 14 European countries in the same survey (ISSP 2002) was closer to the results of the current study, with an average of 2.8, in which in comparison to Slovenia there was more »agreement« in Portugal (3.5) and Northern Ireland (3.2), and the same in Spain (3.1). This contrasted with the responses from the Finns (2.2.) and Swedes (2.4.), who »Disagree – 2.«

The question of respondents' willingness to pay a significantly higher price for various articles (Figure 4) in order to protect the environment was designed to determine people's willingness to actively take part in environmental protection through considerably higher financial contributions or through a decrease in their standard of living.

According to the results of the survey, payment would be fairly well accepted because the overall score was 3.0, with nearly one-third with the predominant answer »Neither willing nor unwilling – 3«. This was followed by the answers »Fairly willing – 4« with 27% of the responses and »Fairly unwill-

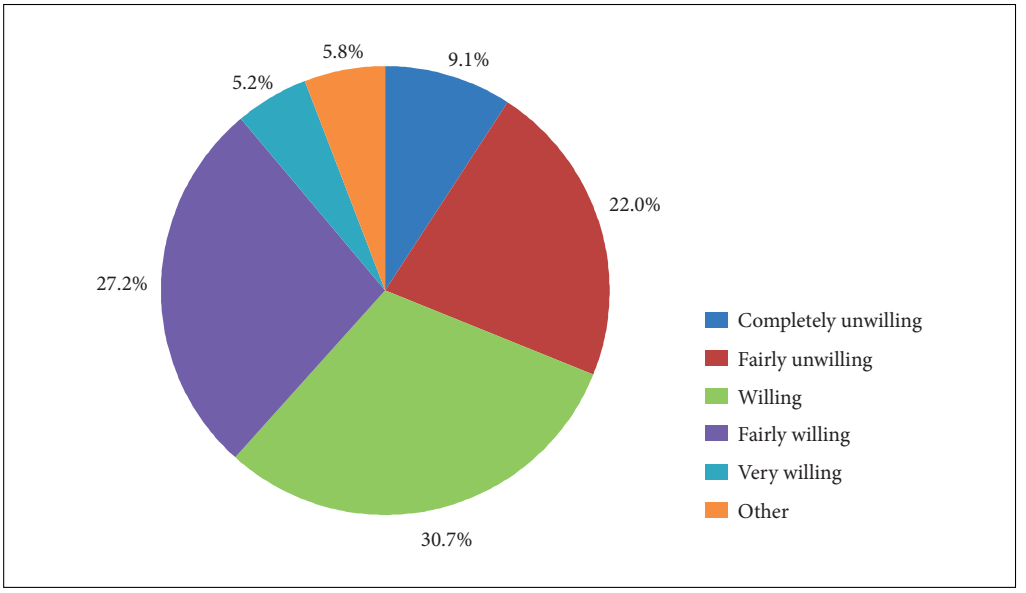

Figure 4: Willingness to pay a significantly higher price for various articles in order to protect the envronment (n = 1,000).

ing – 2« with 22% of the responses. Only 9% of respondents indicated that they were »Very unwilling – 1« to financially contribute to protecting the environment.

An examination of the regions showed that there was no significant difference between Logatec (3.1), Ljubljana (3.0), and Sežana (2.9), but the results from the Municipality of Bohinj (2.7) stood out somewhat in the negative sense.

Just as in the previous question, here there was a considerable similarity in the answers provided by those with primary-school (31.3%), vocational (31.1%), and secondary-school (28.3%) educations, with the answers »Very willing – 5« and »Fairly willing – 4.« For this question, those with a tertiary education showed considerably greater willingness (39.6%).

The findings of this study deviate insignificantly little from the survey results based on a sample from the greater Ljubljana area (2.8; Smrekar 2006) and also from the survey results based on a sample covering all of Slovenia and a sample of 14 European countries from 2000 (ISSP 2002), with scores of 3.2 and 3.0, respectively. People were least willing to pay a significantly higher price for articles in Portugal (2.5), the Czech Republic (2.7), and perhaps somewhat surprisingly Finland (2.6), and the most willing in the Netherlands (3.5) and surprisingly, in comparison with Finland, in Norway (3.3).

Nearly two-thirds of Ljubljana residents in 2004 (Smrekar 2006) believed that the state (72.8%) was the body that the population most expected to collect sufficient money for proper environmental management. The same respondents also recognized businesses (68.8%) that threaten the environment as significantly more appropriate for providing funds than the population (21.1%) living and working in the local environment.

We presented the respondents with the Foundation for Cleaning Up Illegal Dumps, which wants to improve the state of the environment in their area. The most urgent cases of illegal dumps were presented, which need to be cleaned up as soon as possible in order to prevent contamination of the groundwater, soil, and vegetation, and to protect human health. The funding for these programs would be collected through a fixed surcharge on electricity bills two months after the survey was conducted, in which the charge would appear as an independent item on the bill. Power companies, as uninvolved

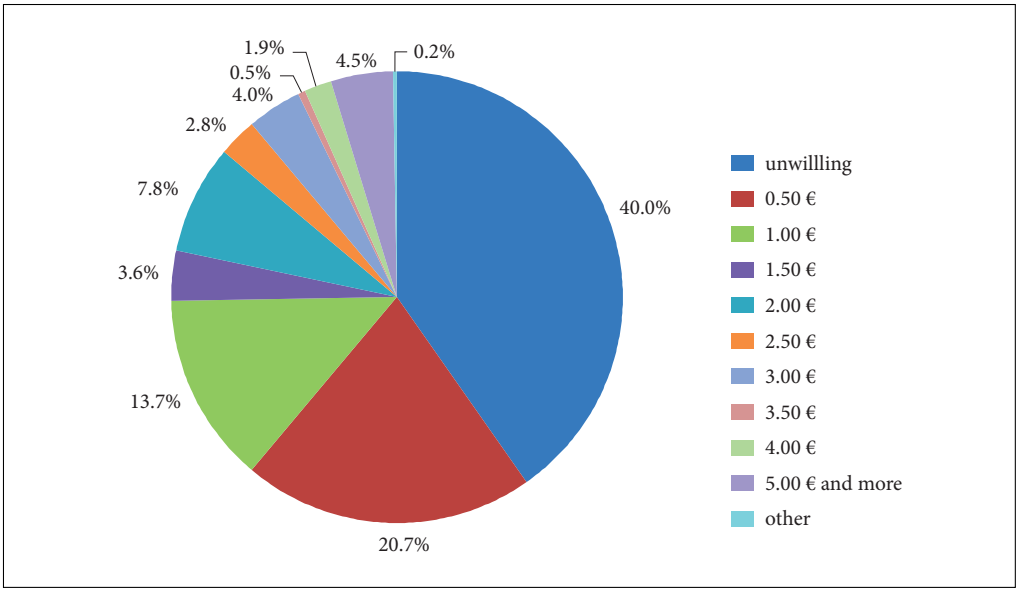

Figure 5: Willingness to pay the foundation the highest monthly contribution to clean up illegal dumps (n = 1,000).

organizations that the foundation would conclude an agreement with, would transfer the money collected to the Foundation for Cleaning Up Illegal Dumps as a non-profit fund, which would use all of the money collected exclusively for solving these issues. Of course, this was a fictitious organization because we believed that only in such a convincing and clear way would it be possible to measure people's actual willingness to help rescue an increasingly threatened environment. The questions connected with the foundation were so convincing and realistically composed that none of the 1,000 respondents expressed any doubt about the reality of this fund.

We were interested in whether those surveyed were willing to pay € 0.50 per month to solve these issues. Nearly three-fifths (59.5%) decided in favor of such a negligible amount. However, the differences between the areas examined are not surprising. People were least enthusiastic about the foundation in the Bohinj area (43% of them were willing to contribute € 0.50 per month), and they were more willing to do so in Sežana (52.0%) and Logatec (54%). At first glance, Ljubljana residents appear to be unusually generous, with almost three-quarters (72.5%) willing. However, the problem of illegal dumping affecting groundwater is so pressing in Ljubljana that the media have also dedicated much attention to this, which has had an effect on public opinion; on the other hand, in Bohinj this problem is almost never encountered.

We were also interested in whether respondents were also willing to make higher monthly contributions to the foundation than a merely symbolic € 0.50 per household: that is, € 1.00, € 2.00, and up to € 5.00 (Figure 5). A bit more than two-fifths of respondents (40.5%) immediately decided they were not willing to pay even € 0.50, and another one-fifth (20.7%) believed that € 0.50 per month was completely sufficient. Thus, just under two-fifths of those questioned (38.8%) were willing to make a contribution greater than the basic one, 21.5% were willing to pay € 2.00 or more, and only 13.7% of respondents were willing to pay € 2.50 or more. Only 4.5% of respondents were willing to make the highest suggested contribution.

The large difference between willingness to pay € 2.00 or € 2.50 shows that probably only a good tenth of respondents are actually willing to contribute something to protecting the environment. A similar breaking-point in willingness was already seen in 2004 (Smrekar 2006), when just over one-fifth (20.8%) were willing to contribute 500 Slovenian tolars (SIT; € 2.09) and less than one-tenth (7.7%) were willing to contribute 600 SIT (€ 2.50).

Of course, willingness to support the foundation also depends on the respondents' education. The most reserved were those with vocational (7.0%) and primary-school (7.5%) educations. Those with a secondary-school education were more inclined (10.9%), and there was a great difference for those with a tertiary education, who were most willing (72.6%).

4 Conclusion

We wanted to determine the size of the Slovenian population actually willing to pay for environmental protection as well as their education level and how much they are willing to contribute. To this end we carried out a study on a sample of 1,000 people living in four Slovenian municipalities. Some of them favor environmental protection in the abstract, but this still does not represent a value for them. A value is something more, in which a person recognizes a great principle value and therefore gives priority to it (Slovar … 1995). People that actually do something for the environment give priority to this kind of lifestyle.

The selected questions from the survey studied can be interpreted at multiple levels. At the first level, the responses remain at the level of individuals' opinions and primarily involve hypothetical behavior by those surveyed. In the majority of such surveys in Slovenia in the last decade, this amounts to between one-half and three-quarters of those surveyed, depending on the given situation in society and the way the question is posed. At the second level one finds answers that approach individuals'

actual behavior in society because we want to find out from them how prepared they are in reality to finance environmental projects, although the questions are still posed in a fictitious enough manner that the respondents are aware that they can provide socially desirable responses without any consequences. The share of such people in Slovenia has been about one-third for quite some time now. At the final, highest level, one encounters seemingly active environmental behavior. In this group one can include those that coordinate and promote the idea of environmentally friendly behavior. This includes between one-tenth and one-fifth of people in Slovenia. Within this framework is also the number of the participants in the one-day drive »Let's Clean Up Slovenia in One Day,« which took place across the entire country in 2010 and 2012.

In recent years, the Slovenian population has been increasingly informed about environmental problems and environmentally friendly behavior. It is therefore not surprising that in the responses at the first level one senses a palpably increased abstract striving for environmental protection, but at the third, actual level this is no longer perceived. Thus it is also possible to confirm in Slovenia that there is a very long path from increased environmental informedness to actual environmentally friendly behavior.

Our findings are also confirmed by the results of the European environmental survey (Internet 4). Protecting the environment has importance in theory in Slovenia because this is what 98% of respondents state, whereas the European average is three percentage points lower. On the other hand, providing more information about environmental issues would be effective for solving environmental problems for only 22% of respondents in Slovenia and 26% in Europe as a whole. These results confirm that residents of Slovenia are more environmentally aware than the European average in principle, but less so in their actual behavior.

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ARTICLES

SOCIO-ECONOMIC CHARACTERISTICS OF THE SLOVENE URBAN SYSTEM

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ABSTRACT
Socio-economic characteristics of the Slovene urban system
The aim of the article is to determine the basic social and economic characteristics of the Slovene urban system. With the quantitative analysis of social and economic variables for each of the 64 identified towns in Slovenia a classification, which elaborates the mentioned social and economic characteristics, was established. It was determined that it is possible, on the basis of our selection of variables, to form eight socio-economic settlement types, with each of them having distinctive characteristics. The analysis has also pointed out that the Slovene urban system can be regarded as a dynamic formation, with smaller settlements usually still being in the industrial developmental phase, while bigger cities have usually already transformed into tertiary centres, characteristic of the post-Fordist developmental paradigm.

KEY WORDS
urban geography, urban economy, urban system, socio-economic characteristics, economic transformation, multivariate analysis, Slovenia

IZVLEČEK
Družbenoekonomske značilnosti slovenskega urbanega sistema
Cilj članka je ugotoviti temeljne družbenoekonomske značilnosti slovenskega urbanega sistema. S kvantitativno analizo družbenih in ekonomskih spremenljivk za vsako izmed 64 identificiranih mest v Sloveniji smo ustvarili členitev, ki najbolje pojasnjuje te družbenoekonomske značilnosti. Ugotovili smo, da lahko na podlagi našega izbora spremenljivk ustvarimo osem družbenoekonomskih tipov mest, ki se medsebojno jasno razlikujejo. Analiza tudi pokaže, da je slovenski urbani sistem dinamična tvorba – skrajno poenostavljena ugotovitev je, da so manjša mesta praviloma še v industrijski razvojni fazi, medtem ko so se večja mesta zvečine že preobrazila v storitvena središča, značilna za postfordistično razvojno paradigmo.

KLJUČNE BESEDE
urbana geografija, urbana ekonomija, urbani sistem, družbenoekonomske značilnosti, ekonomska preobrazba, multivariatna analiza, Slovenija

The article was submitted for publication on June 14, 2011.

1 Introduction

In the article we focused on the research of settlement economic functions, which derive from the complex division of work, which enables the existence of settlements and numerous economic activities and functions. Settlements do not boast only economic, but also non-economic functions (especially the residential function), with the two basic elements of their existence being centrality and diversity of economic activities and various forms of work, otherwise cities and towns would be regarded merely as »dormitory towns« (Vrišer 1974, 80). With the analysis of settlement functions, their specialisation and the quantitative and spatial analysis of the work-active population we contribute to the greater knowledge of the urban system in the post-socialist era and try to determine its possible changes and future developmental tendencies.

In the article we also, with the help of multivariate statistical methods, carried out the socio-economic classification of cities, based on the analysis of workplaces and the characteristics of business subjects. With the assessment and the use of a wide data spectrum of the Slovene urban system, we wanted to establish a simplified categorisation of the Slovene urban system in the form of a classification and determine its future developmental tendencies.

The article includes 64 towns, which were chosen on the basis of formal (population above 2000), functional (at least a local central settlement) and physiognomic principles (the amalgamation of settlements into a functional unit). Together they have a population of 889.056 which represents approximately 46% of Slovenia's population. These towns are home to 451.000 work-active inhabitants, what amounts to 47.5% of the entire work-active population in Slovenia. According to the Census from 2002 the selected cities boasted 70.5% of all workplaces in Slovenia and according to the Economic Census of Slovenia (2002) 110.000 (61%) of all business subjects. The characteristic of the Slovene urban system is that it comprises small, from the European perspective, even extremely small towns (Bole 2008).

2 Method

An urban system is considered a hierarchical form, comprised by structures, which mutually intertwine and affect one another (Rebernik 2008). On the basis of induction, which can be described as an all-rounded empirical analysis of socio-economic characteristics, all data can be scientifically explained, as we make a synthesis or the classification of towns regarding their characteristics within the urban system.

We decided on employing multivariate statistical methods, which are suitable for finding connections within a bigger selection of data and variables, seeing that the connections between them are harder to determine. With this purpose the factor analysis is often employed. We decided on a method, which is often used in numerous typologies of economic and business characteristics in a specific area (ex. Sorenson 2004), as it offers a broader definition of the town. It is based on the combination of the principal components analysis and the hierarchical classification into groups. The standard concept is to establish a smaller number of artificial variables, which elaborate at least 80% of the variant, on the basis of a much bigger number of variables. These artificial variables (known also as components) are then employed within the hierarchical classification into groups. The end result is the typology of towns, in which towns within the same group are as similar as possible, while individual groups are as different as possible.

The analysis comprised 45 variables, which describe the socio-economic characteristics of the urban system. With multiple repeating of the method of main components we excluded all the variables, which are clearly in auto-correlation and are therefore not suitable to be part of the typology. We included the following variable types, for which we think that they reflect the socio-economic characteristics of the Slovene urban system:

- Variables, which are tied to workplaces (locational divergence, sector- and activity-based orientation of towns).
- Variables, which are tied to business subjects (density, sector- and activity-based orientation, size, the time of formation and the origin of the capital of business subjects); as part of these variables we also included the data on added value in municipalities in 2004, which was accumulated by business subjects.
- The basic social variables (population number, the index of work-places).

For a successful realization of the main components method the selection of variables is of key significance. The selection was verified by the KMO test (Kaiser-Meyer-Olkin measure) and Bartlett's test of sphericity. The analyzed variables include all the significant elements of the socio-economic structure, as characteristics of work-places and business subjects.

The main components method shelled out six components, which explain the following groups of variables (Bole 2008):

- The first component describes progressive, speculative towns and is strongly connected to foreign capital and the share of workplaces in tertiary activities, as well as the high density of workplaces and newer companies, which were established after 2001.
- The second component describes the level of settlement suburbanization, seeing that it is strongly connected with the high locational divergence, the high density of business subjects and smaller companies with less than 10 employees.
- The third component describes the size of towns, as it is strongly connected to the number of inhabitants and the low density of business subjects.
- The fourth component describes the economic successfulness, which is connected to the growth in number of workplaces and the share of foreign companies.
- The fifth component is less distinctive, although it describes towns, in which the majority of business subjects was formed after Slovenia gained independence, mostly in the period between 1991 and 2001.
- The sixth component describes the towns, for which the economic foundations date back to the period before 1991; the component is connected to the variable of older business subjects.

In the second phase we started classifying data into groups on the basis of six components, which were acquired for each town with the main components method. We excluded the city of Ljubljana from the analysis, which, due to its bigger deviations, would negatively affect the classification into groups. Based on the experience of other authors (Kerbler 2003, 114; Sorenson 2004, 8) regarding the classification into groups, the Ward hierarchical clustering was employed, with which the affiliation to a specific group is determined with the analysis of the variance among individual groups. As a measure of similarity we employed the Euclidean distance. The disadvantage of the method lies also in the fact that the number of groups is not known in advance, which means that the process of classification into groups had to be repeated with a different number of groups, until the optimal result was reached. The groups were formed so that the towns within each individual group are as similar as possible, while the differences amongst the groups are as big as possible. In our case the best results were acquired with the classification into 8 groups. Alongside Ljubljana, which was excluded from our analysis right at the start, we, on the basis of the economic and social criteria, established 9 different types of towns.

3 The results of the socio-economic classification of the Slovene urban system

At first glance it is already clear that the typology has a typical geographic distribution (Figure 1). The predominant position is taken by towns of the first type (coastal towns, Sežana, Postojna and Nova Gorica), towns of the 7th type (bigger regional centres) and towns of the 6th type (»suburban towns«, administrative centres influenced by Ljubljana). It should be emphasized that we are dealing with

socio-economic typology, seeing that among 18 variables both completely social (population, sector focus) as well as economic variables, which are based on the characteristics of companies (size, date of establishment, source of capital, etc), are adequately taken into account.

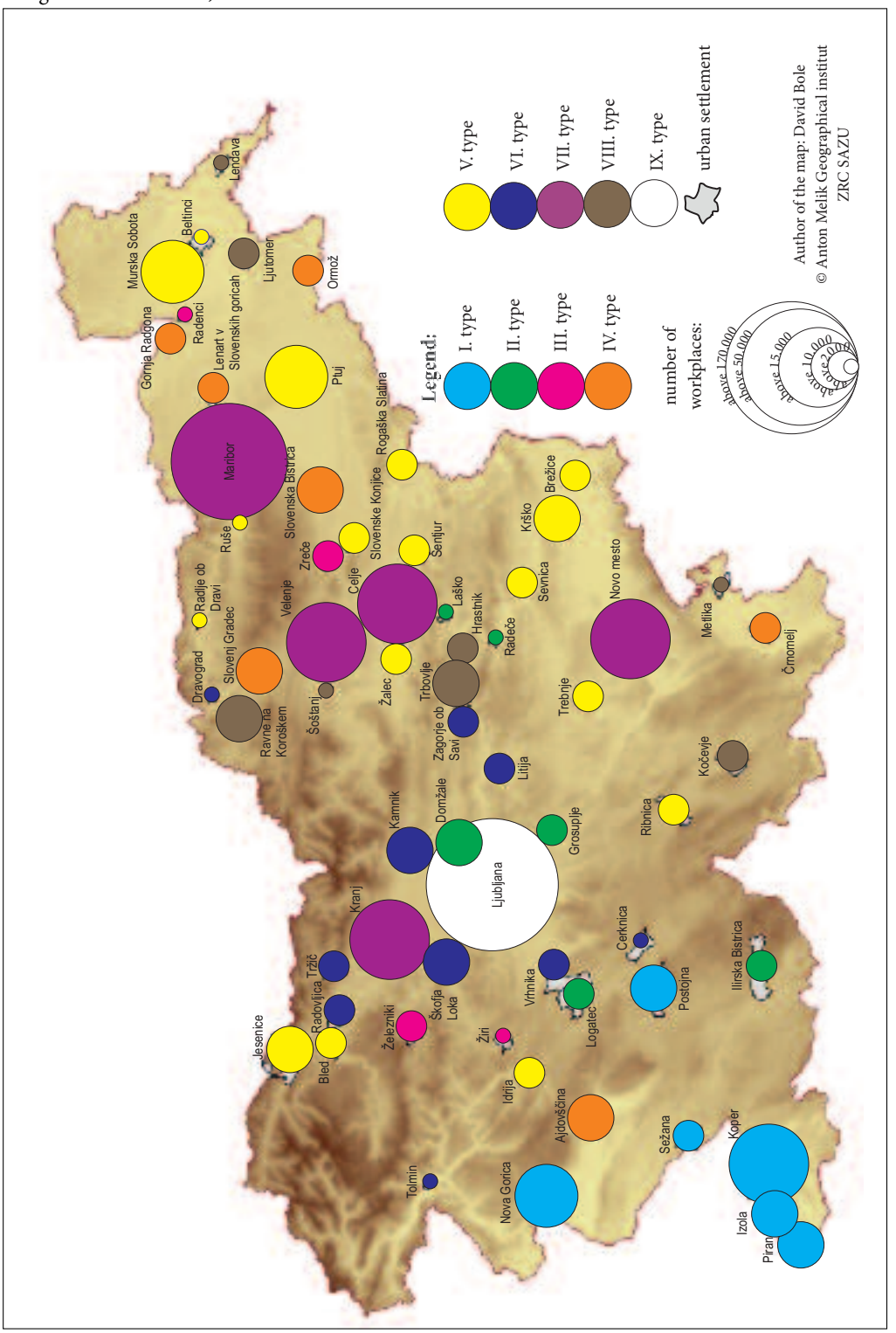
The first (I.) socio-economic type includes settlements, which are similar in the fact that they are above-averagely focused on tertiary sectors, especially the private one. The secondary sector is regarding all towns among the least represented and amounts to only 25% (the average of all towns is 36%). A high share of foreign and mixed capital is typical, especially in coastal towns and in Sežana. If we take into account, as an indicator of the town's success, also the added value of all activities in the municipality, this should be regarded as the second most successful type of towns. This type of towns can be regarded as enterprise propulsive and active, with a young structure of business subjects and the great participation of foreign capital focused on market, tourist and other tertiary activities.

The second type (II.) also comprises six towns. It is a geographically less characteristic sample of towns, which are, with the exception of Ilirska Bistrica, in the vicinity of bigger cities. The insight into the data matrix points to the fact that the similarity among these towns is based mainly on the »old« structure of companies. If for the companies of type I the establishment of new companies and greater participation of foreign capital are typical, the situation for this group is completely the opposite: distinctively above-average participation of companies, which were established before 1991, and of companies which were established with domestic capital. Regarding the workforce orientation there are no bigger deviations from the average values. The structure of business subjects premises that these are smaller or medium large towns, in which economic development, due to various reasons after Slovenia gained independence, came to a halt. In case of Logatec, Grosuplje and Domžale we can assume that this was the case, due to the constantly growing influence of Ljubljana, though they all still remain successful towns. We can make the same assumption for the towns of Radeče and Laško in the vicinity of Celje, whereas the town of Ilirska Bistrica has a distinctively unfavourable geographic location as it is located away from all bigger traffic routes. It is important to emphasize that the slower economic development of towns does not necessarily reflect in a worse socio-economic position, seeing that mainly the towns of Grosuplje and Domžale are places where many people of upper classes, who work in Ljubljana, live.

The third (III.) type comprises only 4 towns, which are mainly connected with the 3rd and the 4th components, which represent a lower number of inhabitants and a lower number of big companies (regarding the number of employed people). All towns are functionally oriented in the industry branch, where there are 72% of all workplaces, which is high above the average of all Slovene towns (28%). These are explicitly mono-functional towns, seeing that alongside the industry sector, only in the cases of Radenci and Zreče, the tourism sector stands out. This group of towns can be defined as small industrial centres, where an important role is played by big individual production plants (Comet, Radenska, Alpina, etc), as well as the electro-, metal-products and furniture industries (Domel, Alples).

The fourth (IV.) type includes towns, which are defined by three basic characteristics: secondary sector orientation; companies which were established before 1991 and the growth of workplaces in the decade between 1995 and 2004. This group is in regards to its orientation quite similar to the 2nd type, plus being more positive from the perspective of economic successfulness, as the number of workplaces in these towns has grown for 4302 or almost 16%. These towns are mainly smaller or medium large industrial centres, the industries of which are clearly quite successful as the employment rate is on the rise. Local companies with more than 200 employees are predominant. The share of people employed in the industry sector is above 50%. The distribution of service activities, especially the public (administrative and educational) and the business-financial services, is below average. This group of towns is regarded as medium large industrial centres with successful companies, which have, regardless of the general decline of industry after gaining independence, seen an increase in the number of workplaces

Figure 1: Socio-economic typization of Slovene towns (Bole 2008). ►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VI. type
VII. type
VIII. type
IX. type
urban settlement
number of workplaces:
above 70.000
above 50.000
above 15.000
above 10.000
above 5.000
Author of the map: David Bole
© Anton Melik Geographical institut
ZRC SAZU
Murska Sobota
Lendava
Beltinci
Gornja Radgona
Radenci
Lenart v Slovenskih goricah
Ljutomer
Ormož
Ptuj
Maribor
Rogaška Slatina
Slovenske Konjice
Slovenska Bistrica
Ruše
Radlje ob Dravi
Zreče
Celje
Šentjur
Dravograd
Slovenj Gradec
Velenje
Laško
Hrastnik
Radeče
Krško
Brežice
Sevnica
Novo mesto
Ravne na Koroškem
Šoštanj
Žalec
Trbovlje
Zagorje ob Savi
Trebnje
Metlika
Črnomelj
Litija
Kočevje
Kamnik
Domžale
Grosuplje
Ribnica
Ljubljana
Kranj
Cerknica
Radovljica
Tržič
Vrhnika
Ilirska Bistrica
Jesenice
Železniki
Škofja Loka
Logatec
Postojna
Bled
Žiri
Idrija
Ajdovščina
Sežana
Tolmin
Nova Gorica
Koper
Izola
Piran

within the industry branch. Among the successful companies we can count mainly the companies from food-, textile- and engineering industries.

The fifth (V.) type is the most common and comprises 17 towns. At first glance this is quite a heterogeneous group of settlements, at least regarding their size, as it comprises medium large (Ptuj, Murska Sobota, Jesenice) cities as well as smaller towns (Ruše, Beltinci, Radlje ob Dravi) of the urban system. The overview of the components results shows that all towns are tightly connected to the fifth component, which is the least explicit and it basically describes the Slovene urban average. This is a group of towns, which are industrialized slightly above the average (35%) and which have an average locational divergence for towns and in which medium large business subjects with domestic ownership, which were established in the period between 1991 and 2001, are predominant. The method of classification into groups has defined this group as the most average one and such, which is in the middle of the cluster of variables, while it cannot be included in any other group.

The sixth (VI.) type comprises ten towns. These towns are connected through the components of suburbanization and average values. While for the second type of towns it is typical that they haven't economically developed much after Slovenia gained independence, for the sixth type of towns economic regression is typical. These are towns, which have more work-active inhabitants than there are potential workplaces. Characteristic of these towns is the decrease of workplaces, especially in older industrial centres, as for example the towns of Tržič and Kamnik. Among all the towns the most favourable indicators are found in the case of Škofja Loka, where the number of workplaces has even slightly risen. These towns became either administrative centres with high locational divergence (Dravograd, Tolmin and Radovljica) or they are considered as moderate industry-based centres, which do not guarantee enough workplaces for the employment of local people (Škofja Loka, Kamnik, Litija, Cerknica, and Tržič). These towns also boast high levels of daily mobility to bigger employment centres. In the towns of Dravograd and Radovljica 73% of all work-active inhabitants are daily commuters, similarly in Tržič (74%) and Kamnik (70%), which can be compared to the most suburbanized municipalities in Slovenia. Vrišer (1984, 49) defined these towns as towns of the suburban type, which are on the one hand characterized by the economic regression, but on the other their »suburbanization« guarantees their inhabitants a good socio-economic status.

The seventh (VII.) type includes only five towns. These are bigger regional centres, which stand out due to their economic role and offer employment also to the people living on the outskirts of the cities. All together they represent 38% of workplaces of the entire urban system. Quite a favourable structure of business subjects is typical, seeing that alongside already established companies with bigger numbers of employees, there is also an above-average level of younger companies, which were established after 2001. These towns boast a favourable combination of older, work-intensive companies and smaller, fragmented companies, which is reflected in the even growth of workplaces, which in the period from 1996 to 2005 amounted to 4% per year. The share of medium large companies is below the average. Kranj, Novo mesto and Velenje are bigger industrial centres with industry, which is important on the national level (pharmaceutical, electro-, auto- and engineering), whereas Maribor and Celje are considered more tertiary centres.

The eighth (VIII.) type comprises eight towns. This is a group of towns with unfavourable socio-economic variables. The number of workplaces is decreasing (for 1780 or 6%), medium large companies with domestic establishment capital and the above-average share of older business subjects are predominant. Quite unfavourable structure is seen in Trbovlje, which has a surplus of the work-active population over the number of workplaces. All towns are explicitly mono-functional and focus mainly on secondary activities. The share of employed people in industry and mining surpasses 40%, while service functions are quite below the average. Towns in this group reach only 70% of the average employment rate in trading. Economic stagnation and regression are visible in the lack of new business subjects. This group differs from the 2nd and the 6th group, which are also characterized by socio-economic regression, in the fact that it does not include »suburbanization«. This type includes the worst economic

conditions, due to the absence of daily mobility which does not sooth the social environment, as is the case for towns of the 6th and 2nd types. These areas are usually described as »depressive«, because they were once relatively successful industrial areas, which later on started to regress and experience the economic crisis (Ravbar 2000, 57), and contrary to the towns of the 6th type, they were also not able to transform into administrative or tertiary centres.

The last group includes only the city of Ljubljana, which was right at the start taken out of the classification process, seeing that it, due to its characteristics, decreases the stability of the classification. Ljubljana as the main economic centre of Slovenia stands out regarding all the criteria aspects. Ljubljana is, due to the big surplus of workplaces, the main mobility destination of people from all over Slovenia. Ljubljana's tertiary socio-economic character stands out the most, as the city focuses moderately on tertiary and explicitly on the quaternary sectors. Ljubljana is the functional centre of all the activities in Slovenia, especially non-economic ones, such as administration, education and research, health care and social care. Regarding the ownership of business subjects the share of foreign and mixed capital is above average, whereas with other activities it does not stand out.

4 Socio-economic »successfulness« of individual town types

On the basis of the general socio-economic development town types can be divided into three basic groups:

- towns which are on the economic level in regression or stagnation; a part of this group are centres of the 2nd, 6th and 8th type;
- towns which are on the economic level in progression; a part of this group are centres of the 1st, 3rd, 4th, 7th and 9th type;
- towns with moderate progression; a part of this group are centres of the 5th type.

Towns which are in economic regression differ amongst themselves, because some of them are gaining more in their residential function and are with that losing their economic function, as they are becoming part of a wider suburban area (for example the 6th and partly the 2nd type of settlements), which points to the high level of urbanization or even the start of metropolisation (Ravbar 1997). Their economic role within the urban system is decreasing, although it still remains important (example: the town of Laško). Some cities of the 2nd type (examples: Domžale and Grosuplje) stand out within the group, as they are considered more successful cities, though they boast an older business structure, which means that they are actually in regression regarding their economic condition. Cities with geographically less favourable locations and a more mono-functional economic structure are experiencing a visible crisis. Among these towns we can also count the towns of the 8th type, where in the past the industrial activity was of great importance, but it did not succeed in adapting to the newly established market conditions. These are towns where the economic development in the past was based mainly on the mining industry (Trbovlje, Hrastnik, Šoštanj) and ironwork industry or only on one work-intensive industrial branch, as is the case of the oil refinery in Lendava or timber industry in Ljutomer. The general economic crisis started already before Slovenia gained independence, in the second half of the 1980s. The loss of markets from the republics of former Yugoslavia and the unpreparedness regarding the market system with technologically inadequate and inflexible production were the reasons why these towns were hit by big social problems and unemployment issues. Towns, which were poly-functional, managed to fight through the crisis and reemploy a part of the work-active population in tertiary sectors. Such an example is the city of Maribor, which has been considered as an industrial centre for a long time, but nowadays it is regarded as a tertiary centre; the same goes for the city of Jesenice, which is not anymore »functionally focused only on one activity« (Vrišer 1998, 307).

Towns which are in economic progression can among themselves be quite different. A group of smaller industrial centres stands out the most. These are small towns, which preserved big production plants

from the socialist period, which have, due to different reasons, transformed into market companies with markets outside the republics of former Yugoslavia. This is a small group of towns, which are, due to their explicit mono-functionality, in the times of globalization quite vulnerable, mainly because of the dangers of production migration in some less developed countries. All these factors contribute to the same position of the towns as is the position of settlements of the 8th type. Quite one-sided is also the economic development regarding medium-large industrial centres, which are nevertheless diverse enough and therefore also less vulnerable. These are towns, which base their economy on bigger production plants, and which are important on the national level and have succeeded in their transition to market economy. Foreign investments are an important factor in the economies of coastal towns, Sežana and Nova Gorica. The closeness of the open EU borders also represents an important location factor. The biggest Slovene towns regarding the number of population are also Slovenia's biggest economic centres. These are six biggest Slovene towns, which boast almost 60% of all workplaces in the urban system. Ljubljana, Maribor and Celje are considered as tertiary centres, while Novo mesto, Kranj and Velenje are more industrial centres. These towns have a guaranteed position within the group of successful economic towns due to their size and dominant role in their regions, and have a relatively heterogeneous structure of workplaces. Their future does not depend only on a particular type of economic activity, but more on the intertwining of social and economic factors.

Towns with moderate progression are in Slovenia most common, with their common characteristic being the averageness, as they boast an average structure of business subjects and other characteristics, although the differences within this group are smaller. The example is the town of Jesenice, which is, with its regression of workplaces and its lower locational divergence, similar to the economically regressive towns of the 8th type. The data on business subjects and functional orientation has in the period after 2001 shown positive tendencies and greater functional diversity, seeing that alongside industry also transport, construction and other activities are present. In the group of towns with moderate progress we also included some national centres, mainly the towns of Murska Sobota and Ptuj, which are, due to smaller companies and more moderate growth of the number of workplaces, not part of the 7th group, like the similar, more successful regional centres. Regarding the flow of workplaces and functional diversity we can determine that the towns of Brežice, Sevnica, Krško, Rogaška Slatina and Žalec have a negative tendency, whereas the towns of Radlje ob Dravi, Ruše, Beltinci, Trebnje, Slovenske Konjice, Ribnica and Idrija boast a positive tendency of improving the socio-economic conditions.

5 Conclusion

We are able to give some insight into the current state of the urban system, more than two decades after the re-establishment of capitalism. It is our finding that the Slovene urban system is currently in the transition period from the industrial to the post-industrial developmental phase. On the basis of the socio-economic typization the current developmental level can be determined for each specific town. An extremely simplified finding is that smaller towns are mainly still in the industrial developmental phase, whereas bigger towns have mainly already transformed into tertiary centres, typical of the post-Fordist paradigm.

Among other article aims we mentioned that we wanted to verify what are the changes and further developmental tendencies of the urban system. The analysis has shown that the transformation into the new socio-economic system is the most intensive right at this moment in time. It is expected that Slovene towns will be more and more under the influence of the post-Fordist economic system, which is defined by tertiarisation, the rise of cultural production, the »deconcentration« of industry and the instability and flexibility of the workforce market. This is especially true for towns still in the process of transition (as for example Maribor and Trbovlje), while in all other towns these processes will additionally strengthen. The biggest unknown factors are smaller industrial towns, which are due

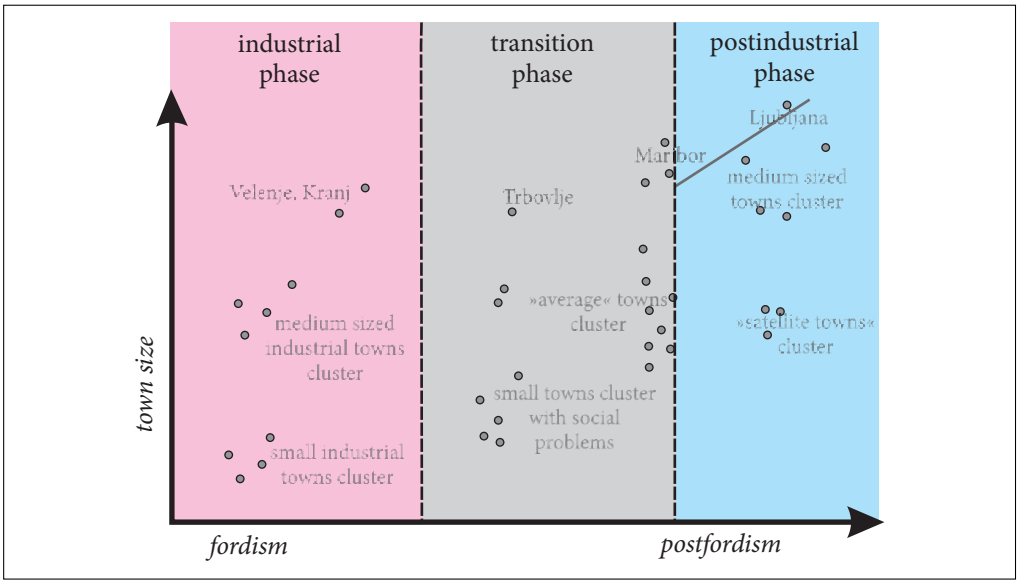

Figure 2: Schematic illustration of the Slovene urban system regarding socio-economic phases (Bole 2008).

to their industrial companies, on the »Fordist« basis, quite vulnerable. If these small industrial towns are able to transform their production into a more flexible form (flexible specialization), they will also be able to quickly adapt to the global economic challenges. The possibility of a successful integration into the global economic process also surfaces in light of searching for new products and technologies within the old industrial tradition (neo-Fordism) (Ravbar and Plut 1999, 112), which is shown in the case of the successful restructuration of Idrija's production activity.

If we agree with the statement that the synthesis of all socio-economic indicators is shown in the relation »industrial/post-industrial«, we can form a symbolic illustration of the urban system, which tries to show all the characteristic socio-economic phases (Figure 2). In the lower left corner of the Figure 2 the towns of the 3rd type of our typology are located (small industrial towns), whereas in the upper right corner there is Ljubljana as the main economic and social centre of the country.

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ARTICLES

THE IMPACTS OF GLOBALIZATION IN RURAL AREAS OF SLOVENIA: EXAMPLES FROM THE POMURJE AND GORIŠKA REGIONS

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ABSTRACT
The impacts of globalization in rural areas of Slovenia: examples from the Pomurje and Goriška regions
Globalization processes have restructured rural areas enormously: their impacts in European rural areas were studied in order to define the balance in opportunities and reality as well as threats. In Slovenia two border rural regions were selected: the Pomurje region and the Goriška region. In the first one the main research focus was: (1) environmental capital and sustainable development of economic activities based on the region's preserved environment (i.e. tourism); (2) migration flows in rural areas, in particular amenity migrations; and in the second one the project objectives were implemented through a study of rural business.

KEY WORDS
globalization, rural areas, rural businesses, sustainable development, amenity migration, Pomurje region, Goriška region, Slovenia

IZVLEČEK
Vplivi globalizacije na podeželje v Sloveniji: primer Pomurja in Goriške
Prispevek prikazuje izsledke raziskave, v kateri so bili preučeni procesi globalizacije in njihovi učinki na evropskem podeželju z namenom prepoznavanja ravnotežja med priložnostmi in realnim stanjem ter grožnjami, ki jih predstavljajo različni globalizacijski procesi. V Sloveniji je preučevanje potekalo v pomurski in goriški statistični regiji, in sicer je bil v prvi podrobneje preučen (1) okoljski kapital in sonaravni razvoj dejavnosti, ki slonijo na ohranjenem naravnem okolju v regiji (npr. turizem) ter (2) selitveni tokovi na podeželju, predvsem priselitev tujcev zaradi privlačnosti pokrajine; v goriški statistični regiji pa je bilo podrobneje preučeno podjetništvo na podeželju.

KLJUČNE BESEDE
globalizacija, podeželje, podjetništvo na podeželju, trajnostni razvoj, priselitev tujcev, Pomurje, Goriška, Slovenija

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1 Introduction

According to the European Commission »globalization is seen to touch every walk of life – opening doors, creating opportunities, raising apprehensions« (The European Interest: Succeeding in the Age of Globalization 2007). On the EU level, the absence of an integrative analysis of globalization processes has been recognized as an obstacle to effective regional development strategies capable of meeting globalization challenges, especially in European rural areas.

For this reason the 7 FP project »Developing Europe's Rural Regions in the Era of Globalization (DERREG)« is focused on rural Europe, where the delicate balance of opportunities and threats presented by globalization is particularly significant. Globalization is bringing significant economic, social, cultural and also political changes, and consequently also changes to rural localities, but the effects of these changes are not everywhere the same (Woods 2007b).

The DERREG project focused on four empirical research topics:

- **Global engagement and the local embeddedness of rural businesses**, where the extent to which globalization processes have impacted the structure of the local business networks and affected the rural economy was investigated;
- **International mobility and migration of rural populations;** the role of rural regions in international flows of mobility were studied (internationalized mobility, transnational mobility of migrant labour, return migration, foreign home ownership);
- **Environmental capital and sustainable rural development;** the opportunities for regional development based on an »eco-economy« were explored;
- **Capacity building, governance and knowledge systems**; the aim of which is to analyze the embeddedness of rural regions in knowledge systems and the processes of learning - the concept of »learning region«.

Nine project partners from eight countries focused their work on 10 selected rural regions: Oevre Norrland in Sweden, West Region in Ireland, Jihomoravský kraj in the Czech Republic, Alytus in Lithuania, Westerkwartier in the Netherlands, Comarca de Verín in Spain, Regierungsbezirk Dresden and Saarland in Germany, and the Pomurje and Goriška regions in Slovenia.

In Slovenia the study was conducted in two very different regions with regard to their geographical features. For a more detailed study of the potential of environmental capital for the purposes of developing a peripheral rural area and of the factors and impacts of recent migration flows in Europe purposes, we turned to the Pomurje region. The study of the development of entrepreneurship in rural areas was carried out in the Goriška region, which traditionally is already closely linked with the international space.

The heterogeneity of Slovenian rural areas, which according to OECD methodology encompass the whole of the country territory, can be seen by some basic comparisons at the national and regional levels.

The Pomurje region is geographically composed of the fertile area of the Mura plain with abundant groundwater resources and agricultural land where consequently mostly conventional agriculture is practiced, with a higher population density, sufficient infrastructure etc. and of the hilly area of Goričko, Lendavske Gorice and a part of Slovenske Gorice, with a high biodiversity and preserved cultural landscape in which settlements are few and dispersed. Compared to other Slovenian regions, Pomurje, bordering Croatia, Hungary and Austria, is historically recognized as an underdeveloped region characterized by outmigration. Although the economic relevance of agriculture in general is decreasing, the Pomurje region is still characterized as an **agricultural region** with the weakest economic power in Slovenia.

The Goriška region extends over the western part of Slovenia and is situated at the geographical crossroads of several regions: the Alpine, pre-Alpine, Karst-Dinaric and sub-Mediterranean. In general,

Figure 1: Selected regions and urban/rural typology of Slovenia according to OECD methodology. ➤

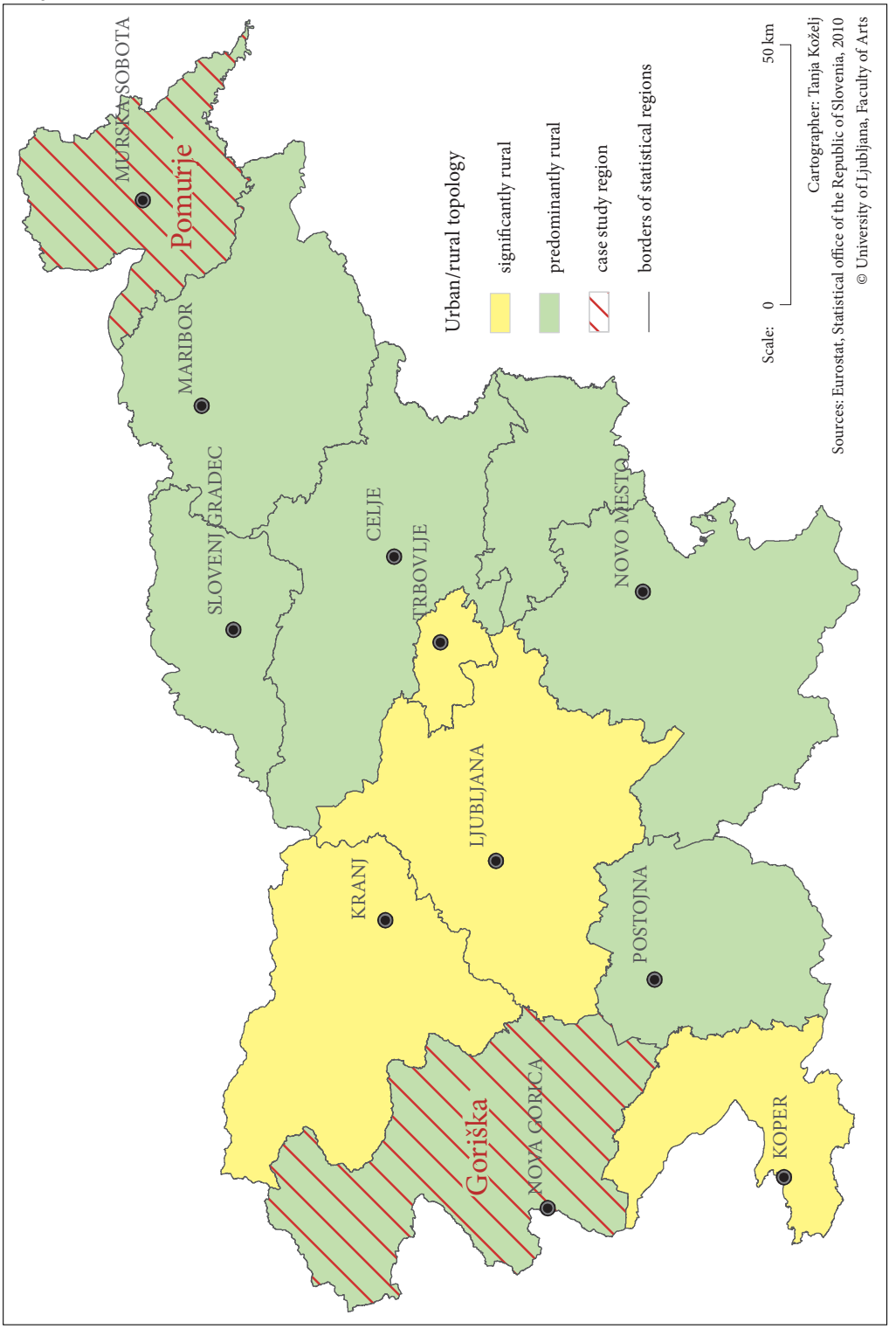
MURSKA SOBOTA
Pomurje
MARIBOR
SLOVENJ GRADEC
CELJE
TRBOVLJE
NOVO MESTO
LJUBLJANA
KRANJ
POSTOJNA
Goriška
NOVA GORICA
KOPER
Urban/rural topology
significantly rural
predominantly rural
case study region
borders of statistical regions
Scale: 0
50 km
Cartographer: Tanja Koželj
Sources: Eurostat, Statistical office of the Republic of Slovenia, 2010
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Table 1: Some general characteristics of Slovenia, the Pomurje region and the Goriška region ([1]SORS 2011; [2]MESP 2011).

indicator	Slovenia	Pomurje region	Goriška region
total area (km^2)[1]	20,273	1,337.5	2,324.7
population (2010)[1]	2,050,189	119,145	119,146
population density[1] (inhabitants/km^2)	101	89	51
ageing index (2010)[1]	117.4	132.2	131.2
% of Natura 2000 areas (2010)[2]	36.0	45.9	47.0
% of protected areas (2010)[2]	9.4	35.7	39.5
unemployment rate (2010)[1]	11.8	19.4	9.8
gross domestic product per capita in EUR (2008)[1]	18,450	11,986	17,696
total increase of population (in 2009)[1]	14,614	–661	21
% of foreigners from EU countries (2011)[1]	6.5	28.0	7.9

the Goriška region is characterized by low population density and dispersed settlement, with Nova Gorica and its immediate vicinity as the only agglomeration area. The transborder character of the area is reflecting in the distribution of economic activities and population, migration flows, configuration of the development axis, etc. The »Goriška« section of the country's border was one of the most open border area in the broader European context even before Slovenia integrated into the EU. This **strong interregional character** of the area has been a significant characteristic of regional development also since joining the EU in 2004.

The main benefit of the DERREG project is to advance existing scientific knowledge and produce practical recommendations for the rising ability of regional development strategies to cope with these new challenges. Research at the interdisciplinary scientific level has been enriched by the cooperation of national and local stakeholders in order to include their knowledge on regional development processes.

2 Methodology

The contribution of the research is twofold:

- Theoretical-methodological; a complex approach to the study of the latest processes and effects of globalization has required introducing a range of new approaches, the results of which contribute towards the establishment of new theoretical principles for interdisciplinary research.
- Programmatic-planning; through an analysis of the operation of various regional stakeholders and their networking, we have prepared a »good practice database«. Of essential importance are the final recommendations to policy-makers at the regional, national, and European levels, which are directed towards encouraging greater resilience of society and the economy to the coming changes in rural areas.

For the research approach (Table 2) in **environmental capital investigation**, the five main steps were already defined in the project initial phase and were followed throughout the entire project. The review of literature and statistical data, focusing on various components of environmental capital (i.e. water, land and soil, air, energy sources and use, biodiversity, protected areas, waste management etc.) was supported by the »media analysis«, in which articles on environmental issues in the newspaper Vestnik were reviewed. The main objective was to compare the contents in the year 2000 and 2008, assessing the presence of the various topics as well as the approach in presentation. The results provided a basis for the selection of regional stakeholders to be included in the third research step. The aim of the qual-

Table 2: Research phases in the selected regions.

	1st phase			2nd phase	3rd phase	
environmental capital	data base set up, literature review	national and regional documentation analysis	media analysis (Vestnik 2000 and 2008)	qualitative interviews with regional stakeholders	identification and analysis of good practices	**good practice database, web resource centre, conclusions and policy recommendations**
amenity migration	data base set up, literature review			qualitative interviews with foreign home owners	identification and analysis of good practices	
rural business	data base set up, literature review		e-survey	qualitative interviews with firm managers	identification and analysis of good practices and network brokers	
regional comparison	data base comparison, regional workshops, contextual reports					

itative interviews (15) was to define the region's main environmental advantages as well as problems as seen by regional developers. Based on the results from the previous steps, the research was focused on two main regional issues – **protected areas and sustainable tourism development**. Therefore, the fourth step involved the definition of best practices (9) from these two fields.

Amenity migration is a new phenomenon in the Slovenian rural space. Detailed demographic analyses with a focus on the migration dynamics of the region formed the basis for our empirical investigation. Due to the high share of EU foreigners in Pomurje, we focused our work on qualitative interviews (13) with foreign home owners. The aim was to identify the profile of amenity migrants, their reasons for coming, and their personal experiences in the region with the local population and legal procedures. The experiences described and especially the obstacles to their integration formed the basis for the identification of the responsible institutions for promoting and facilitating regional engagement of international migrants.

In the era of globalization, **small firms located in rural areas in particular are extremely fragile** (Klemenčič, Lampič and Potočnik Slavič 2008). Evolving DERREG methodology is focused on **addressing globalization processes in rural business development**. After a detailed review of the relevant literature, we have provided a profile of business structures in the case study region based on explicit statistical data at the NUTS 3 level. Numerous statistical data indicated a **shortage of small and medium-sized enterprises in the Goriška region**. Also using the database provided by the Chamber of Commerce and Industry, we enlisted approx. 100 firms that would address the objectives of our research: SMEs with international contacts and SMEs reflecting representative regional structure by sectors. The analytical part was supplemented with the selection of a representative sample of firms (20) that were included in an electronic survey. The latter was amongst others focused on investigating how rural businesses derive strength from being part of a small, supportive business community, or from other aspects of their local business environment (such as close links to local institutions and agencies). In-depth explanations were provided by face to face structured interviews (8) with firm managers willing to cooperate. For a contextual analysis of the wider business environment, interviews with actors responsible for business development (6) were conducted.

The regional comparison synthesizes the findings from all included studies, summarized in contextual reports for each case study region, good practice platform (including practices from all included case study regions) and policy recommendations for policy makers which can potentially be implemented at the regional, national and EU levels.

3 Discussion: Selected impacts of globalization in the Pomurje and Goriška regions

Environmental capital represents the major potential of the Pomurje region for development based on conservation and sustainable use of environmental resources. The importance of environmental capital can be seen through the statistical Ødata and is also recognized through the regional media, the opinion of main regional stakeholders (i.e. the representatives of regional development agencies, regional forest management service) and in the local population's opinion – they are very proud of the preserved natural environment and also of their tradition and cultural heritage.

The percentage of protected areas according to IUCN categories (35.6%) and areas of Natura 2000 (45.9%) in Pomurje clearly indicates the good condition of the region's environment on the one hand but on the other hand it also reflects the response to the environmental threats in the region. The two preservation forms are mostly overlapping, but the regimes are different and combined, and potentially help in nature preservation. The numbers are significantly higher compared to the national level in the case of protected areas and also higher in the case of Natura 2000 areas (Table 3).

The high percentage of Natura 2000 areas is partially the result of human maintenance of the landscape through traditional agricultural use; therefore also the largest protected area in the region Goričko Landscape Park (covering 34.5% of the region) protects its unique cultural landscape as well as numerous localities of cultural heritage reflecting the natural conditions of the area to which the local population adapted throughout the centuries. Due to various threats to the area – such as intensive overgrowth of some parts in the park due to the abandonment of cultivation, the establishment of the park was necessary in order to preserve the area, but on the other hand the richness of the biodiversity can only be maintained through continuing human presence and activities – especially agriculture. The entire Pomurje region is recognized as the main agricultural region in Slovenia. The percentage of agricultural land (61% in the region; 28% in Slovenia) and arable land (42% in the region; 10% in Slovenia; MESP 2011) in Pomurje is also an important component of environmental capital, positioning the region in the first place in Slovenia in terms of opportunities for food self-sufficiency. With the remediation of environmental problems related to agriculture (water and soil pollution), the region has the potential to become not only self-sufficient but also a region with safe food production.

Tourism is another source of sustainable development potential in Pomurje. This economic activity is based primarily on the use of the region's most abundant natural resource – thermal waters. The

Table 3: Protected areas and areas of Natura 2000 in Slovenia and Pomurje (MESP 2011).

	Slovenia			Pomurje statistical region		
type of protected area	number	area	% of national territory	number	area	% of regional territory
national park	1	838 km^2	4.1	–	–	–
regional park	3	418 km^2	2.1	–	–	–
landscape park	44	646 km^2	5.0	3	478 km^2	34.5
Natura 2000		7298 km^2	36		614 km^2	45.9

most important tourism entity in the region is the spa Terme 3000 in Moravske Toplice. It has developed intensively in recent decades and is gradually linking its offer with the overall tourism attractions of the region, which are increasingly more sustainably oriented. The latest development of tourism (such as biking trails and other projects based on the area's tradition) was assisted strongly by various EU funds, and some segments of this offer can be recognized as a good practice of sustainable tourism. The main development generators in terms of new ideas and networking of tourism entities are the three regional development agencies (the Mura Regional Development Agency, Sinergija, Prleška Development Agency); significant also is the role of the Goričko Landscape Park management institution. Their responsibility is to achieve an equilibrium between the preservation of natural and cultural heritage on the one hand and development on the other, with the latest being oriented towards agriculture (focused on food production and associated maintenance of the cultural landscape) and tourism based on the environmental capital of the park, as well as on the rich regional cultural heritage, tradition and strong social capital of the local population.

Peripheral **rural localities are becoming increasingly attractive also to transnational in-migrants,** not only because of improved transport connections but also due to lower property prices, the recognized high natural amenity of rural areas, nostalgia, and similar (Woods 2007b). These factors are very significant in the growing market for foreign property investment in rural regions of Central and Eastern Europe.

Foreign home ownership (second home owners and permanent residents) can be considered a positive development. It can have a stimulating effect on the development of the local economy, increase of services, and renewal of abandoned villages and the cultural landscape.

This process can be seen on a smaller scale in Slovenia as well. Over the period from May 2004 to the end of 2010, there were 3576 foreign purchases of real estate in Slovenia (MF 2010). The majority

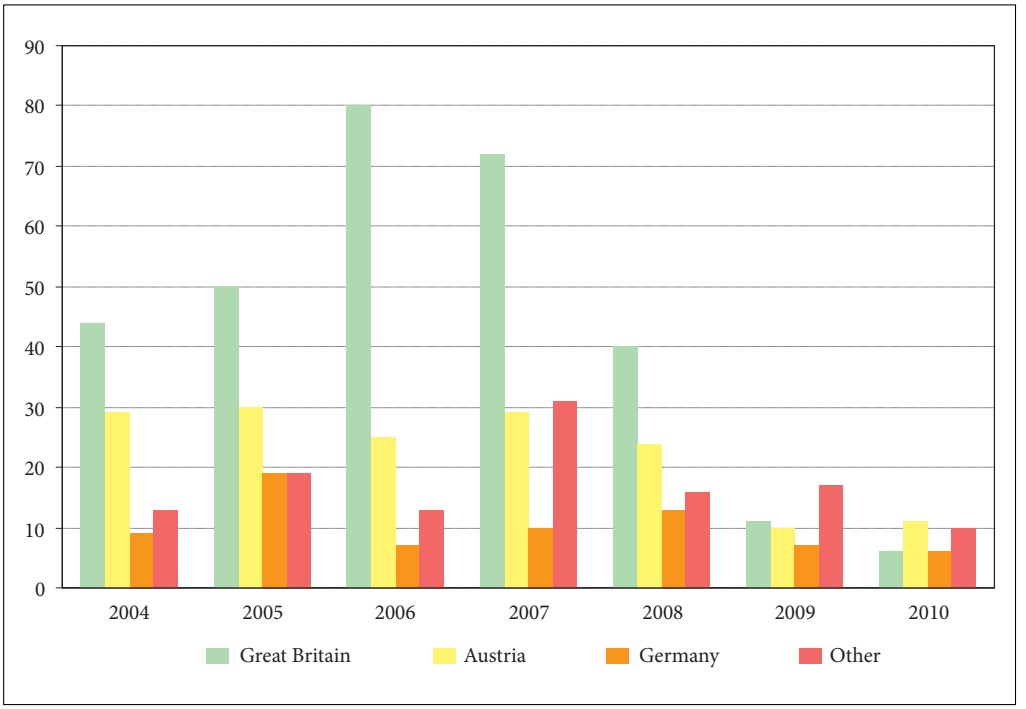

Figure 2: The structure of citizenship of foreign purchases of real estate in the Pomurje region (MF 2010).

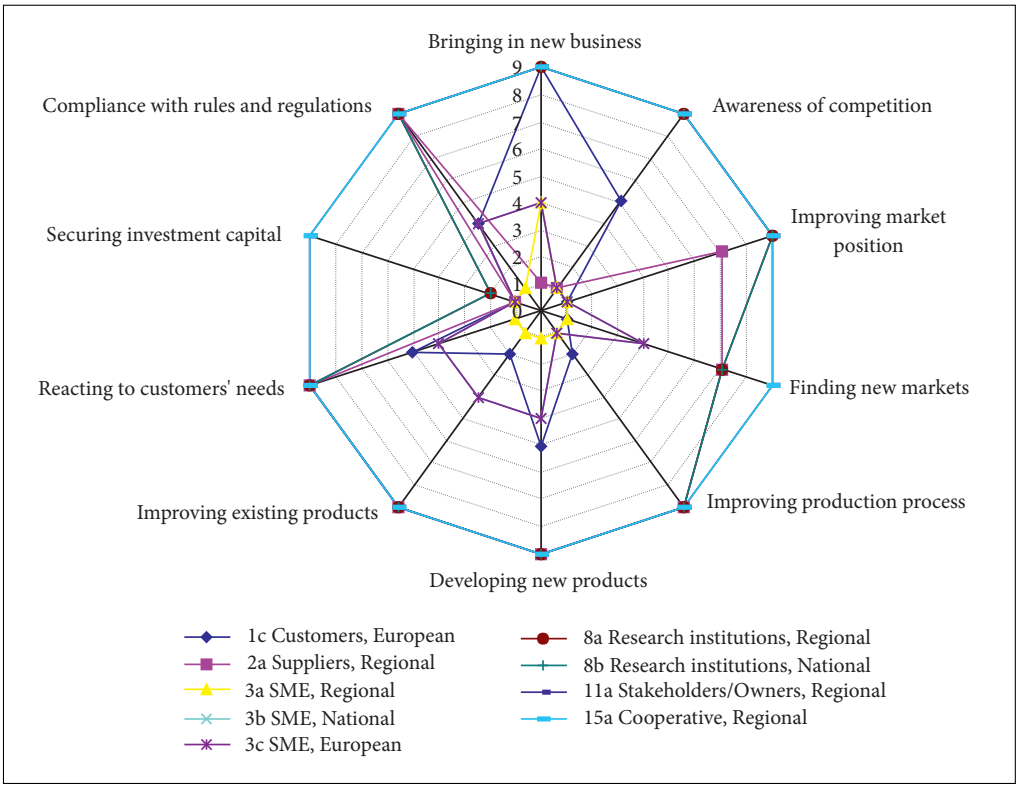

Figure 3: Locally embedded firm in the field of supply, highly specialized, owned by a traditional cooperative, otherwise strongly internationalized firm (note: 1c, 2a, 3a, 3c etc. are codes indicating the variety of partners on different levels: local and regional, national, European, World).

of new real estate owners are second home owners but in some regions they have also settled down permanently as part of the resident population.

The overall number of foreigners in Pomurje is relatively small (1099 in 2011), but the share of foreigners from EU countries is the highest (28%) of all Slovenian regions (SORS 2011; Figure 2). The purchase of a second home or permanent residence by predominantly British migrants (mostly to the hilly area of Goričko) has been attributed to their nostalgic desire for a certain lifestyle. An essential motive in the purchase of property in remoter parts of rural Europe is the quality of the environment (landscape) and a simpler way of life. But two other factors played a crucial role: the very low cost of housing and the existence of low cost airline connections (London–Graz). Also worth mentioning is the part played by an individual from the UK who started to advertise the idyllic countryside in Slovenia, Goričko (via the internet) in 2004 and 2005 and managed to sell several run-down houses in the region.

The research focused on amenity migrants: their reasons for coming to the region, obstacles they encountered in purchasing real estate, settling down in the new country and finally their integration into rural society. The results of our interviews show an overall satisfaction of foreigners with the beautiful and pleasant landscape, new culture and people, but disappointment in the formal part of inclusion in the new society: bureaucratic obstacles and the very poor language (English) knowledge of officials are often exposed as negative experiences in Slovenia. On the other hand, their integration in the local environment (i.e. at the level of villages) was mostly a very positive experience. In the case of our research

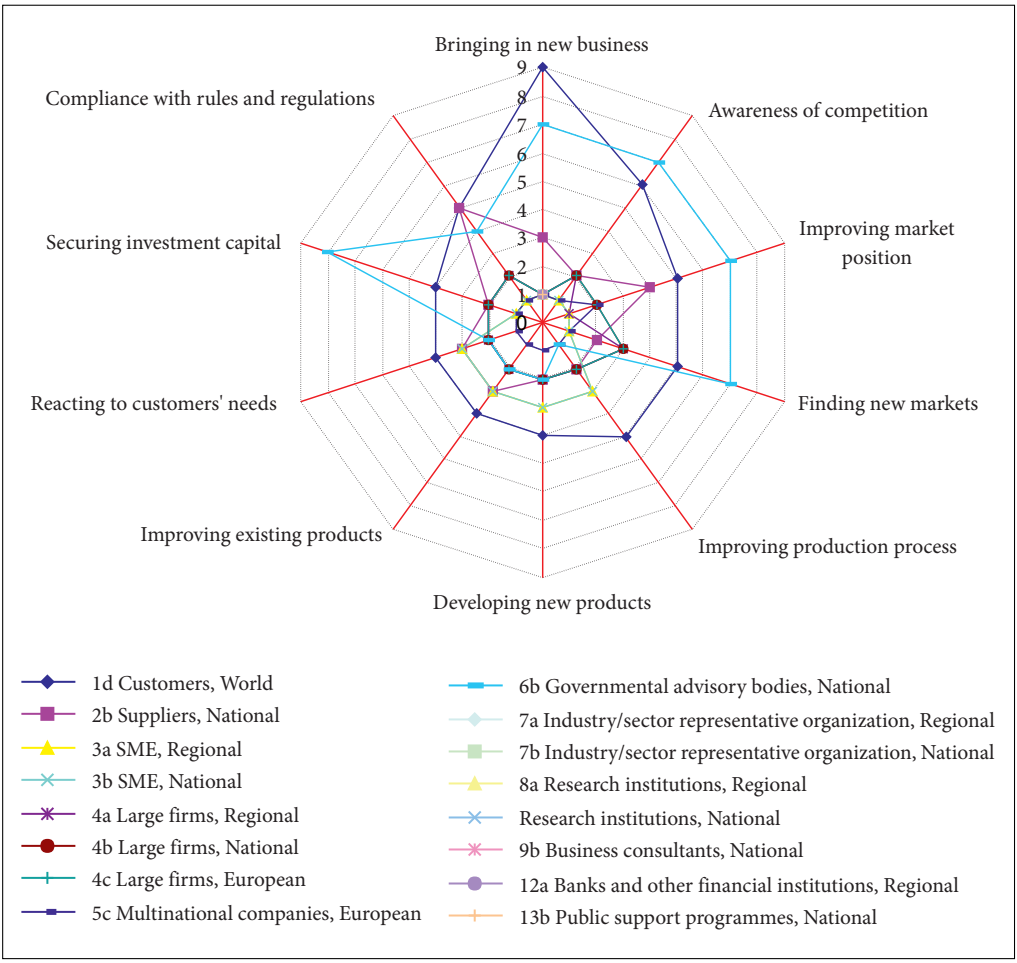

Figure 4: Firm with strong international relationships, which is also an example of a globalized firm, but also having a strong attachment and responsibility to the local environment.

region the »best practice« is the local population and their acceptance of foreign home owners into their social activities and everyday life. The highest share of in-migrants from EU countries, the poor economic situation, the border and peripheral position of the region are all factors which influence the different attitude of local people towards the new settlers. In the case of the Pomurje region the increasing trend of international residential property purchase as a result of globalization is recognized as positive experience mostly in terms of integration with local communities.

Slovenian rural areas are characterized by continuous **long-term underdeveloped entrepreneurship**. After the collapse of the communist system and the former Yugoslavia, vast changes have occurred as a result of EU integration and acceptance of the common Agricultural Policy and Rural Development Program; consequently entrepreneurship has been (at least formally) indicated as an important development factor of rural areas. The reality, however, lags behind the proposed guidelines. The decline of larger systems and their subsidiaries was not replaced by private entrepreneurship at the same pace, while in the former system private entrepreneurship had a limited and quite minor role as well as a neg-

ative image. Small and medium enterprises (SMEs), on the other hand, do not develop overnight: a successful combination of ideas, interest, capital, markets, contacts, social network etc. must first be in place. The data confirm that most of the firm's activities take place outside the regional framework (see Figures 3 and 4). Even those surveyed firms that have a strong international profile perform only a modest share of total transactions outside the European continent. The results obtained indicate that the SMEs surveyed have established stronger ties with SMEs (most evident at the national level) than with large firms or multinational companies (at the European level). The majority of surveyed firms in the Goriška region are highly integrated into the international and globalized market as a consequence of a relatively small domestic market and long-lasting cross-border relations. The bulk of firms in this border zone with Italy already adopted resilience strategies 20–30 years ago – they are mostly export-oriented (European networks prevail). Yet some firms are evidently embedded in the local and regional environment. Some traditional firms (dairy, viticulture) are locally embedded in the field of supply (fresh high quality milk, reeds etc.), but they have evolved different resilience strategies.

It becomes obvious that the mapping of the firms' business network cannot be performed by using solely quantitative methods. The importance of personal contacts, the role of third party organizations (universities, professional associations etc.) as connecting points for SMEs »going global« and the strategic choices of establishing extra-regional collaboration cannot be measured using purely economic or trade indicators.

4 Conclusions

The research on globalization processes and their impacts on European rural areas was focused on ten rural regions, selected by DERREG project partners. The sample regions were chosen according to their characteristics in accordance with the main project objective. In Slovenia two border rural regions were studied: the Pomurje region and the Goriška region, in which different parts of the study were conducted. In the Pomurje region the main focus was: (1) environmental capital and sustainable development of economic activities based on the region's preserved environment (i.e. tourism); (2) migration flows in rural areas, in particular amenity migrations.

In the Goriška region the project objectives were implemented through a study of rural business. In both selected regions, the main goal was to identify the balance in opportunities and reality as well as threats caused by various globalization processes.

Environmental capital represents a major development potential of Slovenian rural areas, and as such is recognized also through various forms of protected areas and areas of Natura 2000. A well-preserved environment along with a rich cultural heritage and strong social capital represent the main pull factors for the development of tourism. Sustainable tourism development has been coming increasingly to the fore in recent times, and as such is also widely supported through different EU projects. One of the constraints on the success of these projects is too strong dependency on EU funding, and at present the sustainability of tourism project results is to some extent questionable. Unfortunately, this segment is still difficult to assess objectively, since insufficient time has passed since the completion of most of the projects.

A well-preserved natural environment in combination with a few other motives (low cost of living and relatively cheap and available real estate, improved transport connection) triggered another process caused by globalization – international migration flows, in particular amenity migration. The Pomurje region is one of the best examples in Slovenia where foreign home owners appeared in a traditional rural environment. The migrants decided to either settle down in the region or to use their property as second homes. They greatly appreciate the preserved rural environment and the openness of the local population on the one hand, but they have had to deal with ignorance and unfriendly experiences in dealing with public authorities and institutions in the formal part of their integration on the

other. This points out show that rural areas are formally not ready to respond rapidly to the new social and spatial phenomena.

Amenity migrants in the Pomurje region have positively contributed to the preservation of cultural heritage preservation since they bought run-down houses which they have renovated in the traditional style and in keeping with the region's environment. With their sympathies and positive attitude to the rural milieu and local tradition, they have also made a positive impact by strengthening the values of the local population, which prior to this had been eroding. This is one of the good examples of positive globalization impacts on peripheral rural areas.

In connection with globalization processes, rural business is very specific and does not depend on the same spatial and socio-economic structures of every rural region. In the Goriška region, for example, there has been dual-track economic development over the past twenty years: (1) large enterprises and SMEs, some of them originating from the socialist period, the others established more recently; both have undergone rapid and comprehensive transformation as they had to adapt to a new business environment; (2) sole proprietor and micro firms that played an important pioneer role in the former system as they introduced the entrepreneurship mentality based on Italian experiences; nowadays they also need to adapt to very severe competition on domestic and foreign markets.

The Goriška region is strongly and widely exposed to external environments and is therefore very sensitive and fragile to market disturbances during periods of economic crisis: at present the gradual examples of the chain reaction effect can be witnessed, and numerous firms are being closed for various reasons. Globalization and embeddedness are parallel processes: they represent two different ways of 'sensing' the dynamics of a firm's business network. The 'globalizedness', i.e. the degree of globalization of a firm, and embeddedness fuel one another. An SME that is highly globalized is, to some extent, well embedded in its local setting. Local embeddedness increases resilience and the return of benefits to the region from global engagement. Firms trading internationally should be encouraged to source materials locally, and to participate in regional support networks (DERREG 2011). Networking inside rural areas (a rural web connecting tangible and intangible capital) combined with purposeful and long-term international networking is nowadays necessary for the success of local/rural economies and sustainable rural development.

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ARTICLES

MOBILITY AND THE LIFESTYLE OF THE SLOVENE POPULATION

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ABSTRACT
Mobility and the lifestyle of the Slovene population
The paper deals with the question how does the place of residence influence mobility and how is mobility part of daily activities of the population in different parts of Slovenia – towns, suburbs, urbanised rural areas and less urbanised rural areas. For better explanation of the question four types of lifestyle has been defined: from very mobile with a wide home-range to less mobile with the small home-range. The whole territory of Slovenia shows all lifestyles; from least to most mobile, but in different volume and size. Approximately 50% of the respondents live a very mobile lifestyle, which is probably due to large dispersion of residential areas and concentration of work in urban centers.

KEY WORDS
lifestyle, mobility, social and spatial differentiation, Slovenia

IZVLEČEK
Mobilnost in življenjski stil prebivalcev Slovenije
Besedilo obravnava odnos med krajem bivanja in življenjskim stilom. Ugotavljali smo, ali se življenjski stil prebivalcev, ponazorjen s stopnjo mobilnosti, v različnih socioekonomskih območjih Slovenije – v mestih, obmestjih, na bolj ter na manj urbaniziranem podeželju, razlikuje. Opredelili smo štiri tipe življenjskega stila, od zelo mobilnega z velikim radijem prepotovane razdalje do manj mobilnega z majhnim radijem potovanj. Na celotnem ozemlju države se pojavljajo vsi življenjski stili, od najmanj do najbolj mobilnih, vendar v različnem obsegu. Približno 50 % anketiranih živi zelo mobilen življenjski stil, največ na bolj urbaniziranem podeželju in v obmestju, vzrok česar je velika disperzija poselitve ter koncentracija delovnih mest v urbanih središčih.

KLJUČNE BESEDE
življenjski stil, mobilnost, socialna in prostorska diferenciranost, Slovenija

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1 Introduction

Mobility has become one of the main characteristics of a modern lifestyle. We travel more often and to far-away places. Separating the place of residence with the workplace is only one of the reasons for daily migration; equally important is the separation of the place of residence and the location of recreation, provisions and other areas that fulfil our daily needs. Dispersion of non-agricultural activities, or in other words – a widespread of urbanisation, which is the reason (or the consequence) of mobility, can be seen as the second generator of this occurrence. As stated by Gabrovec and Bole, in 2002, there were 658,911 daily commuters in Slovenia, which is about 115,000 (or approximately 20%) more than in 1991 (Gabrovec and Bole 2009, 24). The number of cars almost doubled between 1985 and 2005 (Gabrovec and Bole 2009, 12); in 2008, there were 1.8 cars per household. Due to time, spent in traffic, mobility became an important part of daily activities. It became so important that it is slowly developing into an element of individual's lifestyle. What remains unanswered is whether the level of mobility is a question of choice, thus voluntary; or a must, caused by the distance to work, centres of provision, recreational areas and similar. The question also interferes with the relationship between our wishes (such as the residential area) and reality; it however does not play any crucial role at understanding the lifestyle.

Mobility can to a certain extent also be seen as a social category. Not all the people are mobile in the same way; we also differ in the level of mobility. It is a general belief that the changes of mobility have social reasons; they are connected to age, education and social status. Mobility is, however, also a spatial category because it stands for the ability of covering distance, which is in the first place linked to the location of our point of departure and our final destination. We believe there is a connection between the social and spatial aspect of mobility, the medium being the lifestyle. Different intensity of mobility can on one hand be seen as social characteristics of an individual and his/her lifestyle, and on the other as a consequence of the place of residence. This article is trying to show in what way mobility can be seen as a social category and how it is connected to the place of residence; in other words: how does the place of residence influence mobility and how is mobility part of daily activities. This topic touches upon the constant dilemma in terms of geographical recognition of space: is space a relevant factor that influences the social behaviour of an individual?

2 Lifestyle and mobility

Lifestyle is a »relatively stable, whole and routine way of human performance« (Burzan 2005, 105). Sociologists see lifestyle as a consequence of individual's social characteristics. However, we cannot attribute all forms of daily performance only to social characteristics, such as social, material and cultural capital, as described by P. Bourdieu (Bourdieu 1978). Instead, it is believed that a part of individual's daily life depends on the place of residence and other locations, where the individuals fulfil their needs. The crucial word in this case is »mobility«, because it means two things: 1) the ability of covering distance in space and 2) journeys or the structure of covered ways. The first characteristic is objective as it mostly does not depend on the individual but rather traffic infrastructure and network. It shows as accessibility of location and the final destination. The second lists how often an individual leaves home, the distance, covered in one day (the whole journey as well as partial trips); the frequency of journey, choice of vehicle and what is perhaps most important; the purpose of the journey. We believe the latter being a reflection of the individual's lifestyle, because the mobility structure partly stands for personal choice and not only as a consequence of objective circumstances. The most common purpose of travel depends on the individual (excluding commuting), so does the choice on the distance, covered by such journey. This includes the term »home-range« that can also be seen as an element of lifestyle and consequently mobility. It marks an area, working area, »lifestyle area« within which the individual frequently moves

(Pohl 2009, 63). The size of such »home-range« is definitely an element of lifestyle, because it to a certain extent depends on the choice of the individual regarding where to fulfil his/her needs.

3 Methodological explanations

There are two ways for defining lifestyles: 1) define types that apply to the whole activity of an individual or 2) define thematic types that apply only to a certain segment of the individual's life. In the latter, the lifestyle area shrinks to the selected content. These lifestyle types are not really a comprehensive demonstration of the society's social structure. However, they have an aim and explain a certain aspect of the society, or better said: the individual's performance. As opposed to the comprehensive lifestyles, one could perhaps talk about different ways of life that apply to chosen factors.

This research tried to find the elements of lifestyle that have a spatial character that consequently shows in the home-range. It was based on the lifestyle as such and not on social position; we defined types that are based on spatial and not social indicators. While looking for a suitable theoretical basis, a strong foundation was found in social geography and social action theory. The former suggests that human interaction includes six basic activities (living, work, education, provisioning, recreation and communication (e.g. Ruppert 1981, 89), all spatially relevant. According to activity theory, the human interaction shows in social and not physical space. Each form of interaction produces a different social space (Werlen 2000, 327), which means that each individual also operates in a social space that is typical of his/her lifestyle. The typology of lifestyles should thus list different types of life and forms of spatial inequalities. This can be summarized with three indexes that show a spatial segment of a lifestyle:

- Place of residence. Space is differentiated according to social characteristics of residents, economic activities and intensity of construction of housing areas. According to the above, one can differentiate between four areas: town, suburbs, urbanized rural area and less urbanized rural area (socio-economic characteristics of individual areas; see Drozg 2001).
- The size of the activity area: it is set by the most common areas that fulfil the needs, the distance from the place of residence to the areas that fulfil the needs.
- Frequency of fulfilling individual needs: we assumed that this index showed the interests of an individual. It is obvious that someone who shops more often has a different lifestyle from somebody who prefers recreation.

Previously listed indexes are important for formation of lifestyle types because they show 1) different preferences for the place of residence (town, suburb, rural area) and 2) a different level of mobility as a consequence of separating the place of residence from the place where other needs are fulfilled; or different distances from the place of residence to the places where the needs are fulfilled. The latter is definitely a question of personal choice; one that the individual made by having all consequences in mind. 3) The size of the activity area, being on one hand a consequence of personal habits; and on the other a consequence of the place of residence. 4) Different amount of time, an individual plans for certain activities, also depending on personal habits and the place of residence (due to space limitations, this part of research is not included in the text).

Data on lifestyle was obtained from 536 persons through a questionnaire. Each respondent provided data on the so called time and spatial structure for 5 days in the week. The questionnaire included the following data: the number of daily departures from home; the number of partial trips on one day; the distance between home and the destination (final and partial destination) for each journey; time of departure, time of arrival and time of return for each journey individually; time spent for each journey; the purpose of the journey and the means of travel. 212 persons furthermore gave additional data through an interview which revolved around places where the needs were fulfilled (very often and sometimes). Apart from data, related to mobility of the respondent, additional social background data was

obtained in the sense of: gender, age, educational level and the profession of the respondent. Regional dispersion of respondents proved to be balanced enough, even though majority came from NE and SW part of Slovenia. The emphasis was placed rather on the balance between socio-economic areas than the location of respondents, namely the number of respondents that live in towns, in suburbs, more urbanized and less urbanized rural areas seems to be rather balanced. Given that many researches on lifestyles show that the age and education tend to play a rather important role (Spellerberg 2007; Otte 2008), we tried to limit the influence of social factors where possible by comparing respondents with similar social characteristics; that is age and education from different socio-economic areas.

While getting to know a lifestyle, one can define individual types in advance or on the basis of obtained data (Otte 2008). Also relevant is the question on the number of types and related indexes. Experience from already present typologies shows that the number of indexes should not be too large, because the types would in such case be internally too heterogeneous. The best option is therefore having two or three indexes. The same applies to the number of types which should also not exceed 5; or 12 with subtypes (Otte 2008, 75). Our research defined the lifestyle types in advance on the basis of indexes for which we believed they had spatial character and answered the question of connectivity between the place of residence and the way of life. The characteristic of individual lifestyles was set on the basis of data, obtained with the questionnaire.

4 Lifestyles according to mobility (of respondents)

Lifestyles were defined by two indexes, »the number of departures from home and the number of partial daily trips« and »distance, covered from home to the most remote location of journey«. Four lifestyles were defined on the basis of this (Table 1):

- Very mobile with a large radius: a person of this type leaves home at least twice daily and makes at least three partial trips. He or she travels a minimum of 30 km daily (if living in town) or 50 km (if living in suburbs or in rural areas). This means that he/she spends more than 30 or 50 minutes daily travelling.
- Less mobile with a small radius: the person with such lifestyle leaves home only once daily, when making two partial trips. The covered distance is shorter than 30 km (if living in town) or 50 km (if living in suburbs or in rural areas) which means that this person spends between 30 and 50 minutes travelling daily.
- Very mobile with small radius: a person with this lifestyle leaves home at least three times daily, performing at least two partial trips but of shorter distance, usually amounting to less than 30 km (if living in town) or less than 50 km (if living in suburbs or rural areas). This person spends at least 30 or 50 minutes travelling daily.
- Less mobile with a large radius: a person with this lifestyle leaves home twice or less daily, while at the same time performing at least three partial trips of at least 30 km (if living in town) or more than 50 km (if living in suburbs or rural areas), spending more than 30 or at least 50 minutes in traffic.

Table 1: Lifestyles, indexes and share of individual lifestyle among respondents.

lifestyle	number of daily departures	travelled distance	share (n = 536)
very mobile with large radius	several (3 or more)	large (30 or 50 km and more)	28%
less mobile with small radius	few (1 or 2)	short (up to 30 or 50 km)	22%
very mobile with small radius	several (3 or more)	short (up to 30 or 50 km)	34%
less mobile with large radius	few (1 or 2)	large (30 or 50 km and more)	16%

Values that determine the individual lifestyle are mean values of all answers. The latter can be seen as methodological deficiency, because travelled distances in towns are shorter than in the urbanized rural areas – even though we are only talking about a mobile lifestyle, we could assign a less mobile lifestyle to a certain person. We thus considered two different indicators for distance and time, spent for travelling in the case of town, suburbs and rural areas.

Majority of respondents showed a very mobile lifestyle with a small radius, followed by a very mobile lifestyle with a large radius. The most common forms are thus the mobile lifestyles! The third most common occurrence is less mobile with a small radius. However, one needs to say that even a very mobile lifestyle with a small radius is quite frequent. The difference between the most and least frequent lifestyle is 18 percentage points. One need to point out that the differences in the number of travelled kilometers are more important than the number of trips.

5 Lifestyle according to the place of residence

One of the basic questions of this research was in what area would the mobility of inhabitants be the largest. Results are presented in Table 2.

Table 2: Presentation of lifestyles according to the place of residence of the respondents (in %).

lifestyle	town (n = 162)	suburb (n = 180)	urbanized rural area (n = 125)	less urbanized rural area (n = 66)
very mobile with large radius	18	27	21	11
less mobile with small radius	29	18	26	45
very mobile with small radius	34	18	18	13
less mobile with large radius	19	37	35	31

The largest similarity among lifestyles can be found among people, living in towns, where the difference between the most and the least common forms is only 16 percentage points. The largest difference is shown in less urbanized rural areas, where the difference among the two amounts to 34 percentage points. Suburbs show a 19 point difference, urbanized rural areas 17 percentage points. One should emphasize that suburbs and urbanized rural areas most frequently show the same lifestyle, other than that, the picture looks much different. Majority of more mobile people can be found in towns (52%) and suburbs (48%). The least amount of very mobile lifestyle was found in less urbanized rural area (24%), which is approximately one third less than in towns.

6 Lifestyle according to the gender of respondents

Considering the gender, the lifestyles in different socio-economic areas can be quite different, which shows the ongoing presence of the rather »traditional« split of work and tasks between the genders. Women are on average less mobile than men, this difference is smaller in urbanized areas and larger in rural areas (a very mobile lifestyle of women, living in suburbs is twice as common as among those, living in less urbanized areas). The analysis shows that women make on average more partial trips than men, most probably due to getting provisions and accompanying children to school. Men travel on average longer distances than women. These differences are slightly bigger in urbanized areas than in the countryside.

Table 3: Presence of lifestyle according to the gender of respondents (in %).

lifestyle	town (n = 162)		suburb (n = 180)		urbanized rural area (n = 125)		less urbanized rural area (n = 66)	
	male n = 81	female n = 81	male n = 88	female n = 92	male n = 69	female n = 56	male n = 37	female n = 29
very mobile with large radius	22	17	48	32	44	29	9	5
less mobile with small radius	21	27	9	17	19	26	57	65
very mobile with small radius	37	24	18	23	26	31	20	16
less mobile with large radius	20	32	25	28	21	14	14	14

7 Lifestyle according to age of respondents

Age is according to many researchers one of the most important indexes (Spellenberg 2007, 190), which was also confirmed by our survey (Table 4). Mobility decreases with age, which can be applied to urban and rural areas. According to our findings, the most mobile tends to be the age group 20 to 44 years, living in suburbs.

Table 4: Presence of lifestyles according to age of respondents (in %; 1 = 20 to 44 years, 2 = 45 to 64 years, 3 = 64 years and older).

lifestyle	town (n = 162)			suburb (n = 180)			urbanized rural area (n = 125)			less urbanized rural area (n = 66)		
	1 n = 61	2 n = 58	3 n = 43	1 n = 62	2 n = 72	3 n = 46	1 n = 46	2 n = 41	3 n = 39	1 n = 26	2 n = 22	3 n = 18
very mobile with large radius	34	43	7	36	28	16	44	26	9	29	12	0
less mobile with small radius	21	21	44	6	27	46	11	22	67	17	47	91
very mobile with small radius	24	19	39	31	34	31	23	19	12	26	22	0
less mobile with large radius	21	17	10	27	11	7	22	33	12	28	19	9

8 Lifestyle according to activity of respondents

Activity and lifestyle go hand in hand. Even if we don't consider the retired people, there are large differences between different active groups regarding mobility. The most mobile are entrepreneurs, the least mobile are people, working in public administration. Differences according to the place of residence are usually the consequence of daily commute to work; the mobility in the category »other employees« is thus larger in suburbs and urbanized rural areas as in towns where work is closer.

9 Conclusions

Heterogeneity of lifestyles is no longer a specialty of urban areas as the situation is becoming similar in the rural areas, too. The whole territory of Slovenia shows all lifestyles; from least to most mobile,

Table 5: Presence of lifestyles according to activity of respondents (in %; 1 = entrepreneurs, 2 = other employees, 3 = public administrators, 4 = retired).

lifestyle	town (n = 162)				suburb (n = 180)				urbanized rural area (n = 125)				less urbanized rural area (n = 66)			
	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
very mobile with large radius	51	10	27	17	50	56	54	8	65	38	35	7	21	15	18	8
less mobile with small radius	5	24	19	33	7	12	7	62	4	22	21	44	9	20	17	68
very mobile with small radius	35	29	23	28	36	11	15	27	18	21	28	46	43	21	22	20
less mobile with large radius	9	37	31	22	7	21	24	3	13	19	16	3	27	44	43	4

but in different volume and size. Approximately 50% of the respondents live a very mobile lifestyle, which is probably due to large dispersion of residential areas and concentration of work in urban centers. This is shown by an above-average share of mobile lifestyles in suburbs and urbanized rural area. As opposed to this, there is an above-average share of very mobile lifestyles with a small radius in towns, where the majority of activities can be reached more easily. This data shows a gap between urbanization of inhabitants (urban way of life) and urbanization of space (accessibility of urban activities).

The share of individual lifestyles is different in socio-economic areas. What stands out is a large share of very mobile lifestyles in suburbs and in urbanized rural areas; the share of very mobile lifestyles in towns is slightly smaller, while it is the smallest in less urbanized rural areas. Such result shows the place of residence as a very relevant element of lifestyle (social relations in a wider sense), because the difference in the share of individual lifestyles seems considerable. A more detailed comparison of lifestyles within households with similar social characteristics in different areas showed their lifestyles to depend on the distance from centers of provision and work, which shows especially in time, spent in traffic on a daily basis. We believe this factor to show the connections between social and physical features, at the same time confirming space as a relevant element or modifier of social sphere. The lifestyle is a mixture of social and physical factors and the place of residence.

One should point out the methodological dispute of familiarization with lifestyles and their valuation. The term lifestyle itself is relatively wide and not completely defined yet; it can't be quantified, it cannot be compared, because it depends on »time and place, here and now.« The number of sample itself also raises some doubts in terms of regularity of results. The same can be said about values that define (quantify) individual lifestyles. One will therefore have to wait until the next similar research for adequacy and suitability of defined types.

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ARTICLES

DAILY COMMUTERS IN SLOVENIA

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ABSTRACT
Daily commuters in Slovenia
The paper analyses and explains the phenomenon of daily commutes of workers in Slovenia. The first part of the article presents the daily mobility analysis of workers in the ten biggest employment centers between 2000 and 2009. The results indicate shifts in the daily mobility patterns, which is a result of traffic infrastructure development and socioeconomic changes in the urban system. The second part describes the analysis of the worker's mode of transportation and the reasons for the regional differences. We may notice considerable differences, especially in the distinct decline of public transportation use and the increased motorization of the population. Regional differences are also apparent, particularly in the modal split between the western and eastern part of the country and between larger and smaller towns. This can be explained by varying levels of motorization in individual areas, differences in the public transportation system providers, and numerous ways of work process organization in industrial and service centers.

KEY WORDS
geography of transportation, commuting, modal split, motorization, public transportation, Slovenia

IZVLEČEK
Dnevna mobilnost zaposlenih v Sloveniji
Prispevek analizira in razlaga pojav dnevne mobilnosti delavcev v Sloveniji. V prvem delu prispevka je predstavljena analiza dnevne mobilnosti zaposlenih v desetih največjih zaposlitvenih središčih v obdobju med letoma 2000 in 2009. Rezultati kažejo na spreminjanje vzorcev dnevne mobilnosti, zlasti zaradi razvoja prometne infrastrukture in družbenoekonomskih sprememb urbanega sistema. V drugem delu predstavljamo analizo načina prevoza delavcev in regionalne razloge za razlike. Ugotavljamo obsežne spremembe, zlasti v izrazitem upadu javnega prometa in naraščanju motorizacije prebivalstva. Opazne so tudi regionalne razlike, zlasti v »modal splitu« med zahodom in vzhodom države ter med večjimi in manjšimi mesti. To lahko razložimo z različnimi stopnjami motorizacije posameznih območij, razlikami v ponudbi javnega potniškega prometa in različno organizacijo delovnih procesov v industrijskih ter storitvenih središčih.

KLJUČNE BESEDE
prometna geografija, dnevna mobilnost, modal split, motorizacija, javni promet, Slovenija

The article was submitted for publication on July 5, 2011.

1 Introduction

Human social and economic activities have always been conditioned by movement. The division of labor means the spatial separation of the place of residence and place of work and leads to daily mobility, causes traffic arteries and has a strong impact on the geography of the landscape. The first substantial flows of daily commuting in the developed world date back to the end of the nineteenth century due to the use of the train and other public means of transport; today automobiles have become the common mode of transportation (Dessemontet, Kaufmann and Jemelin 2010). Urry (2007) talks about the real mobility turn that employs many scientific fields, from sociology, spatial planning, transport, history, and others that attempt to explain the reasons for these changes in the mobility of the population.

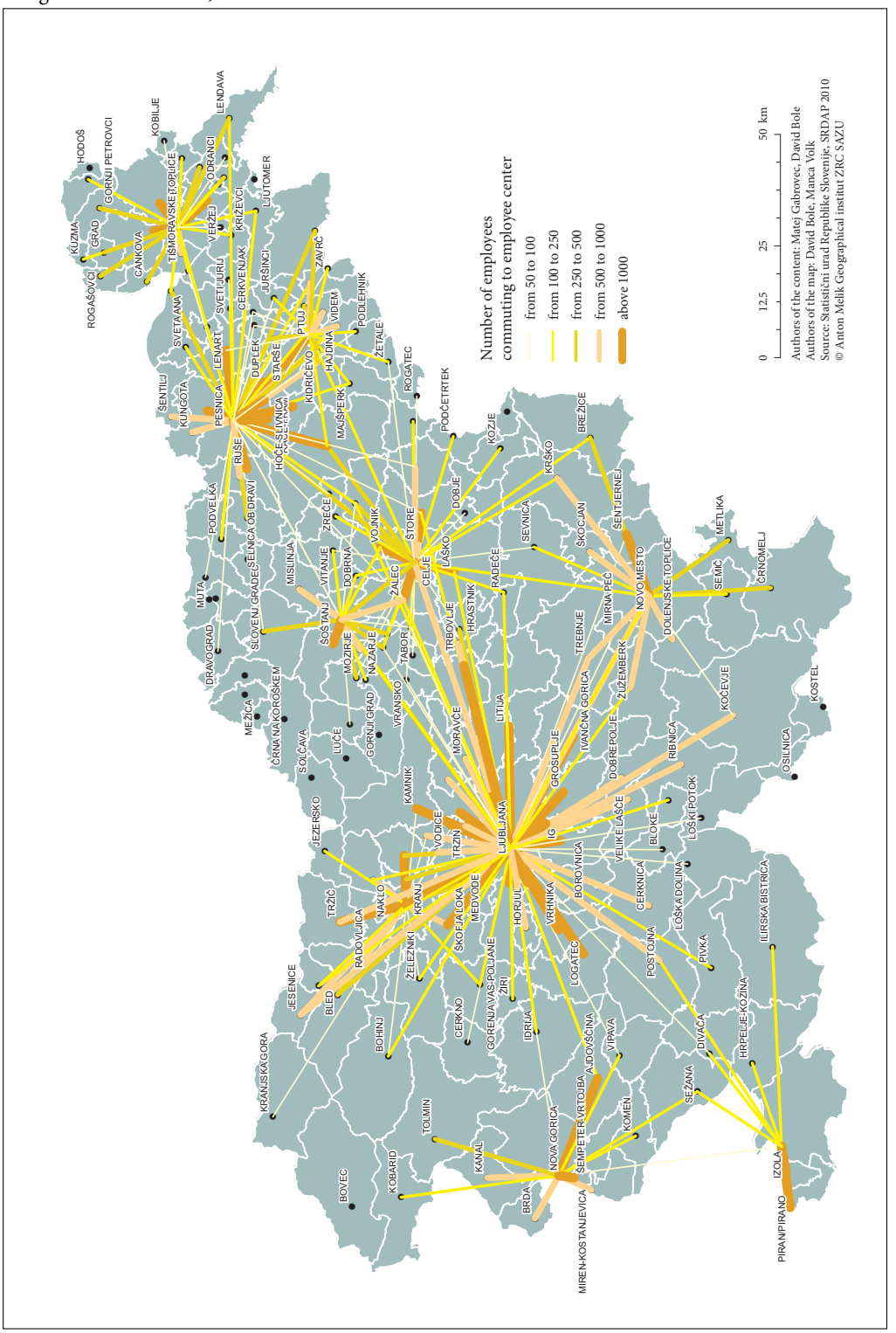
It is evident that Slovenia has undergone substantial changes regarding structure and the mode of transportation in the last two decades, perhaps even more so than in other countries. The number of registered automobiles has nearly doubled from 1985 to 2005, the percent of workers who use public transport for their daily commuting has decreased from over 64% in 1981 to just 10% in 2001. This has led to increased greenhouse gas emissions of the road traffic in Slovenia, reaching 5,000,000 tons in 2006, which is a 429% increase compared to the year 1986. The exterior traffic costs are accordingly high as well, ranging from 6 to 10% of the entire GDP of Slovenia, with passenger road traffic taking the lead (Božičnik et al. 2004; Plevnik 2008). The impact of the population's increased mobility is also expressed in other ways, not only from the environmental or economic aspect. The automobile-based traffic network is causing the formation of dispersed settlements with a low population density and the subsequent construction of a wasteful traffic and communal infrastructure (Bole 2004 and Uršič 2006).

This paper describes the numeric and spatial changes in worker's mobility in the last decade. The aim is to examine whether the construction of the motorway network as an important factor enabling daily mobility has caused greater mobility flows to employment centers. We will focus on the shifts in the scope of workers' mobility, specifically their numerousness and their alterations to the spatial scope. We will also analyze the daily commuters according to their chosen mode of transportation. The analysis encompasses the entire surface of the country and evaluates the workers' daily commutes in various directions and according to their choice of transportation (modal split). There are considerable differences in choice of transport that differ according to geographical area in Slovenia; for this reason, we tried to determine why regional differences in use of public transport occur with daily commuters.

2 Daily mobility analyses from 2000 to 2009

The main source for the illustration of the employment centers' attraction between 2000 and 2009 is the Statistical Register of Employment (SRDAP 2010), where employed persons are listed by place of work and place of residence. However, these registers raise some questions about their exactness. Inconsistencies occur because some companies with several branches or affiliates in various settlements list the seat of the company as the same place of work for all their employees. Discrepancies in place of residence happen because some inhabitants do not state their permanent residence at the address they are actually living. The order of magnitude in these flaws is estimated at 10%. The quality of the data is further analyzed in the monograph *Daily mobility of workers in Slovenia* (Gabrovec and Bole 2009). There is a relatively larger margin of error in some routes where the actual number of commuters is low and the distance between place of work and place of residence is 100 km or more. This problem was quickly solved by simply removing the routes with a suspiciously high number of daily commuters

Figure 1: Attraction of the ten biggest employment centers in 2000. ►
Figure 2: Attraction of the ten biggest employment centers in 2009. ► *str. 174*
Figure 3: Change of employment centers' attraction from 2000 to 2009 in relative values. ► *str. 175*


Number of employees
commuting to employee center
from 50 to 100
from 100 to 250
from 250 to 500
from 500 to 1000
above 1000
0 12.5 25 50 km
Authors of the content: Matej Gabrovec, David Bole
Authors of the map: David Bole, Manca Volk
Source: Statistični urad Republike Slovenije, SRDAP 2010
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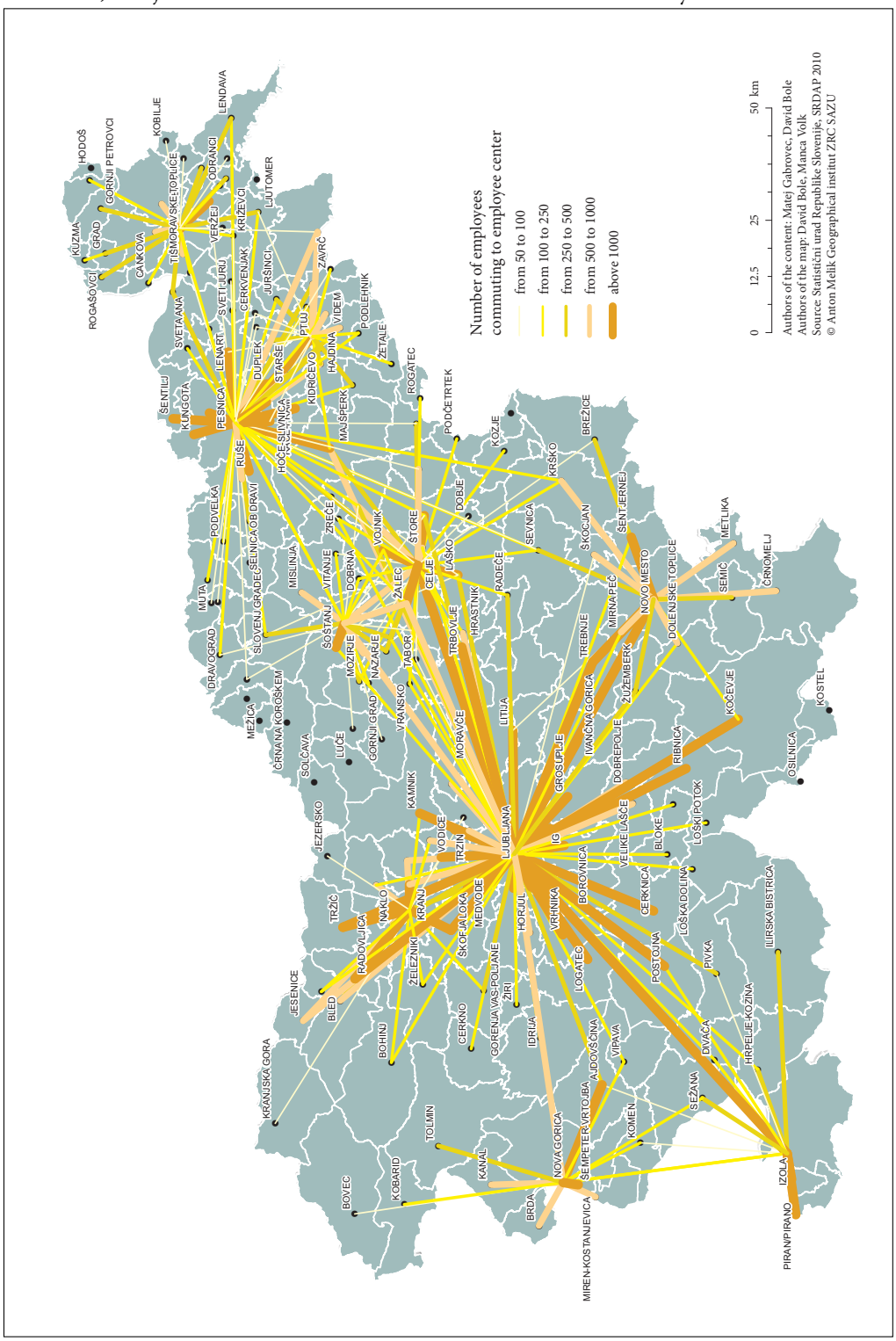
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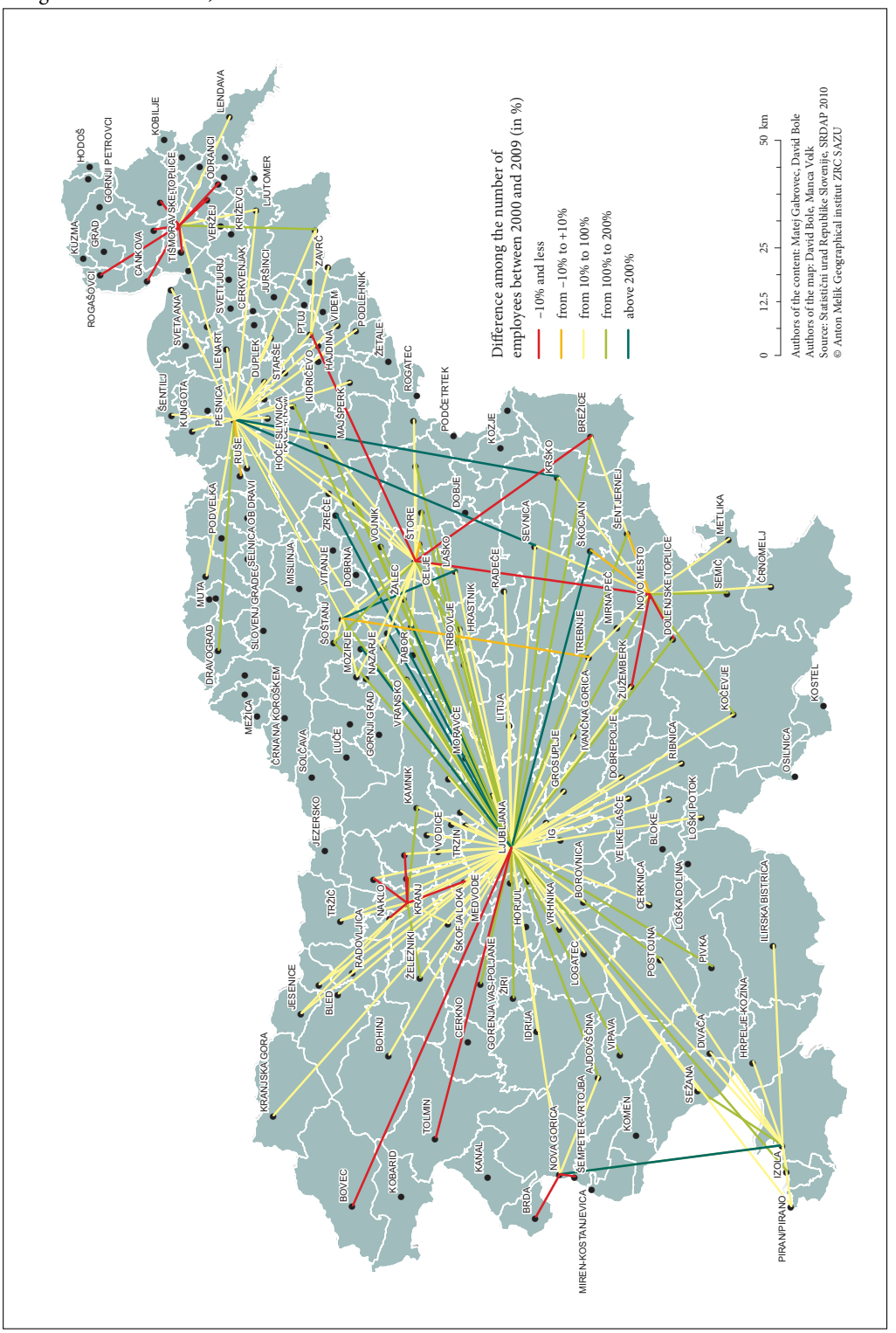
Difference among the number of employees between 2000 and 2009 (in %)
–10% and less
from –10% to +10%
from 10% to 100%
from 100% to 200%
above 200%
0 12,5 25 50 km
Authors of the content: Matej Gabrovec, David Bole
Authors of the map: David Bole, Manca Volk
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between very remote municipalities (for example Lendava–Ljubljana) and not taking them into account. We determined the elementary spatial unit to be the municipality, more precisely, the 192 municipalities as they existed in 2000 and we then examined the commuter flows for the ten largest employment centers in Slovenia. The power of the employment centers, also described as the scope of daily mobility, was illustrated by connecting the originating municipality with the target municipality with a straight line (route). This is a simple method used to examine the regional composition and the power of individual employment centers and their spatial scope. The maps show (Figures 1 and 2) all the one-way routes with more than 50 commuters.

Figures 1 and 2 illustrate the daily mobility of workers in 2000 and 2009. The workers' commute routes show the extensive range especially to Ljubljana, in part also Maribor and Celje. In addition, there proved to be important connections between the employment centers that lie closer to one another. A high level of commuters' spatial mobility was observed especially to the north of Ljubljana in the Ljubljana Basin due to the high level of urbanization or metropolization (Ravbar 1997, 86) and the well-developed motorway and railway connections. A similar conclusion could be drawn in the Drava Plain, where in addition to Maribor, Ptuj was determined to be an important secondary employment center. In 2009 we could observe the expansion of the spatial »scope« of individual employment centers into neighboring municipalities, as well as an increase in the number of commuters between the employment centers themselves. Such are the routes Koper–Ljubljana, Celje–Ljubljana, and Novo mesto–Ljubljana. The most evident reason may be the construction of traffic infrastructure, specifically the completion of motorway sections between these centers. It is interesting to note that besides being a target municipality, it has also become the originating municipality of workers: the number of workers on the routes Ljubljana–Celje and Ljubljana–Koper has more than doubled in the years from 2000 to 2009 (from 200 to approximately 400 workers).

The employment centers Ljubljana and Maribor stand out as the ones with the most increased scopes. It is interesting to note that the scope of the routes in both cases did not only move along the newly-constructed motorway sections, but also along areas where the traffic connections did not improve substantially. In the case of Ljubljana's attraction, an increase can be noticed in the municipalities to the south and in Maribor to the north of the city.

Figure 3 displays the changes in attractiveness according to relative values (shares). It illustrates even more clearly the routes where the biggest changes in worker's mobility occurred. The most noticeable increase can be observed on the route Ljubljana–Celje, where the worker's mobility scope more than doubled in 2009 in comparison to 2000. A 100% increase could also be noted in the worker flows from the Slovenian Littoral, Lower Sava Valley and Lower Carniola regions towards Ljubljana. Important motorway sections had been completed on all the mentioned routes, which enabled better accessibility in the direction of Ljubljana. Other employment centers also saw certain alterations; however, these were not as distinct when compared to Ljubljana. A decrease could be noted only on routes that once lead to important industrial companies. This is an example of shifting the currents of workers' daily mobility combined with economy restructuring from the manufacturing to the service sector; the decrease of mobility to industrial centers was namely followed by an increase in mobility to service centers.

2.1 Reasons for shifts in workers' daily mobility

Improvement of objective and subjective traffic accessibility:
The first characteristic is that motorway construction obviously influences a consequential increase of the workers' scope of mobility. The maps indicate axes where the number of employed commuters increased drastically in absolute as well as in relative values. This refers specially to the following axes:

Koper–Ljubljana, where the completion of the motorway section to the town of Koper shortened the travel time by approximately 15 minutes, which is psychologically evidently enough to remove the »resistance« when contemplating commuting to work.

The construction of the motorway tunnels (in 2005) evidently increased the workers' mobility between the Celje and the Ljubljana region. There was also a drastic increase of worker currents form the municipalities around Celje towards Ljubljana.

The same period also saw the opening of the completed A2 motorway in Lower Carniola in the direction Obrežje, making Krško accessible in an hour and ten minutes. The maps clearly indicate that the absolute shares of workers in Ljubljana commuting from the municipalities of Krško and Trebnje increased drastically and the relative numbers in smaller municipalities.

We may also observe that the increase in the other employment centers was substantially less distinctive than in the case of Ljubljana. The improvement and completion of the traffic network has strengthened Ljubljana's central role, as some past studies have predicted (Gulič and Plevnik 2000). The mobility to the other regional centers changed to a lesser degree. However, it is not only the objective travel time that plays an important role with regard to accessibility, but also the subjective comprehension of the accessibility. Even though the construction of a certain motorway section moves an employment center only a few minutes closer, the comprehension of the accessibility is apparently much greater. An additional increase in motorway use was contributed by implementing the vignette system, thus further stimulating a better comprehension of the employment centers' accessibility.

Socio-economic changes in the municipalities:

The second characteristic is not related to construction or improvement of the traffic network. Some routes reveal a high increase in commuter numbers without any enhancements to the traffic infrastructure. This increase can be ascribed to the basic socioeconomic changes within the urban system (Bole 2008). In the case of some routes the cause is the spreading of suburbanization influences and consequently an increased mobility between satellite places and the central place of work – an example of this being the route Hoče–Maribor. In other cases the mobility to remoter employment centers in increasing due to the originating municipalities' economic crisis. The municipality of Šentilj lost almost a third of all its jobs and simultaneously caused an increase in commuting to the nearby Maribor for more than 300 workers in the period 2000–2009. The same goes for employment centers that are losing their scope of employed commuters; the crisis and job cuts of workers in the food-processing and textile industries in Murska Sobota most likely led to a decrease in mobility of workers from neighboring suburban municipalities.

Changes in hierarchy between regions:

The third characteristic relates to the increasingly obvious connections between regions. Regional centers do not necessarily have a uniform hinterland; they are more and more intertwined and integrated. The connections between the regional centers increased drastically in the examined time period. The important commuter flows extend beyond »regional« borders and form a uniform urban network. Other authors have come to similar conclusions, for example in Switzerland, where it was discovered that not only the mobility patterns within the regions change, but also the patterns between the regions themselves (Dessemontet, Kaufmann and Jemelin 2010); in other words that the hierarchy between individual regions changes.

Changes in hierarchy within regions:

The differences in mobility within regions are also important. Based on urban-geographic research it may be estimated that the inhabitants of regional centers increasingly commute to work to secondary employment centers within as well as outside the regions. Commuter flows are becoming so increasingly dispersed that more and more workers from a certain regional center commute to smaller neighboring employment centers in various industrial zones that are emerging on the outskirts of towns. A similar process has already been described with the examples of the Ljubljana (Bole 2008) and Maribor regions (Drozg 2006) and they point to the establishment of a polycentric formation of regions or a kind of »regional city« where the hierarchical organization of the settlements within the region changes and »balances« out. The improved traffic accessibility has a two-sided effect on the employment center: it means that more and more workers are commuting to an employment center from in the wider region but also enables the inhabitants of the employment center itself to commute outside of it.

3 Modal split to work

The main source of the data on the mode of commuting to work and the choice of transportation is the population census, carried out in 2002. The census information may be somewhat dated, but they are the only data on the commuters' choice of daily transportation for the entire country. The data also enable comparisons with the same data from 1981 and 1991. In this chapter only those daily commuters are examined who do not work in the same place as their permanent residence. If we took into consideration the commuters who live and work in the same settlement, the shares of automobile users would be lower.

A peculiar feature of the Slovenian form of daily commuting is the high percent of automobile use, a consequence of which is the uncompetitiveness of the public transport system's travel times. According to the 2002 census, 78% of daily commuters travel to work by car, with an additional 7% as passengers. Only about a tenth of all commuters use the public transport system. In 2003, a survey sampling was carried out in Ljubljana and its gravitational hinterland about travel habits. The journeys were analyzed according to the purpose, choice of transportation and the time of day. The results for the modal split in the municipalities that tend to gravitate toward Ljubljana in terms of employment were very similar to the census results; 76% of commuters to work were drivers in their own automobiles. A more favorable modal split was shown with the commute of workers in the Ljubljana city municipality, where 58% of the commute were driving a personal automobile (Guzelj and Košak 2003).

Slovenia ranks on top of the EU regarding the use of automobiles. The European statistical data shows that in 2007, 86.2% traveled kilometers of the land transport were driven in automobiles. The

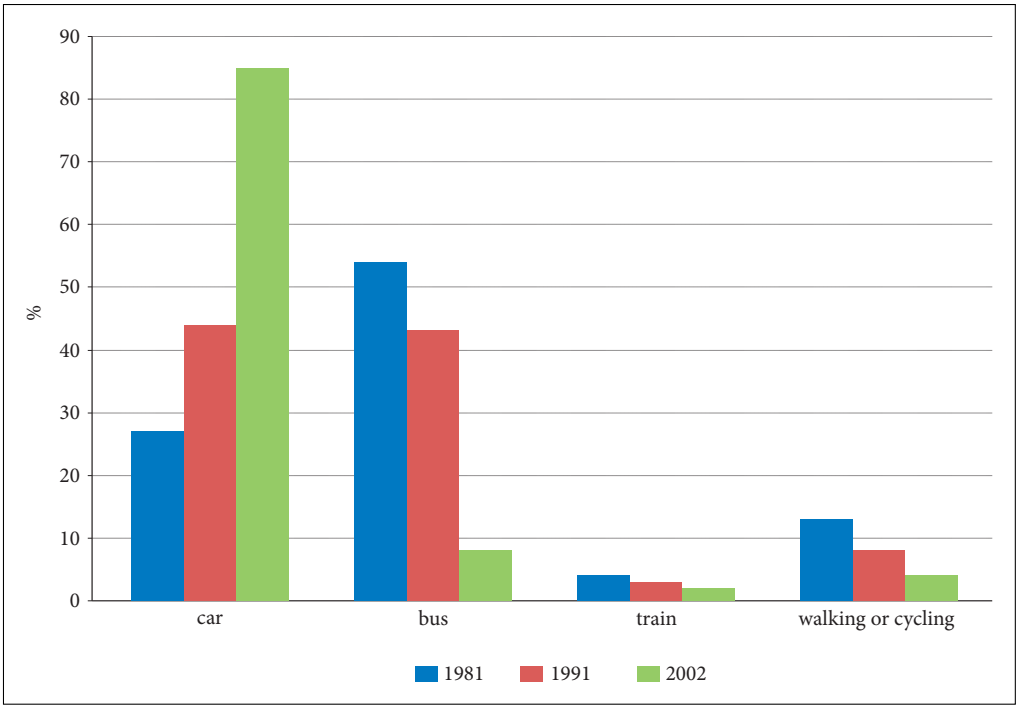
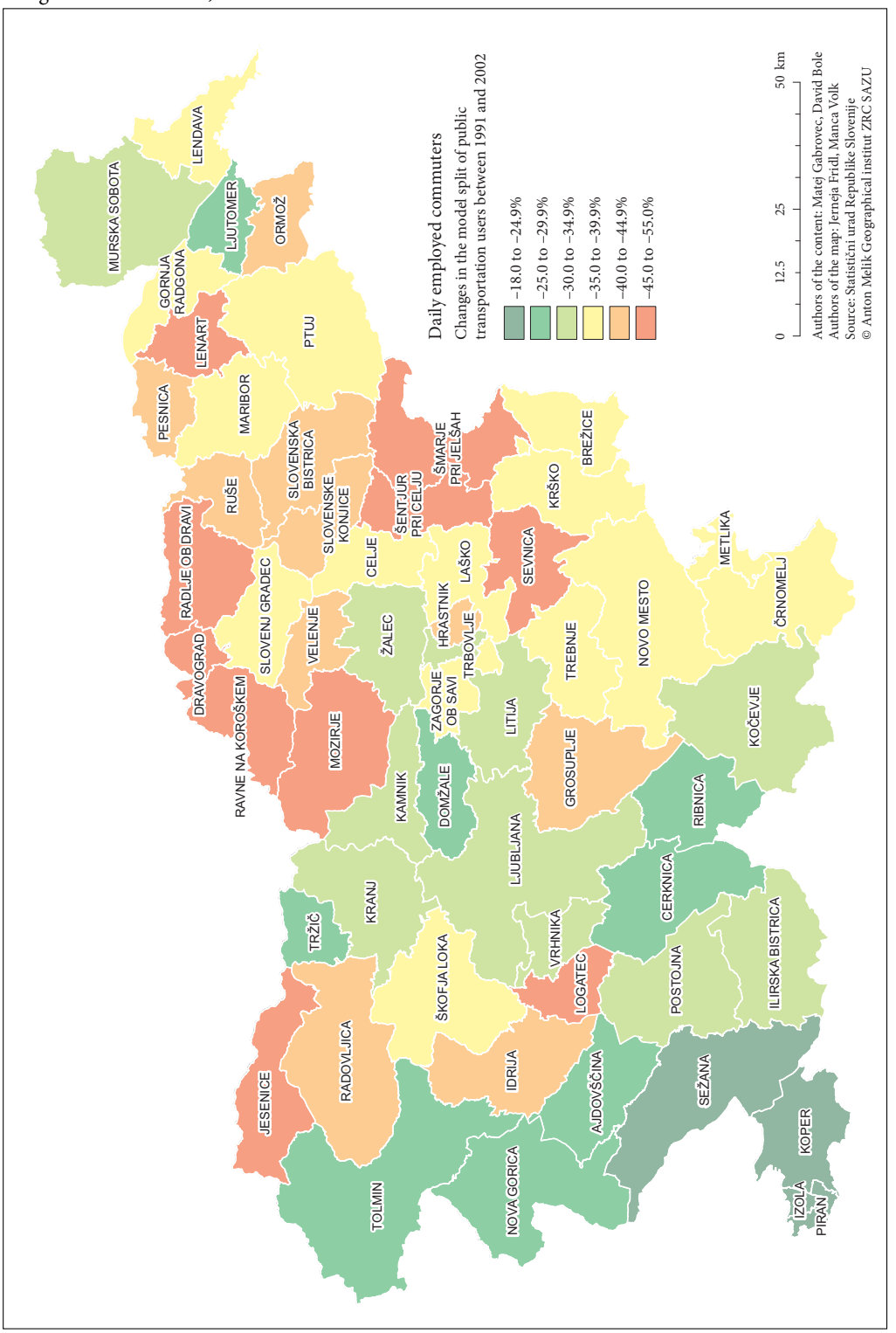


Figure 4: Modal split to work in 1981, 1991, and 2002 (Pelc 1988; Population census 1991; 2002).

Figure 5: Change in the use of public transportation of commuters from 1991 to 2002. ➤


Daily employed commuters
Changes in the model split of public transportation users between 1991 and 2002
−18.0 to −24.9%
−25.0 to −29.9%
−30.0 to −34.9%
−35.0 to −39.9%
−40.0 to −44.9%
−45.0 to −55.0%
0 12.5 25 50 km
Authors of the content: Matej Gabrovec, David Bole
Authors of the map: Jernej Fridl, Manca Volk
Source: Statistični urad Republike Slovenije
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MURSKA SOBOTA
LENDAVA
GORNJA RADGONA
LJUTOMER
ORMOŽ
PTUJ
PESNICA
LENART
MARIBOR
RUŠE
SLOVENSKA BISTRICA
SLOVENSKE KONJICE
ŠENTJUR PRI CELJU
ŠMARJE PRI JELŠAH
RADLJE OB DRAVI
CELJE
LAŠKO
KRŠKO
BREŽICE
SEVNICA
SLOVENJ GRADEC
VELENJE
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HRASTNIK
TRBOVLJE
METLIKA
ČRNOMELJ
DRAVOGRAD
RAVNE NA KOROŠKEM
MOZIRJE
ZAGORJE OB SAVI
LITIJA
TREBNJE
NOVO MESTO
KOČEVJE
KAMNIK
DOMŽALE
GROSUPLJE
RIBNICA
LJUBLJANA
KRANJ
TRŽIČ
VRHNIKA
CERKNICA
ŠKOFJA LOKA
LOGATEC
POSTOJNA
ILIRSKA BISTRICA
JESENICE
RADOVLJICA
IDRIJA
AJDOVŠČINA
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TOLMIN
NOVA GORICA
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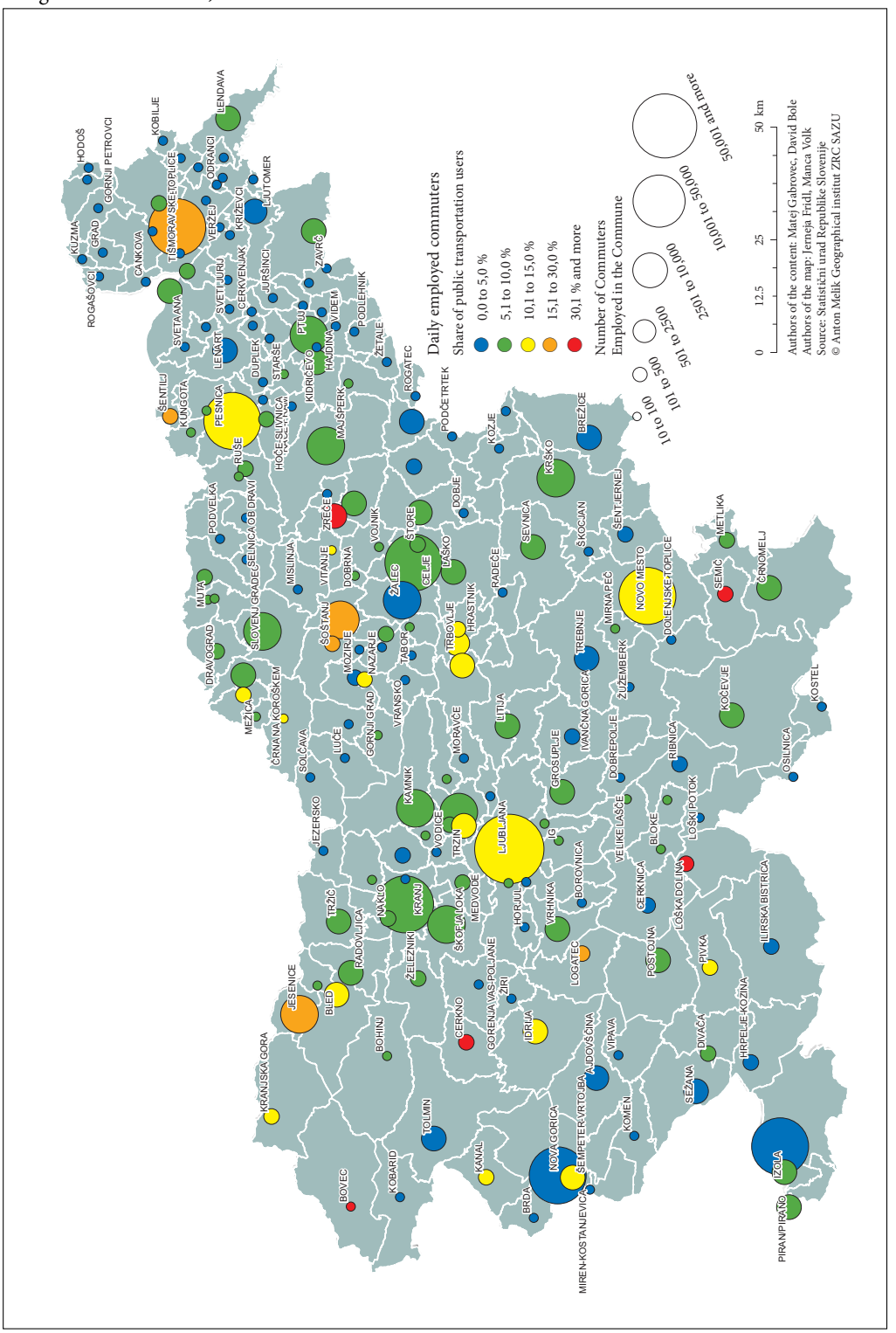
IZOLA
PIRAN

European average is 81.9% and is exceeded only in Lithuania (EU Energy and transport in figures 2010). The rapid decline of the public transportation's role and the increased motorization are high even for European standards, which is especially worrying from the aspect of sustainable spatial development. With 514 cars per 1000 inhabitants, Slovenia ranks higher than the European average (470) and resembles the state in Austria (513) and Germany (504) (EU Energy and transport in figures 2010). The level and spatial arrangement of motorization is a good indicator of the economic circumstances and the values of the society as a whole. Municipalities in the Slovenian Littoral stand out, where according to data by the Statistical Office of Slovenia from 2010, the level of motorization is between 500 and 600 automobiles per 1000 inhabitants. Another such municipality is Trzin near Ljubljana, where the level was the highest in Slovenia (708). Suburbanized municipalities and economically more successful city municipalities are defined by above-average ratings; under-average are mainly older industrial centers which are facing numerous problems (population aging, unemployment, low income) and the least developed rural areas in Slovenia. The access to an automobile seems to be the value of society that dictates the standard of life, as the areas with the highest motorization in Slovenia have the lowest unemployment rate and the highest income. This process has been reversed in environmentally more »friendly« countries where the level of motorization is decreasing despite the high living standard, mostly due to the strengthening of environmental consciousness.

More troubling than the current state of transportation choice in Slovenia is the worrying trend of change in the last two decades. Figure 4 indicates a rapid growth of automobile use for commuting to work on account of more sustainable ways like using the public transportation system and non-motorized forms of traffic. The nineties saw especially fast changes, when the use of automobiles doubled on account of the public transportation system that lost four fifths of its daily commuters during this time. The railway saw less of a decrease, mainly because of lower prices and competitive travel times in comparison to bus transportation. The ratio of drivers to passengers is also unfavorable with car commuters; according to the data from the 2002 census it was 10 : 1. The changes of the modal split mark important regional differences. Figure 5 demonstrates a smaller decline of commuters by public transportation system in the west of Slovenia than the central region. A great decline can be observed particularly in the areas where the public transportation system is quite perfected and its use above-average. This leads to the conclusion that individual regions in Slovenia are in different developmental stages regarding the change of transportation. In western Slovenia the rapid decline of public transportation use already started before 1991, so the change is understandably less noticeable in the studied period. There seems to exist a certain time lapse. The gradual increase of automobiles in families means that one of the parents (or both together) commute to work by car in the first phase; in the second phase they each commute by separate cars; in the third phase, students also stop using the public transportations system and commute with their parents and get their own cars in their senior year of high school. In this way it is possible to simplify and say that western Slovenia is reaching the third phase, with a rapid decrease of public transportation among high school and university students, while eastern Slovenia is still in phase two. In this part of the country the commuters are using public transportation less and less, while the students are not following these tendencies yet. The abovementioned is a description of the period 1991 to 2002; the trends most likely continued after the census year, but there are no statistical data available.

The decrease of public transportation system users as well as users of non-motorized forms of traffic is a consequence of the traffic policy in this period, which focused mostly on the construction of new motorway infrastructure and dealt with the railway and public transportation infrastructure and other sustainable forms of traffic only on a declarative level. Consequentially, using the public transportation system has been assigned a derogatory meaning; for most Slovenians, it is seen as a service

Figure 6: Share of daily commuters who travel to work by means of public transport in municipalities according to the place of work in 2002. ➤
Figure 7: Employed daily commuters by routes between municipalities in 2002. ➤ *str. 182*


Daily employed commuters
Share of public transportation users
0,0 to 5,0 %
5,1 to 10,0 %
10,1 to 15,0 %
15,1 to 30,0 %
30,1 % and more
Number of Commuters
Employed in the Commune
101 to 500
501 to 2500
2501 to 10000
10001 to 50000
50,001 and more
0 12.5 25 50 km
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Authors of the map: Jerneja Fridl, Manca Volk
Source: Statistični urad Republike Slovenije
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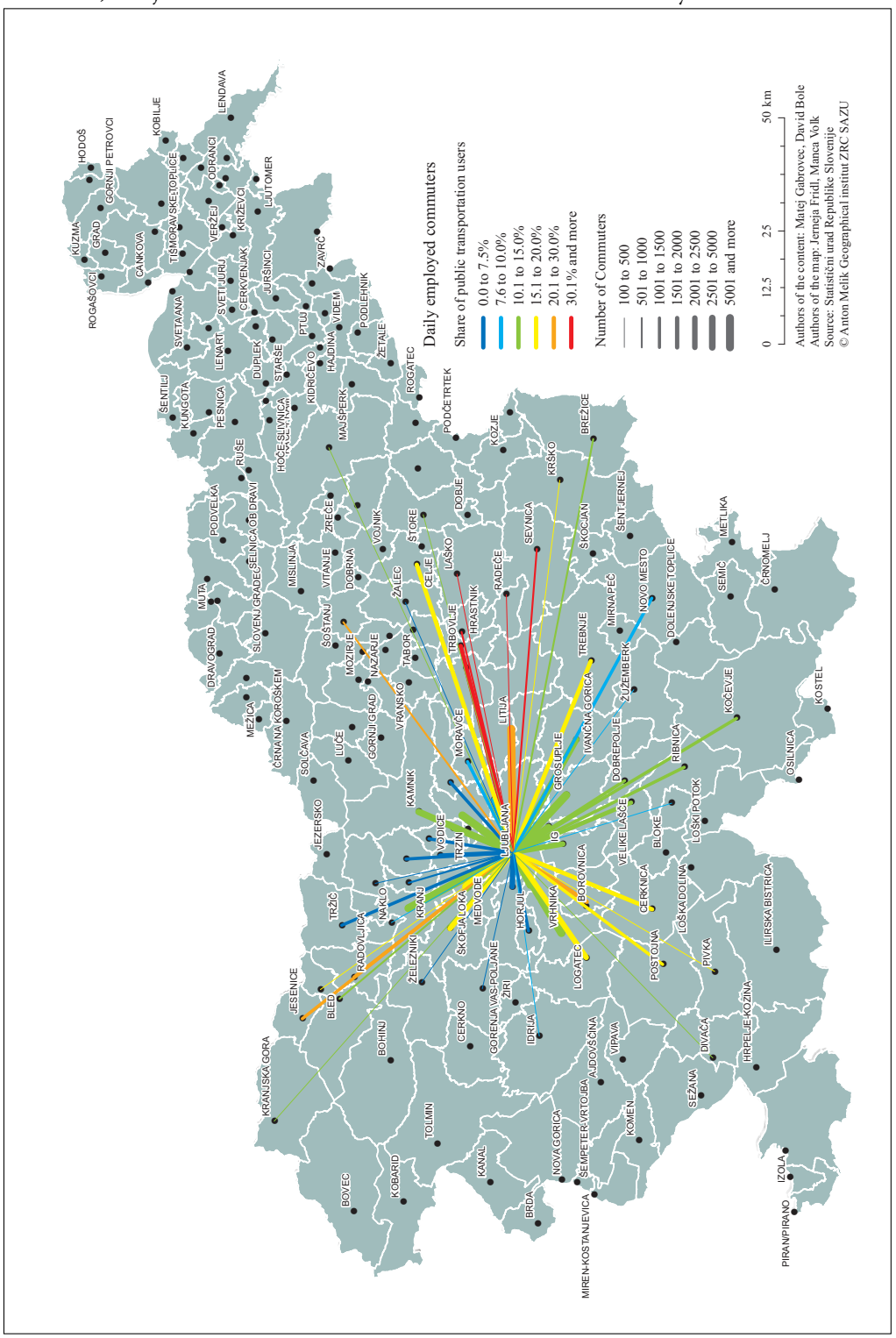
Daily employed commuters
Share of public transportation users
0.0 to 7.5%
7.6 to 10.0%
10.1 to 15.0%
15.1 to 20.0%
20.1 to 30.0%
30.1% and more
Number of Commuters
100 to 500
501 to 1000
1001 to 1500
1501 to 2000
2001 to 2500
2501 to 5000
5001 and more
0 12.5 25 50 km
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MARIBOR
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KRANJ
VELENJE
KOPER
NOVA GORICA
NOVO MESTO
MURSKA SOBOTA
PTUJ
SLOVENJ GRADEC
POSTOJNA
ILIRSKA BISTRICA
IZOLA
PIRAN/PIRANO
SEŽANA
DIVAČA
KOMEN
ŠEMPETER-VRTOJBA
AJDOVŠČINA
VIPAVA
IDRIJA
CERKNO
TOLMIN
BOVEC
KOBARID
KANAL
BRDA
MIREN-KOSTANJEVICA
HRPELJE-KOZINA
PIVKA
LOGATEC
ŠKOFJA LOKA
ŽELEZNIKI
RADOVLJICA
TRŽIČ
JESENICE
BLED
BOHINJ
KRANJSKA GORA
ŽIRI
GORENJA VAS-POLJANE
MEDVODE
NAKLO
TRŽIČ
VODICE
ŠKOFLJICA
KAMNIK
JEZERSKO
SOLČAVA
LUČE
GORNJI GRAD
MOZIRJE
NAZARJE
ŠOŠTANJ
TABOR
ŽALEC
VRANSKO
ŠENTJUR
ŠMARJE
ŠENTJERNEJ
ŠKOCJAN
KRŠKO
BREŽICE
METLIKA
SEMIČ
ČRNOMELJ
KOČEVJE
KOSTEL
OSILNICA
RIBNICA
DOBREPOLJE
ŽUŽEMBERK
DOLENJSKE TOPLICE
MIRNA PEČ
TREBNJE
IVANČNA GORICA
GROSUPLJE
LITIJA
MORAVČE
TRBOVLJE
HRASTNIK
LAŠKO
ČETEJE
ŠTORE
ZREČE
VOJNIK
DOBJE
PODČETRTEK
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ČANKOVA
KOBILJE
TIŠINOVSKE TOPLICE
LENDAVA
ODRANCI
VERŽEJ
KRIŽEVCI
LJUTOMER
ŠVETI JURIJ
ČRENŠOVCI
JURŠINCI
ZAVRČ
SVETAINA
LENART
DUPLEK
STARŠE
PTUJ
VIDEM
PODLEHNIK
ŽETALE
ROGAŠEC
ŠENTILJ
KUNGOTA
PESNICA
RUŠE
HOČE-SLIVNICA
KIDRIČEVO
HAJDINA
MAJŠPERK
PODVELKA
MUTA
DRAVOGRAD
SLOVENJ GRADEC
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IVANČNA GORICA
GROSUPLJE
LITIJA
DOBREPOLJE
KOČEVJE
KOSTEL
OSILNICA
RIBNICA
LOŠKI POTOK
VELIKE LAŠČE
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LJUBLJANA
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SEŽANA
KOMEN
ŠEMPETER-VRTOJBA
NOVA GORICA
TOLMIN
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BOVEC
KOBARID
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MIREN-KOSTANJEVICA
IZOLA
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intended only for underage pupils and the people who cannot afford an automobile. The Eurobarometer research further supports this way of thinking, in which EU citizens were asked whether they would use automobiles if the cost of fuel doubled. According to the research, Slovenians were the least prepared to change their habits, as only 9% of the interviewed people said they would drive substantially less and as many as 47% said they would drive just as frequently (Attitudes …, 2006). The public transporters in Slovenia adapt their services to the users who do not have any other means of transport. On most routes the services are so poor from the aspect of a commuter with flexible working hours that they are only partly useable. There has not been enough attention paid to public transport on a national level; more ambitious projects started only in 2007 and they are still in the planning phases (Gabrovec and Lep 2007; Gabrovec and Bole 2009).

The choice of transportation when commuting to work and school differs greatly according to regions and municipalities in Slovenia. The percent of daily commuters who travel to work by bus or train exceeds 30% on certain routes, but has decreased below 1% in others. This data clearly shows that workers use public transportation for commuting to work only on those relatively few routes where it can compete with automobiles with regards to time and price.

Figure 6 shows a very low percent of public transport users in western Slovenia and in the Littoral, where it practically never exceeds 10%. This is a consequence of a higher level of motorization in this part of Slovenia and a sufficient number of parking spaces in both regional centers, Koper and Nova Gorica. On the other hand we can observe some smaller employment centers with shares of public transport that exceeds 30%. These are individual industrial centers where a large portion of the employees work in local factories. They are mostly companies with more than a thousand workers that organize bus transportation for their own workers or they collaborate with transport providers with coordinating time tables. Cerkno, Loška dolina, Semič, and Zreče stand out. In all these cases one employer stands out that provides more than half of the jobs in the municipality. The map also indicates a more favorable modal split in larger towns that are also regional centers than in smaller municipalities. Larger cities are connected with their hinterlands better; at the same time the increase of automobiles is contained by the shortage of parking spaces. It is also easier to organize public transportation in towns where the work process is uniform and the beginning and end of the work day is the same for the majority of workers: this is a common case in industrial factories, while the work process is less predictable in the service industry and the organization of public transport is consequently more challenging.

When analyzing the choice of transportation on individual routes, the frequency and speed of the public transport are key. Figure 7 demonstrates the percentages of public transport users on individual routes. The map indicates a few characteristics described above: the low percentage of public transport users in the Littoral and high percentages in industrial centers, especially routes towards Novo mesto, Velenje, and Murska Sobota. The most heterogeneous is Ljubljana, where the proportions of the shares on certain routes can be up to 1 : 5. The highest percent of public transport users are from the municipalities in the Central Sava Valley and Borovnica. These are exclusively routes with good railway connections. The travel times of passenger trains on these routes are comparable to automobiles or they are even shorter; in addition the frequency is suitable – there are trains to Litija leaving every half hour. It is therefore evident that a quality railway connection can be competitive. The municipalities Vodice and Komenda have the lowest shares of public transportation users in the direction Ljubljana. Both municipalities lack railway transportation and bus transportation is unsuitable because buses do not use motorways as automobiles do (Gabrovec and Bole 2009).

4 Conclusion

In the last decades Slovenians are traveling greater and greater distances to commute to work and school. This statement is supported by the census data from 1981, 1991, and 2002 as well as the statistical

registers that keep the workers' information on the place of residence and place of work. Despite greater traveled distances, the travel time has been constant in the last twenty-five years. At first glance this realization is exciting. The possibility to overcome greater distances on a daily basis expands the commuters' choice of jobs and schools, but also shopping centers and options for daily trips. This indirectly increases the quality of life. However, a more detailed analysis reveals the negative sides of the described progress. The public transport speed has been constant in the examined period. Its users have therefore not gained anything; not only that, their travel times are now slower than commuters in automobiles. The difference in automobile and public transport speed has constantly grown in the past decades. This is predominantly a consequence of motorway infrastructure construction and a simultaneous neglect of railways. With this, the public transportation system has become less competitive with time and its services have decreased because of less demand. The decreased competitiveness of the public transportation system has also led to a drastic decrease of its use: the percent of daily commuters to work with the public transportation system has decreased from 58% in 1981 to 10% in 2002 and the percent of automobile commutes has increased from 27% to 85% in 2002. The increase in automobile use has a negative impact on the environment. In addition, the increased dependence on automobiles has led to fewer public transport services and has also had negative social consequences. Those inhabitants who cannot afford to use an automobile due to health, financial, or other reasons are witnessing a decrease of their accessibility to work, education, treatment, and recreation. This contributes to greater social exclusion in society.

There are great regional differences in daily mobility changes in Slovenia. These differences are on the one side connected to the economic development and on the other to different measures of the traffic policy. The analysis of regional differences and individual good practices enables coordinated spatial and traffic planning that will promote sustainable forms of mobility.

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ARTICLES

DEVELOPMENT PATTERNS OF SLOVENE TOURIST DESTINATIONS

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ABSTRACT
Development patterns of Slovene tourist destinations
The paper discusses the applicability of Butler's model of the life cycle of a tourist area in interpreting various development patterns of Slovene tourist resorts. In order to find out similar development patterns a hierarchical cluster analysis was performed. As a result, nine clusters were identified. The results show very heterogeneous development of individual resorts. Only in regard to a smaller part of them a pattern similar to the one from Butler's model could be discerned. Lesser importance of those factors of tourism development, which could be related to exceeded carrying capacity, is also a consequence of the fact that tourist resorts in Slovenia in regard to their size cannot be compared to the major European destinations.

KEY WORDS
tourism, tourist arrivals, resort, tourism area life cycle, Slovenia

IZVLEČEK
Razvojni vzorci slovenskih turističnih destinacij
Prispevek obravnava uporabnost Butlerjevega modela življenjskega cikla turističnih območij pri interpretaciji različnih razvojnih vzorcev slovenskih turističnih krajev. Za identifikacijo podobnih razvojnih vzorcev je bila uporabljena analiza razvrščanja v skupine. Na ta način je bilo ugotovljenih devet skupin. Rezultati kažejo zelo raznolik razvoj posameznih turističnih krajev. Samo pri njihovem manjšem delu je bilo mogoče opaziti vzorec, kakršnega prikazuje Butlerjev model. Manjši pomen tistih dejavnikov razvoja turizma, ki bi se lahko nanašali na preseženo nosilno zmogljivost, je tudi posledica dejstva, da se slovenski turistični kraji po svoji velikosti ne morejo primerjati z glavnimi evropskimi turističnimi cilji.

KLJUČNE BESEDE
turizem, prihodi turistov, turistični kraj, življenjski cikel turističnih območij, Slovenija

The article was submitted for publication on June 15, 2011.

1 Introduction

Tourism in Slovenia has a relatively long tradition (Janša 1968). Many places were visited by tourists even before the 19th century (Zorn, Erhartič and Komac 2009), but only after the World War II tourism developed into a mass phenomenon. Real tourism development started at the end of the 1950s and at the beginning of the 1960s, along with the increase of the standard of living of Slovenian population and increase of the arrivals of foreign tourists. The latter was to a large extent a consequence of the improvement of road network in Slovenia (then part of Yugoslavia) as well as in the neighbouring countries (Jeršič 1992). Despite the general trend of tourism growth, which continued in the 1970s and the 1980s, the periods of growth were interrupted by short periods of decline. Tourism was hit hard by the proclamation of independence of Slovenia in 1991 and the ensuing war. It resulted in a strong decrease of foreign tourist arrivals. The share of tourists not coming from Slovenia decreased from 74.32% in 1990 to 51.8% in 1991. The interest to visit Slovenia heavily reduced in traditional markets like Germany, the UK, and the Netherlands (Gosar 2005). The new situation was a start of a rethinking process in the tourism economy of Slovenia. The necessity for the change in tourism policy resulted, to a great extent, from the new geopolitical reality in the region (Gosar 1999; 2005). Among the results of the new development processes were a reduction of available beds, the increase of the quality of accommodation and other guest services, expansion of wellness programmes, the construction of several new amenities, like ports (marinas), sport facilities (e.g. golf, tennis), and swimming pools with thermal waters, etc. (Gosar 1999; 2005). In the subsequent years the growth of tourist arrivals and overnight stays has been continuous, but has not entirely compensated the earlier losses.

The pattern of tourism development, briefly presented above, was not characteristic of all of the Slovene destinations. Among them are resorts with a history of tourism development dating back to the 19th century as well as the ones, in which the process of tourism development did not begin until 1960s and 1970s, in some cases even later. Destinations experienced very diverse development processes, the reason for this being the influence of very heterogeneous factors.

The most influential interpretation of development of tourist areas was made by Butler (1980). His model, often referred to as Tourism Area Life Cycle (TALC), explains development of a tourist destination going through six stages (exploration, involvement, development, consolidation, stagnation, and decline or rejuvenation). A tourist destination starts with a small number of visitors, which is a consequence of a lack of access, facilities and local knowledge. In the next stages tourist numbers begin to grow. When the levels of carrying capacity are reached, the tourism growth slows down. This stage could be followed by a decrease of tourist numbers or even a complete decline of tourism. On the other hand, rejuvenation may occur along with the increasing numbers of tourists.

Butler's model was frequently used and tested in various areas of the world. A very thorough review of a destination life cycle literature was presented by Lagiewski (2006). In the majority of cases only one or two destinations were studied. The most obvious exception is the research by Schuckert et al. (2007), which focused on changes in numbers of tourist nights (separately for summer and winter season) in 278 Austrian (Tyrolean) municipalities. In Slovenia the model was used in the case of a coastal resort Portorož (Vrtačnik Garbas 2005), and partly in the study of tourism development of the health resort Rogaška Slatina (Horvat 2000).

The model was applied on various spatial scales from individual settlements to whole states (e.g. Formica and Uysal 1996). It is hard to believe that one single model could be equally appropriate in such diverse cases. The question of spatial scale was discussed in detail by Johnston (2001, 9), who pointed out that Butler adapted the product life cycle model to individual destinations, which are going through their own life cycle, and not to the tourism products. He concludes (Johnston 2001, 10) that the spatial level, for which this model is most appropriate, is a tourist destination with its environmental or cultural resources as a basis for their attractiveness and recreation business district (or potentials to have one).

Butler (1980) focused predominantly on the role of factors in a particular area, which contribute to the attainment of carrying capacity. Among them are environmental factors, such as water and air quality, the capacity of transport infrastructure, accommodation facilities, etc., and also social factors, such as crowding and opposition to tourism among the local population. He pointed out also the possibility of influence of the factors which do not originate in a tourist area, but can anyway decisively influence tourist visitation (e.g. wars, epidemics or other catastrophic events). The above-mentioned factors, along with some others, influence changes in the number of tourists and can – according to the predictions of the model – lead to a decline of tourism or to rejuvenation of a tourist destination. Nevertheless, the propositions of the model have been questioned by some authors (e.g. Lundtorp and Wanhill 2001).

As already mentioned in the introduction, the long-term trend of tourism growth was characteristic of the majority of Slovene destinations but by no means of all of them. Statistical Office of the Republic of Slovenia (SORS) has been publishing data on tourism for different types of tourist resorts (coastal resorts, mountain resorts, health resorts, Ljubljana, other tourist resorts, other places). These data show marked differences among types of tourist resorts. Many destinations have been faced in the last decades by stagnation or even a decline in tourist numbers. In relation to this the question of the conformity of development processes in Slovene destinations with the ones predicted by Butler's model could be raised.

The aim of this paper is to find out what development patterns, such as shown by data on tourist arrivals, have been present in Slovene destinations. Related to this is another question: to what extent their development has been influenced by common factors and, on the other hand, by processes specific to individual destinations. The paper also discusses the applicability of Butler's model in interpreting various development patterns.

2 Data and method used

To analyze tourist numbers, similarly as in Butler's model, data on tourist arrivals were used. Till 2009 SORS collected and published data on accommodation facilities, tourist arrivals, and overnight stays for municipalities as well as single settlements (the so called »important tourist resorts«). In the last two decades, the number of municipalities has changed several times; therefore data at municipality level are not appropriate for the analysis of changes in tourist numbers through lengthy periods of time. Because of that, data at settlement level were used for the analysis. Till 2002 data were published in a yearly publication *Letni pregled turizma* (Annual Review of Tourism). Since then, these data have been mainly published on the web page of SORS (www.stat.si).

In the present analysis the data for the period 1966–2009 were included (in 1966 for the first time the data for ten new resorts were published). »Important tourist resorts« have been in the majority of cases identical with settlements, but in some cases also data for surrounding settlements were added to major tourist resorts.

To find out similar development patterns (similar changes in the numbers of tourist arrivals) in 131 tourist resorts a hierarchical cluster analysis, the Ward's method, was performed, and as a measure of distance a squared Euclidean distance was used. Only those tourist resorts were taken into account, for which data for at least ten years were available. As a result, 131 tourist resorts were included in the analysis. Clusters were identified with the help of a dendrogram.

3 Results of cluster analysis

As a result of the cluster analysis, 9 clusters were identified. They vary in size in regard to the number of tourist resorts. Characteristics of clusters are briefly presented in the next pages. In order to graphically show the changes in numbers of tourist arrivals through time, the data for individual tourist

resorts were transformed into values on the interval between 0 (minimal value) and 1 (maximal value). This was made in order to avoid the prevailing influence of only a few most visited tourist resorts on the shape of the curve. The average values for resorts in individual cluster were computed for every year. The graphs thus show average changes in numbers of tourist arrivals. Tourist resorts with regard to cluster membership are shown on the map (Figure 5).

Cluster 1: The common characteristic of 22 resorts from cluster 1 is that tourist arrivals peaked in the first decade of the 21st century. A continuous growth of tourist numbers can be observed for the whole period between 1966 and 2009 (Figure 1). The decrease of tourist arrivals after 1991 was less pronounced than in almost every other cluster. Already in the mid-1990s the peak values from the past were exceeded. After 2008 the economic recession was the cause of a small decrease in tourist arrivals.

Cluster 1 includes 9 health resorts, but also some mountain and coastal resorts (see Figure 5). Among the more popular destinations prevail the ones in which the majority of visitors come from Slovenia. This was one of the most important reasons for the very modest decrease of tourist numbers after 1991. In cluster 1 there are also some resorts, in which tourism started to develop for the first time during the very period under study (1966–2009) (e.g. Kope, Zreče with Rogla, etc.). On the other hand, this cluster includes also resorts with tourism tradition dating back to the 19th century (e.g. Dolenjske Toplice). Accordingly, despite similar changes in tourist arrivals tourist resorts in cluster 1 are not within the same life cycle stage.

In the case of health resorts the growth of tourist numbers throughout the period under study (even in the 1990s) was caused by the construction of modern thermal parks and reorientation into mass tourism, based on recreation, healthy lifestyle and wellness (Horvat 2010). In addition, the uncertain political situation in the area of former Yugoslavia in the 1990s induced a large number of Slovenes to visit the newly equipped and modernized spas instead of spending their vacation along the Adriatic coast of Croatia (Gosar 2005). Mountain resorts from this cluster are partly new skiing centers (e.g. Cerkno, Kope), which are only at the beginning of their life cycle, or resorts which in the last two decades offered tourists new types of recreation and experiences (e.g. a thermal park in Bohinjska Bistrica, river-based recreation in the case of Bovec).

Cluster 2: In cluster 2 (n = 14) growth of tourist numbers till the 1980s can be seen. It was followed by a strong decrease in tourist arrivals after 1991. The recovery was relatively rapid. Peak values were reached mostly shortly before the 2008 economic recession. In comparison with cluster 1 peak tourist numbers did not surpass the values from the 1980s as decidedly. Moreover, the numbers from the 1980s were surpassed later.

In cluster 2 there are some of the most important Slovenian resorts, e.g. Portorož, Izola, Bled and Rogaška Slatina. For the majority (but not all) of the resorts in this cluster foreign tourists are of above-average importance. A considerable dependence on foreign visitors was one of the reasons for a strong decrease in visitation after 1991 when foreign tourists started to avoid Slovenia.

In most cases, resorts from this cluster have not experienced radical changes (in the sense of Butler's rejuvenation stage) in tourism offer. However, they have introduced various novelties and have been taking care of the maintenance of appropriate quality of their tourism product, including new accommodation facilities (e.g. Ptuj) and investments in new tourist facilities, as in the case of Portorož (a new thermal recreation centre, medicinal beauty, physio-therapeutic and massage centre, conference rooms, etc.; see Vrtačnik Garbas 2005).

Cluster 3: A late beginning of growth in tourist numbers (in the 1980s or even later) is a typical feature of cluster 3. The peak values were registered in the 1990s. The growth was soon interrupted by a strong decrease of tourist arrivals. The trends for the last decade and a half are mostly negative. The period with peak tourist numbers (which should represent Butler's stagnation stage) was relatively short. Among the resorts from cluster 3 there is not a single one with large tourist numbers (mostly below 10,000 tourist arrivals per year). Smaller tourist resorts (e.g. Log pod Mangartom, Izlake/Medijske Toplice, etc.) prevail. The curve of tourist arrivals seems to follow the pattern described by Butler but the sim-

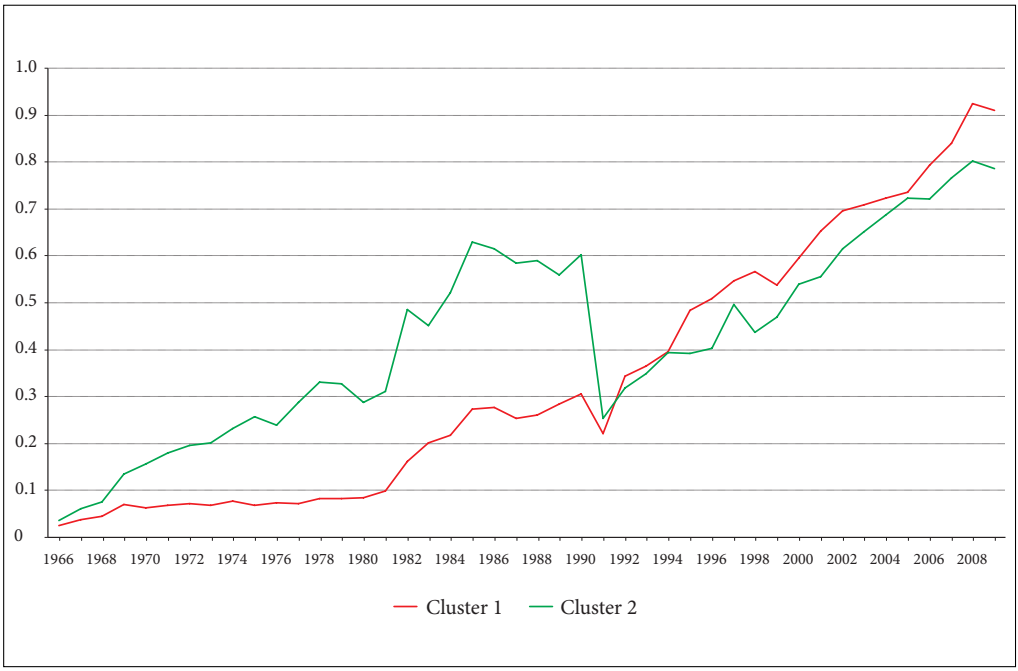

Figure 1: Changes in tourist arrivals in clusters 1 and 2.

Figure 2: Changes in tourist arrivals in clusters 3 and 4.

ilarity is only superficial. Over-development of tourism could by no means be blamed for the decline of tourist numbers. In fact, these destinations never got seriously involved with tourism. Tourism entrepreneurs (or sometimes even a single one) in individual resorts have not been able to start development of tourism on a larger scale. Often also natural and social potentials have been comparatively limited.

Cluster 4: Similar to cluster 3, also in cluster 4 there are no important tourist resorts. Destinations reached a well-marked maximum before the break-up of Yugoslavia, in the 1980s. After 1991 numbers of tourist arrivals have been much smaller. In some cases tourism stopped completely or at least diminished to such an extent that SORS stopped publishing data on tourism for these settlements (e.g. Črni vrh, Poljane nad Škofjo Loko). Cluster 4 includes also some urban centres (Slovenj Gradec, Ormož, Tolmin, etc.), which are visited by tourists with non-leisure motives. The second group of destinations in cluster 4 is formed by rural settlements with smaller tourist attractions (e.g. a ski slope in Črni Vrh, a spring of mineral water in Kotlje, etc.). As in cluster 3, the reasons for tourism decline are not related to the exceeded carrying capacity but to various other, more or less locally specific factors.

Cluster 5 includes only 7 resorts. What they have in common is the fact that they experienced peak tourist numbers already in the 1980s. Despite the subsequent recovery they have not been able to approach those numbers. The period of high visitation lasted much longer than in the case of cluster 4. The most important tourist resorts from this cluster are Kranjska Gora and Bohinj. The reasons for the disability of resorts to reach tourist numbers from the 1980s are diverse. In the case of Bohinj one of the important reasons is the fact that many accommodation facilities have been, already for some time, in a bad state of repair, since their owners have not invested in their renovation (Arh et al. 2006). In the case of Kranjska Gora, some of the factors influencing smaller numbers of tourists could be placed in the context discussed by Butler, e.g. excessive growth of apartments and second homes, obsolete infrastructure, problems with parking regime, etc. (Strategija razvoja turizma … 2005). Nonetheless, looking for causes only among the previously mentioned factors, would be oversimplifying the situation and overlooking other important factors, e.g. problems with winter seasons because of the lack of snow cover, a strong decline of tourists of some nationalities after 1991, who later did not come back (especially Serbs), etc. The new

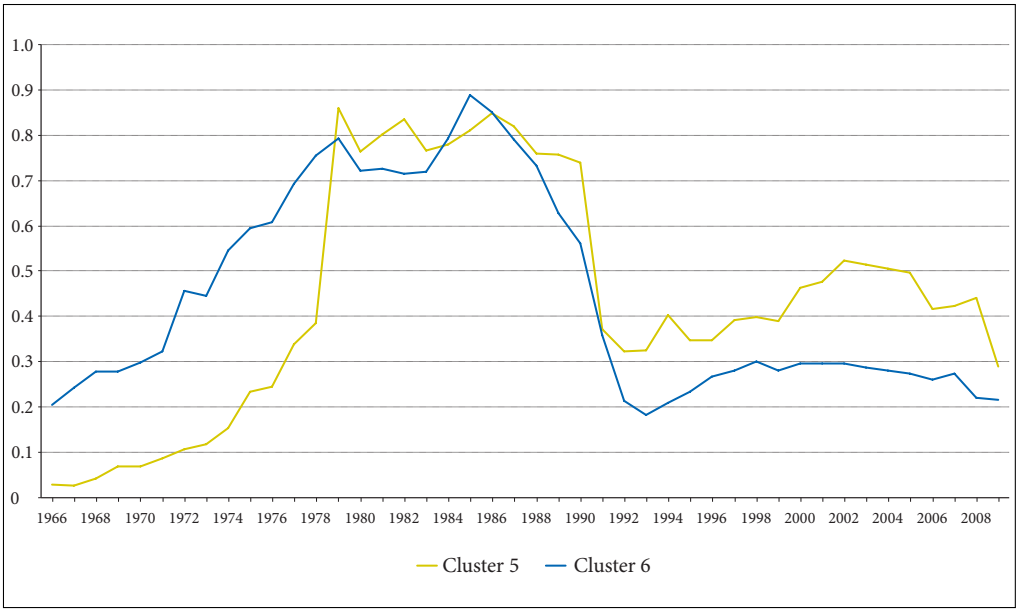

Figure 3: Changes in tourist arrivals in clusters 5 and 6.

geopolitical reality in the South-Eastern Europe negatively influenced also some other tourist resorts from this cluster, which had previously depended to a large extent on tourist flows to neighbouring Croatia due to their favourable location along the main traffic routes (Lipica, Kozina, Podlehnik).

Cluster 6: 13 resorts from cluster 6 were classified by SORS only into two groups (Ljubljana is an exception) of tourist resorts: mountain resorts (e.g. Gozd Martuljek, Jezersko, Krvavec), and »other tourist resorts« (e.g. Ajdovščina, Grosuplje, Murska Sobota, etc.). In the second group urban settlements prevail. Ljubljana (as the capital) was classified into a special group but has – in regard to its tourism attributes and tourism offer – many similarities to some other destinations in this cluster (e.g. Murska Sobota, Škofja Loka, Radovljica, etc.) for which urban or business tourism is of importance.

Cluster 6 shows similar development as cluster 5. The main difference is in the more distinctive decline of tourist numbers after 1991. Despite the subsequent partial recovery tourist arrivals remained far behind the 1980s numbers. At the end of the period under study they were similar to those from the 1960s.

Ljubljana is the only resort in cluster 6 with a large number of tourists (526,813 tourist arrivals in 1985). Therefore, also in cluster 6 the exceeded carrying capacity was not the cause of decline.

Cluster 7 (n = 26) is formed, similarly to clusters 3 and 4, mostly by destinations in which significant tourism development has not taken place. The majority of resorts were classified by SORS into the group of »other tourist resorts«. The peak numbers were attained sooner than in the majority of other clusters. The decrease after 1991 was very strong and subsequently tourist numbers remained at below-average levels. In some destinations in the last period at least some growth could be observed (e.g. Maribor), while others still show negative trends (e.g. Kamniška Bistrica). Among the resorts from cluster 7 only a few possess the amenities and attractions that could help them to play the role of a real tourist resort.

Many resorts from this cluster were strongly affected by the political instability in the area of former Yugoslavia, the reason for this being their location along the main traffic routes to Croatia (similar to some resorts from cluster 5), e.g. Postojna, Otočec, Brežice, Ilirska Bistrica, etc. Furthermore, the diminished tourist numbers were also a result of interruption of economic and social contacts with the other areas of former Yugoslavia, from where previously the majority of tourists came (e.g. Celje, Jesenice, Kranj, Novo mesto, etc.).

Cluster 8: Resorts in cluster 8 (n = 5) were relatively important tourist destinations already at the beginning of the period under study (1966–2009) – especially Piran and Mariborsko Pohorje. Till the end of the 1980s tourist numbers did not significantly change, unlike in the majority of other clusters. Very modest tourist numbers were not just the consequence of the political instability and violence in the nearby areas after the break-up of Yugoslavia, but had been indicated already at the end of the 1980s. This trend was related to diminishing numbers of domestic tourists (Slovenian tourists as well as tourists from other Yugoslav republics) as a result of economic problems. The first peak of tourist numbers was registered soon after the beginning of the period under study. Only in the last decade similar numbers were reached.

Cluster 9: The majority of resorts from cluster 9 (n = 20) are classified by SORS as »other tourist resorts«. They registered the highest tourist numbers at the beginning of the period under study (the second half of the 1960s, the first half of the 1970s), when they were visited by relatively large numbers of tourists, although they were far from being major tourist resorts. From the 1970s onward a trend of a decreasing number of tourists set in. An additional impulse to this process was given by the break-up of Yugoslavia. Later, tourist numbers remained below the 1970s level. In some cases tourism virtually disappeared.

Tourist arrivals were often influenced by non-leisure motives or by good traffic location. Higher tourist numbers were registered only in Koper (which is a coastal town but also an economic centre of Slovenian Istria), Sežana and Vrhnika (in-transit visitors, business tourism). The average length of stay was very short. The same holds true for many other destinations in this cluster.

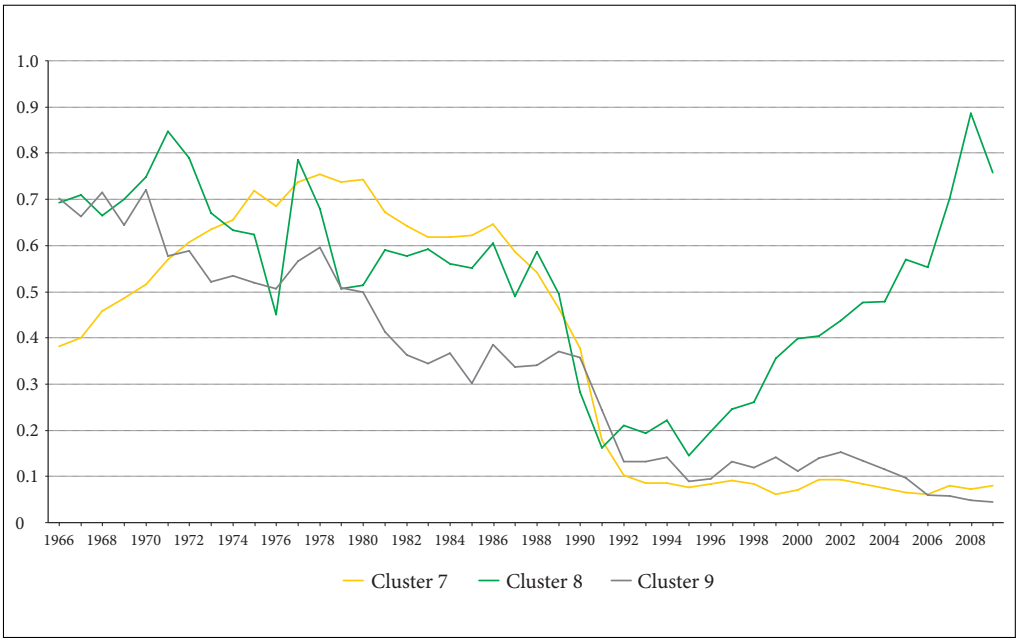

Figure 4: Changes in tourist arrivals in clusters 7, 8 and 9.

Cluster 9 includes also some smaller, rural destinations, in which the decline of tourism was again caused by diverse locally specific factors (e.g. a withdrawal of the main tourism entrepreneur in the case of Lokve; Skok 2005).

4 Conclusions

The analysis of the data on tourist arrivals in »important tourist resorts« offered an insight into development processes and characteristics of tourism development in Slovene destinations. Very diverse development patterns, as having been identified, are also the consequence of the landscape diversity of the Slovene territory and, consequently, heterogeneity of tourism offer and tourist attractions. The analysis pointed out some common factors of influence which could, according to Johnston's (2001) terminology, be labelled as macro-structural conditions. These factors comprise the influence of the state economic policy and especially tourism policy (the growth of tourist numbers in the sixties), the influence of political instability (independence of Slovenia) and a new geopolitical situation in the area of former Yugoslavia, economic problems (e.g. economic recession after 2008), etc.

Other factors are more closely related to the specificities of development in individual places. Nevertheless, there are still many similarities between different destinations in regard to the characteristics of development as well as the influence of different exogenous and endogenous factors. For this reason they show a similar evolution of tourist numbers.

The changes in the number of arrivals through time are thus partly related to the type of destination (similar development patterns in many health or coastal resorts) and consequently to the type of its tourism offer. Less positive trends in mountain resorts are, for example, related to the problems of

Figure 5: Tourist destinations and their cluster membership. ➤

0 10 20 30 km
Author of the content: Dejan Cigale
Cartographer: Dejan Cigale
Sources: Statistični urad RS (Statistical Office of the Republic of Slovenia);
Direkcija RS za ceste (Slovenian Roads Agency)
Cluster
1
2
3
4
5
6
7
8
9
Maximum yearly number of tourist arrivals in the period 1966–2009
over 10,000
5,000–10,000
less than 5,000
Type of tourist resort (according to the classification of SORS)
coastal resort
health resort
mountain resort
other tourist resort
Ljubljana
road
Moravske Toplice
Murska Sobota
Lendava
Gornja Radgona
Radenci
Banovci
Ljutomer
Ormož
Pesnica pri Mariboru
Maribor
Pitui
Podlehnik
Brestrnica
Mariborsko Pohorje
Slovenska Bistrica
Slovenske Konjice
Rogaška Slatina
RADLJE OB DRAVI
LOVRENC NA POHORJU
Zreče/Rogla
Podčetrtek
Ravne na Koroškem
MEŽICA
ČRNA NA KOROŠKEM
KOTLJE
Kope
Dobrna
Laško
Rimske Toplice
Krško
Brežice
Čatež ob Savi
RAJEC
Slovenj Gradec
Topolšica
ŠOŠTANJ
Velenje
Žalec
ŠENTJUR
RADEČE
Otočec
Novo mesto
Dolenjske Toplice
Metlika
ČRNOMELJ
VINICA
Šmarješke Toplice
Trebnje
SEVNICA
ZAGORJE OB SAVI
HRASTNIK
ZLAKE
Trbovlje
PREBOLD
TROJANE
LITIJA
Mozirje
Prebold
Solčava
Logarska dolina
LUČE
LJUBNO OB SAVINJI
Jezersko
Kamnik
KANDRŠE
DOMŽALE
Ljubljana
Grosuplje
Zavrtače
RIBNICA
GORNJE LOŽINE
Kočevje
Krvavec
Preddvor
GORNJI GRAD
Vopovlje
MOŠE
Škofja Loka
Medno
Vrhnika
Logatec
RAKITNA
RAKEK
Postojna
Podkoren
PLANINA POD GOLICO
Jesenice
Podljubelj
TRŽIČ
Lesce
MOŠNJE
Radovljica
Bohinjska Bistrica
Kranj
SPODNJA SORICA
POLJANE NAD ŠKOFJO LOKO
GORENJA VAS
Cerkno
Idrija
ČRNI VRH
Ilirska Bistrica
Gozd Martuljek
Kranjska Gora
Dovje-Mojstrana
Pokljuka
Bohinj
Tolmin
MOST NA SOČI
LOKVE
Nova Gorica
Ajdovščina
VIPAVA
Šempeter pri Gorici
Sežana
DIVAČA
Lipica
Kozina
Ankaran
Izola
Koper
Piran
Portorož
Sečа
Rateče
LOG POD MANGARTOM
Kobarid
Kobarid
Kranjska Gora
Dovje-Mojstrana
Bovec
Bohinj
Tolmin
Nova Gorica
Šempeter pri Gorici
Sežana
Lipica
Kozina
Ankaran
Izola
Koper
Piran
Portorož
Sečа

winter tourism (scarcity of snow) and to the decrease of tourist numbers in summer because of changed expectations of visitors. However, in many cases similar development patterns can be found in tourist resorts in different natural geographical regions (e.g in the alpine and coastal region). Natural features are an important part of attraction of an individual destination but what matters is also its ability to adapt to changes in tourism demand.

The most negative trends are characteristic of the clusters 3, 4, 7 and 9. In resorts from clusters 3 and 4 tourist numbers remained very modest throughout the period under study. In the case of clusters 7 and 9 numbers of tourist arrivals were on average much larger. Nonetheless, in the majority of cases tourism was only a marginal economic activity and its contribution to a local economy was not of greater importance. Only in exceptional cases tourism completely declined. Usually, this was the consequence of the problems of the single or the most important tourism entrepreneur in the resort.

Destinations, which to a large extent depended on business tourism and in-transit visitors (they are strongly represented in clusters 5 an 7) were seriously affected by the decline of tourist travel to the neighbouring Croatia and the decrease in contacts (economic, social) with other areas of former Yugoslavia. Such factors could be counted among exogenous factors. It is worth to mention also the role of the national origin of visitors in influencing the changes in numbers of tourist arrivals. After the independence of Slovenia the decline in tourist numbers was greatest in the resorts (e.g. from clusters 2 and 6) which to a large extent depended on foreign tourists who perceived Slovenia as a potentially dangerous destination. Also the influence of the economic crisis after 2008 has been often more apparent in those resorts in which foreign tourists prevail.

Analysis showed very heterogeneous development patterns of individual destinations. Only in regard to a smaller part of them a pattern similar to the one from TALC model could be discerned. Nevertheless, it should be taken into account that for many destinations the period under study represents only a part of a life cycle of much longer duration. It should also be mentioned that Butler's model considers especially endogenous factors. As it is evident from the data analysed, in many periods the influence of exogenous factors was much more noticeable and had a long-term effect. Besides, it should be born in mind that the model describes a hypothetical development path which would set in in the absence of planning (Butler 2004).

In spite of the fact that several clusters showed declining tourist numbers, there is hardly a single destination where reasons for the decline could be ascribed to factors discussed by Butler, which were related to an exceeded carrying capacity. Among the destinations that show a decline in tourist arrivals the ones with very low tourist numbers prevail. These destinations were only superficially changed by tourism development and tourism was never a dominant economic activity. In such cases we could not really talk about tourist resorts. Because of that, it could be expected that processes observable in larger tourist resorts appeared here only to a limited extent. In fact, it is questionable whether they could be discussed within the framework of the development of tourist resorts, although they are classified as such by the Statistical Office. Lesser importance of those factors of tourism development which could be related to exceeded carrying capacity, is also a consequence of the fact that tourist resorts in Slovenia in regard to their size cannot be compared to the major European destinations.

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ARTICLES

THE ROLE OF CREATIVITY IN GEOGRAPHIC STUDYING OF HUMAN RESOURCES IN SLOVENIA

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ABSTRACT
The role of creativity in geographic studying of human resources in Slovenia
The article analyzes the spatial dispersion of creative occupations in various municipalities in Slovenia. The main conclusion, drawn from the article, is the very uneven distribution of creative occupations, which are most dominant in national employment centres and suburban areas of urban regions. Creative social groups undoubtedly represent a strong impact on the regional development, which is seen through GDP per capita. The areas with higher levels of creative occupations are more innovative and their social and economic development more dynamic. The analyses also show a positive correlation between the share of employed people in creative occupations and innovativeness based on the average number of patents per capita.

KEY WORDS
geography of human resources, creative social groups, Slovenia

IZVLEČEK
Vloga ustvarjalnosti pri geografskemu preučevanju človeških virov v Sloveniji
V prispevku analiziramo prostorsko razprostranjenost ustvarjalnih poklicev v Sloveniji po občinah zaposlitve. Ključna ugotovitev je, da so ustvarjalni poklici zelo neenakomerno razporejeni. Z najvišjimi deleži izstopajo zaposlitvena središča nacionalnega pomena in okoliške obmestne občine v nastajajočih mestnih regijah. Ustvarjalne socialne skupine imajo nedvoumen učinek na regionalni razvoj. Primerjave s stopnjo bruto družbenega proizvoda na prebivalca to potrjujejo. Območja z visokim deležem ustvarjalnih poklicev so tudi bolj inovativna in njihov ekonomski in družbeni razvoj je bolj dinamičen. Opravljene analize izkazujejo še pozitivno povezanost med deležem v ustvarjalnih dejavnostih zaposlenih prebivalcev in inovativnostjo, izmerjeno s številom patentov na prebivalca.

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geografija človeških virov, ustvarjalne socialne skupine, Slovenija

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1 Introduction

Today different forms of social effectiveness are becoming regular debate topics. Research studies, which try to explain the correlation between basic elements of social (in)effectiveness, are coming to the foreground. Among these research studies the most common ones, in recent times, have been studies on functional correlation of economic structure with landscape characteristics (natural resources), infrastructure, and the educational level of the population. There have also been numerous studies on innovative characteristics of society, which are regarded as key developmental factors in the rise of the life quality of people living in geographically closed areas. Different economic and natural geographic conditions are in many cases the reason of regional disparities, which are mosaically formed by individual landscape areas with different levels of development and different speeds of transformation regarding the structural and social-economic changes.

The expression »society of knowledge« was first mentioned as a social-economic developmental idea by the Austrian-American theoretician of management, Drucker (1970), at the start of the 1970s. This expression first had the meaning of economic regulation, where knowledge, in comparison to money, work and materials gained in its role. Its effects had positive impacts on the economic growth as well as on social differentiation.

In the 1990s the term »society of knowledge« was equalized with the term »information society«. Research studies were based on a widely spread computer and internet work. This brought changes in the way of living, especially in the rise of population's mobility. The term »society of knowledge« has in the past decades coincided with other comprehensions of contemporary social happenings. Some similar expressions were used, especially in correlation with discussions about the effects of post-industrial (»post-Ford«) production on the society. They are encouraged mainly by the analyses of the »creative environment« as metaphors for the ability of a successful transfer of new knowledge into practice and for intensive connecting of scientific-technological centres with economic networks and societies. The term was in the 1980s promoted by the group of Francophone researchers »*Groupe de Recherche Européene sur les Milieux Innovateurs*« (GREMI), who have, from the theoretical perspective, greatly contributed to the implementation and acceptance of this term (Maillat, Quévit and Senn 1993; Fromhold-Eisebith 2004).

Terminologies, where knowledge takes over the leading role in social development, differ in their details within different social science disciplines, which deal with this issue, as for example sociology, which primarily focuses on the development, the expansion and the realisation of knowledge within the institutional context. Economic findings are a result of the theory of growth, which is accelerated by the stimulative political and spiritual aspect (Keynes 1936). Later research was based on the technological development, mainly on innovations, researching and accumulating of man's knowledge as the source of growth. The correlation between new knowledge and entrepreneurship results in the commercialization of new ideas, which are a driving force of economic progress and regional development (for example Schumpeter 1911; Feldman 2000).

Theoretical and empirical research of human resources geography (Läpple 2001) is also gaining in its meaning. Spontaneous burst of knowledge can be seen from various perspectives. Globalisation makes global networking of production, which depends on regional inclusion into a closed geographic environment, less and less possible. Connecting of subjects into different international units can have important impacts on spatial structures. Conscious formation of the network of transport corridors and communications has long-lasting consequences for the development of city networks as developmental generators, as well as the expansion of their outskirts, and for the rise in mobility. Urban regions are becoming a polygon of the reconstruction of social processes, where economic, political, social and cultural transformations are most visible in the changes of urban and regional economies. This affects also the level of spatial interactions, with which new possibilities for networking and the changed paradigm of regional politics come to the foreground. The regional politics is in charge of accelerating the favourable economic atmosphere for human and social capital, with an array of attractive settlement

locations, with the expansion of material and non-material infrastructure, etc. Knowledge accumulation has mutual and two-sided impacts on the formation of city regions and the transformation within economic activities. In these conditions are cities, as developmental generators, forced to adapt to the changed factors which encourage competitiveness. Modern technologies enable a different geographic flexibility from the one locational factors once had (for example: the closeness of materials, energy, capital, etc.).

2 Aims and methodological explanations

Creativity (lat. »*creatio*«) represents a successful and innovative solving of various tasks in society, which is not the domain of only scientists and artists. Creative groups are extremely hard to identify, as their activities can be quite different. The most difficult thing is to identify the »contents« of creativity. Generally speaking these groups are able to recognize the problem at hand and on its basis form new ideas or their combinations, with creating new products. Their activities derive from several areas of social life. The correlation between human resources and the levels of economic growth has been studied by many researchers (Meusburger 1998; Florida 2005; Landry 2006; Kroehnert, Morgenstern and Klingholz 2007; Lorenzen and Vaarst Andersen 2006), who all see the existence of highly qualified workplaces as a decisive factor in modern settlement development. The renowned researcher, Florida (2005) in his studies shows that locational factors, within the group of creative occupations, play an important role regarding the decision on the place of residence. Their common characteristic is that they are mainly situated on the wide outskirts of the economically successful urban centre. The concentration of creative population is centred only in certain city agglomerations, which boast technical and social innovations and with them accelerate the economic growth.

For the purposes of this article the databases on work-active population were used, differentiated according to the units of occupation-fields, the level of education and the municipality of work-place or place of residence for the period from 2005 to 2008. Databases were taken from the Statistical register of work-active population (SRDAP), which is organized by Statistical Office of the Republic of Slovenia (SURS). For the research it is vital that from the whole array of different occupations only representative categories are taken into account, according to the level of creativeness, which is in many regards a risky task. Regardless of the expected obstacles and research risks, this article is based on the typology by Florida. The distribution is based on the internationally comparable standard classification of Occupations ISCO-88.

3 Geographic evaluation of mutual correlation of developmental factors

The analysis of statistical data for 2008 has shown that the percentage of creative occupations in Slovenia amounted to 7.4% of all the population, or 18.1% of the entire work-active population. Among the three subgroups of creative occupations experts present the biggest group (5.23%), while on the other hand the percentage of »Bohemians« (»cultural creators«) is only a mere 0.23%. The distribution of creative occupations according to developmental regions shows a distinctive concentration in the Central Slovenia developmental region (*Osrednjeslovenska regija*), where almost half of all creative occupations in Slovenia are located. Due to the extraordinary concentration in regards to the population number in each region, the share of creative occupations in all other developmental regions is lower than the country's average. More than 3 times less work-places of creative occupations (28%) are located in the region of Podravje, followed in number and percentage by the Savinjska developmental region (8.6%) and the Gorenjska developmental region (7.4%). Around 5% of creative occupations can be found in the Obalno-kraška region as well as in the regions of Dolenjska and Goriška. The comparisons of

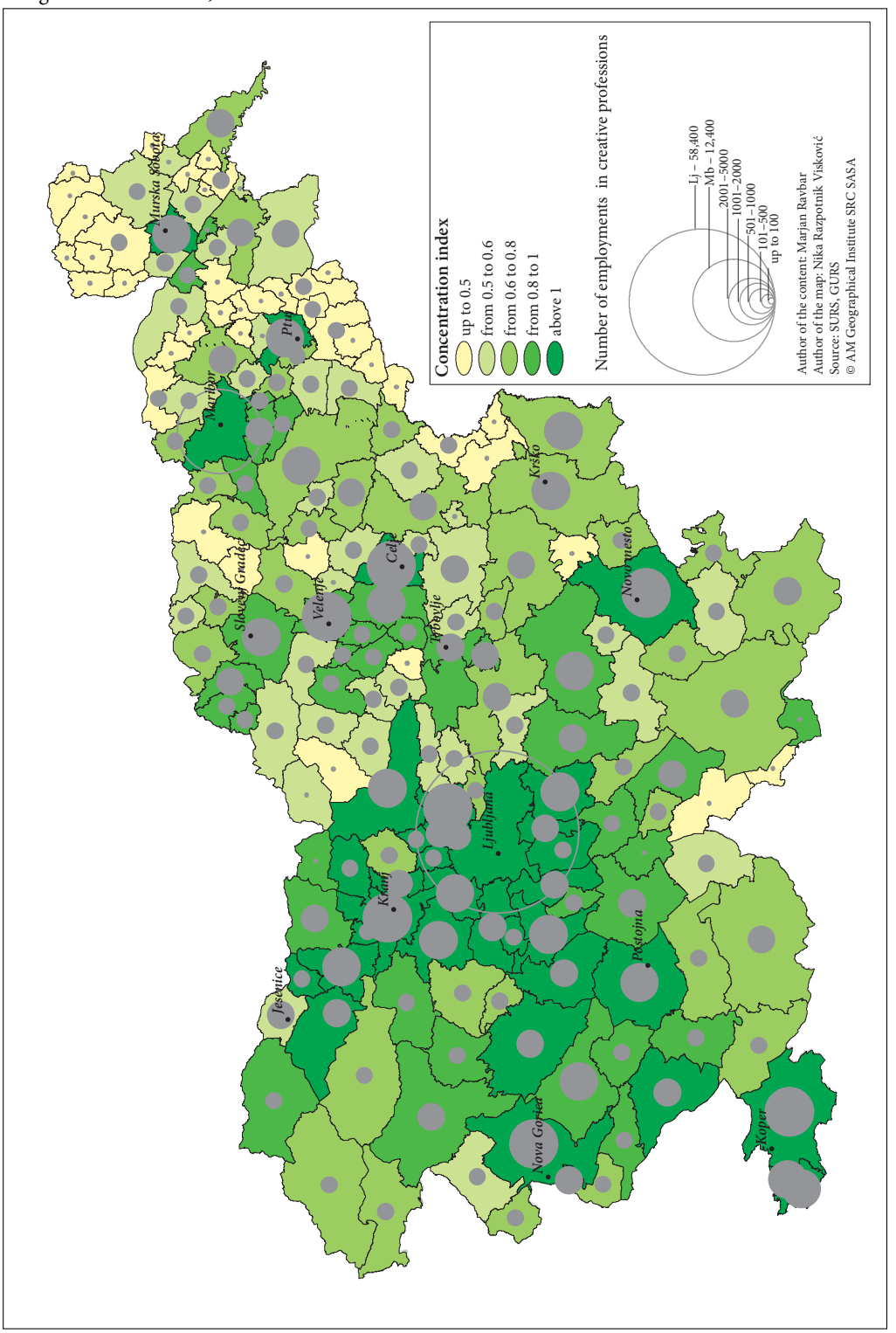
percentages of creative occupations with the work-active population show a somewhat favourable distribution among developmental regions. The percentage in the region of Central Slovenia still represents more than a fourth, whereas in the developmental regions of Koroška, Notranjska, Pomurje, Savinjska and Posavje an eighth of the entire share.

Table 1: The number of creative occupations regarding the place of residence and work-place and their shares according to the developmental regions of Slovenia, 2008 (SURS 2008).

developmental regions	number of creative occupations	% of creative occupations according to the place of residence/ work-place	% of creative occupations in regards to the population number of the region	% of creative occupations in regards to the work-active population of the region
Dolenjska	19,430	4.9/5.6	5.2	10.3
Gorenjska	13,657	7.4/9.8	5.6	10.8
Goriška	7,764	4.6/5.6	5.8	11.1
Koroška	3,118	2.2/2.8	4.4	9.1
Notranjska	1,861	1.4/2.1	4.1	8.8
Obalno-kraška	8,132	5.1/5.5	7.3	11.9
Osrednjeslovenska	71,892	46.5/36.8	13.9	18.1
Podravje	7,522	12.7/13.6	5.9	11.5
Pomurje	2,314	3.3/3.9	4	9.4
Posavje	5,080	2.0/2.5	4.2	9.4
Savinjska	11,462	8.6/10.0	5	9.1
Zasavje	3,384	1.2/1.7	4.1	9.8
Slovenia	**155,616**	**7.0**	**7.4**	**12.9**

The comparisons of creative occupations between the location of the work-place and the municipalities of residence in regards to developmental regions show big differences, which point to the fact, that in all regions, with the exception of the Central Slovenia region with the surplus of 14,503 (20%), there is a lack of such work-places. This consequently leads to massive interregional daily migrations, with the focus mainly on Ljubljana. The most distinctively is the negative balance seen with the regions of Notranjska, Zasavje and Gorenjska. Differences are even more visible from the perspective of municipalities. In the case of the municipality of Ljubljana there is a surplus of 24,029 work-places among creative occupations regarding the work-place, with the striving towards concentrations still growing, as the difference regarding the surplus of work-places among creative occupations in the period from 2006 to 2008 grew for 2,204 or 9.2%. On the other hand, some municipalities in the immediate Ljubljana hinterland (Grosuplje, Medvode, Kamnik, Vrhnika and Domžale) are hit by the lack of work-places among creative occupations for more than 2,000 work-places of »Bohemians« in each of these municipalities. The empirical cases clearly point to the above-average level of suburbanization in this social-geographic group and consequently significantly contribute to a higher share of daily work-migration from these municipalities to Ljubljana. On average, daily migrations represent one seventh of the work-active population, while the share in the developmental region of Central Slovenia is one fifth.

Figure 1: The distribution of workforce in creative occupations. ➤


Concentration index
up to 0.5
from 0.5 to 0.6
from 0.6 to 0.8
from 0.8 to 1
above 1
Number of employments in creative professions
Lj – 58,400
Mb – 12,400
2001–5000
1001–2000
501–1000
101–500
up to 100
Author of the content: Marjan Ravbar
Author of the map: Nika Razpotnik Visković
Source: SURS, GURS
© AM Geographical Institute SRC SASA
Murska Sobota
Ptuj
Maribor
Slovenj Gradec
Velenje
Celje
Trbovlje
Krško
Novo mesto
Ljubljana
Kranj
Postojna
Jesenice
Nova Gorica
Koper

In the next step we included in the system of evaluation the following: (1) the size of the gravitational hinterland of most important urban centres, or better said, the level of centeredness in correlation with the level or urbanization, (2) the state and the development of the workforce, especially regarding the educational structure and the number of researchers, (3) the level of economic development on the basis of investments and the development of entrepreneurship. This will offer the possibility of realizing the analysis of developmental factors with clearly defined and measurable indicators. A more detailed representation of developmental indicators is shown in the Table 2.

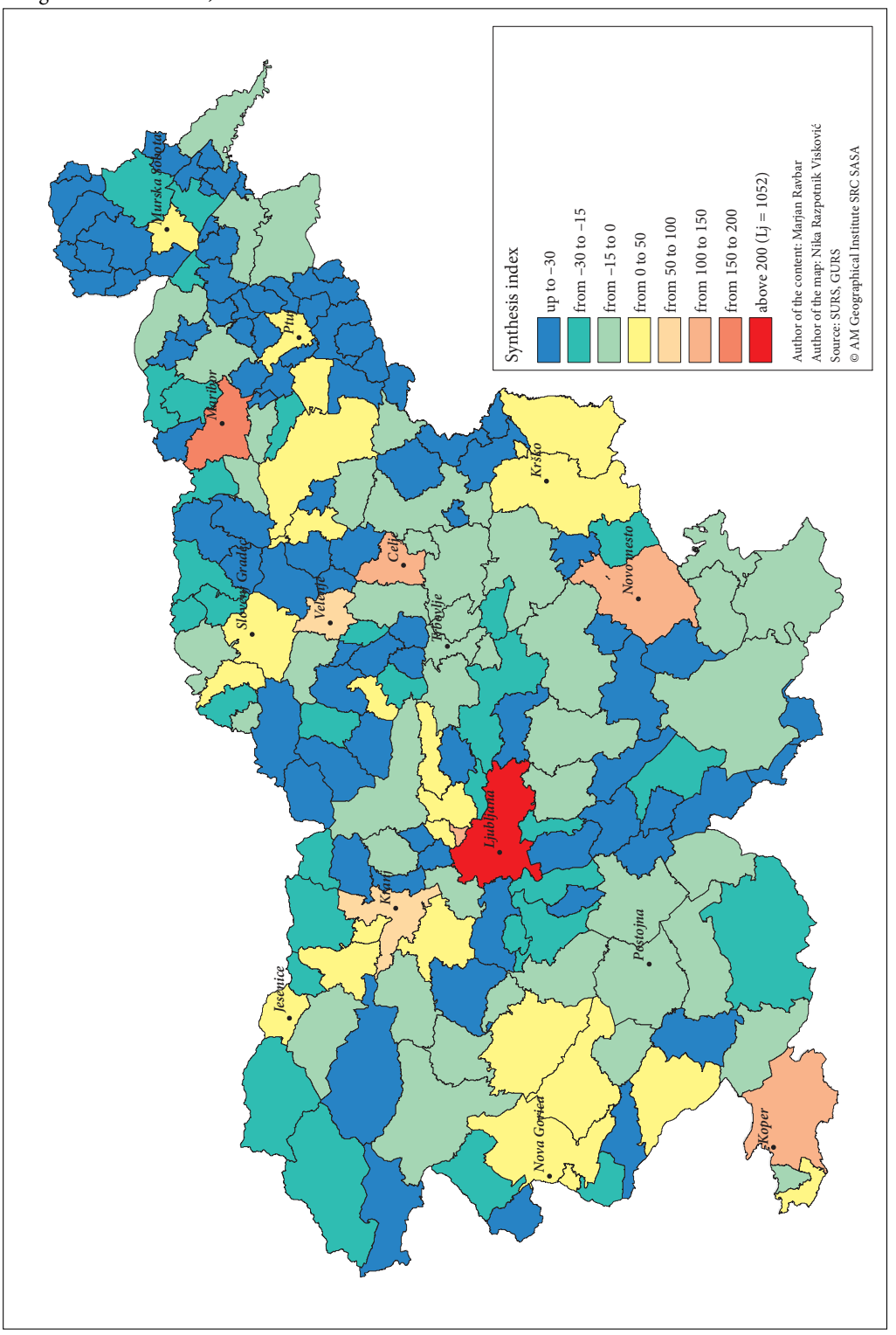
Table 2: Indicators for measuring developmental factors.

Indicator	Measuring
Area size	urbanization level, the size and growth of the population in the gravitational hinterland between 2000 and 2008
Workforce	the changes in the number of employed people per 1000 inhabitants between 2000 and 2008 (employment index), the number of employed people in creative occupations in 2008 (creativity index) and the number of researchers per 1000 employed people between 2000 and 2008 (talent index)
Investment extent	the investment value and investment per inhabitant between 2000 and 2007 (investment index), the development of companies between 2000 and 2007 (the developmental index of entrepreneurship)

First, developmental factors were classified according to developmental indexes in three fields, which define the size of the influence area in the gravitational hinterland and its dynamics, the workforce in correlation with the number of employed people in creative occupations and research activities, and the extent of investments in correlation with the development of entrepreneurship. Within the presented methodology, indexes of developmental successfulness on each individual level were calculated. In the next step, we defined the average value for each of the aforementioned indicators and then, for each local community, determined the difference to the average value. Then we calculated the index values for all territorial units by adding to them the difference value between the average value and the actual value. The values of some indexes can be negative. The values of an individual territorial unit depend on the difference to the average value on the state level. The acquired result, the index of developmental successfulness, is therefore a joint, synthetic indicator of developmental factors of all the aforementioned dimensions.

The last dimension of developmental factors, on the basis of the employed methodology, consists of the synthesis selection of developmental indicators. As it can be determined from the development of indexes of developmental factors, among the value of investments, the current state and the trend index of creativity (or talent) and the index of employment and entrepreneurship, five sixths (84%) of Slovene municipalities have sub-average values. Their collective investment share is only 25% and their share of creative occupations only 20%. These 84% of Slovene municipalities include roughly one half of all the population of Slovenia. The density of investments and creative occupations can be seen only in six Slovene cities and towns: Ljubljana, Maribor, Celje, Novo mesto, Koper and Kranj, where a half of all investments in Slovenia are located, as well as two fifths of creative occupations, almost a half of work-places in creative occupations and four fifths of all researchers. Elsewhere, due to extreme centrality, the share of investments and creative occupations in comparison to the number of inhabitants is below state average.

Figure 2: Synthesis index of developmental factors in 2007. ➤


Synthesis index
up to –30
from –30 to –15
from –15 to 0
from 0 to 50
from 50 to 100
from 100 to 150
from 150 to 200
above 200 (Lj = 1052)
Author of the content: Marjan Ravbar
Author of the map: Nika Razpotnik Visković
Source: SURS, GURS
© AM Geographical Institute SRC SASA
Murska Sobota
Ptuj
Maribor
Slovenj Gradec
Velenje
Celje
Trbovlje
Krško
Novo mesto
Ljubljana
Kranj
Jesenice
Postojna
Nova Gorica
Koper

Indicators of investment activities and the qualifications of human resources, social capital and innovations show, that urban centres stand out, especially the Ljubljana urban region as the most urbanized area in Slovenia. Ljubljana is home to all the ministries of the Republic of Slovenia and the majority of government offices, which means that the city also attracts numerous complementary activities, which are in close correlation with public administration. Ljubljana is therefore also the most attractive centre for building a company, as the close vicinity of administrative bodies enables a smooth information flow among companies and state agencies. As the capital city, Ljubljana has, with its central position, numerous advantages, which strengthen its location attractiveness and with that raise its location value. Seeing that in public administration and in companies with higher added value, the majority of employees have higher education, which guarantees higher wages; this also shows in the income of the city. In 2010 the average gross wage in Ljubljana surpassed the average gross wage in Slovenia by 18.2%. Highly above average is also the gross basis for the personal income tax per inhabitant, which surpasses the state average by 38.9%. As a strong employment centre, Ljubljana has for a long time attracted people from all over the country, also from the bordering areas of Slovenia, as mainly people with the highest levels of education found employment in the Slovene capital.

4 Conclusion and the evaluation of the assessment of developmental factors

The goals of regional politics have for more than four decades been based on the acceleration of the polycentric development. In realizing a balanced polycentric development, the key role is played by the acceleration of diversity of basic economic elements, especially in those urban regions, which are highly dependent on one single activity. The formation of network and partner relationships between Slovene urban regions represents a transformation of current strategies in speeding up regional development. A balanced development in the modern paradigm includes the formation of new relationships between urban and rural areas. What is important is the distribution of knowledge and innovations, which contributes to a higher level of general education and occupational particularities in depressed areas, as a constituent part of combining individual units into bigger areas, with which the minimum standards of accessibility to developmental-innovative generators are met.

Social-cultural conditions, social factors and developmental capabilities, which determine the extent of knowledge, are, from the geographic perspective, unevenly distributed and centered only on some of the biggest Slovene urban agglomerations, which boast technical and social innovations and with that contribute to new economic growth. Contrary to information, which is nowadays accessible in every given moment and in almost all parts of Slovenia, knowledge, creativity and experience, which are connected to concrete creative social groups, are focused mainly on the central part of Slovenia. According to our analysis they focus mainly on six urban regions (Ljubljana, Maribor, Koper, Celje, Kranj and Novo mesto and partly Nova Gorica together with Šempeter), while smaller employment centres and secluded towns are in many cases pushed to the side. Their inhabitants depend on long daily commuting to the aforementioned urban centres.

City regions and their influence areas boast at the same time the spatial distribution of production capacities and especially the centrality of financial and other managerial functions. Striving towards the de-concentration of economic geographic function doesn't reflect only in the spatial distribution of »flexible« work-places of creative occupations, but also in the dispersion of locations with modern technologies. These »laws« are employed mainly with the uneven distribution of human resources, which are also subdued to dispersion, especially regarding the place of residence, which is influenced mainly by infrastructure, the quality of living outside urbane centres, quality information sources and modern factors of attractiveness. Under the pressures of an even competitiveness, cooperation is gaining in its importance.

Slovenia is a country with lots of responsibilities on the level of 12 developmental regions. In real life these regions play a vital part in the establishment of regional politics. Indicators show, that func-

tional reality doesn't follow institutionalized regional borders, which therefore cannot be regarded as real functional areas.

Functional regions are those areas where a great part of daily activities in the field of economic and social activities of citizens and companies intertwine. They are defined by many indicators. The most important are daily migration flows, which surpass the borders of developmental regions, as well as the effects of knowledge flow and economic correlations. More could be done in the field of harmonizing interregional political aspects. Regional politics, based on the flow of knowledge, demands the improvement of cities' competitiveness on the national and regional level, as well as the enforcement of mechanisms for connecting smaller urban centres into a unified urban system. It also strives towards the formation of sustainable »regional« bodies or associations for the strengthening and development of regional awareness and the ability to connect in joint tasks, which leads to the formation of innovative and flexible management regions.

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ARTICLES

GEOGRAPHICAL MARGINALITY AS A RESEARCH TOPIC IN SLOVENIAN GEOGRAPHY

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ABSTRACT
Geographical marginality as a research topic in Slovenian geography
This text gives a brief overview of the research work in the field of geographical marginality in Slovenia and presents some of the views and findings of the author about geographical marginality and about marginal areas in Slovenia. The topic is relatively new in Slovenia as well as elsewhere and not many Slovenian authors directly contributed to it. There are certain dilemmas and unanswered questions that we point out as signposts for future investigation.

KEY WORDS
geographical marginality, regional development, Slovenia

IZVLEČEK
Geografska marginalnost kot raziskovalna tema v slovenski geografiji
V besedilu je podan kratek pregled raziskovalnega dela na področju geografske marginalnosti v Sloveniji. V njem predstavljamo nekaj pogledov in ugotovitev avtorja o geografski marginalnosti in o obrobnih območjih v Sloveniji. Tema je razmeroma nova tako v Sloveniji kot tudi drugje in le redki slovenski avtorji so do zdaj neposredno pisali o njej. Izpostavili smo tudi nekatere dileme in neodgovorjena vprašanja, s katerimi smo želeli nakazati smeri prihodnjih raziskav na tem področju.

KLJUČNE BESEDE
geografska marginalnost, regionalni razvoj, Slovenija

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1 Introduction

In the presentation of International Geographical Union's (IGU) commission C08. 27. Marginalization, Globalization, and Regional and Local Responses (Internet 1) the author of this text stated on the IGU website: »There is no simple and certainly no unique answer to what geographical marginality is. Every annual meeting of the commission reveals that there are many different views and no consensus. It almost seems that marginality is something you can feel, but cannot define.« There are at least two reasons for this quotation. Firstly it points out the basic dilemma of geographical marginality as a research topic in geography and secondly it communicates that the above mentioned IGU commission and its predecessor commissions and study group introduced and developed this field of research. Our aim in this text is to present the main contributions made by Slovenian geographers considering geographical marginality and to present some of the author's viewpoints and findings published in different papers, articles and book chapters. An important goal according to that is to define the state of the art of geographical marginality research in Slovenia in the first decade of the new millennium.

For the purpose above we used the following methodological approaches: The review of literature and the synthesis of partial conclusions as well as a comparative study. This text is therefore a summarized overview of author's research accomplishments in the field of geographical marginality.

2 Contributions of Slovenian authors on geographical marginality

Slovenian authors that actively participated at annual conferences of IGU commissions (study group) on geographical marginality presented different topics and different views of marginality. Vojvoda (1994) even defined Slovenia as a »marginal state«. In the beginning of the nineties Slovenia:

- had just separated from Yugoslavia,
- went through a severe economic crisis at the fall of socialist system and Yugoslav market,
- was outside EU and still far from becoming a part of it,
- had limited or no contacts with the rest of former federation due to war, at first in Croatia and then in Bosnia and Herzegovina, or due to political dispute with Serbia and Montenegro.

Due to these facts we cannot claim that Vojvoda's statement was inaccurate.

Vojvoda once again defined Slovenia as marginal by claiming that »within the framework of Europe as a whole, the Republic of Slovenia is politically and economically marginal« (Vojvoda 1996, 185). He also stated that there are two large regions within Slovenia that may be classified as marginal (Alpine and Dinaric). For these two he specifies the natural conditions as the reason for their marginality. In addition he also classified the whole hilly area as a marginal region of Slovenia too. The reason, in his opinion, is the ongoing process of depopulation that takes place there. The marginality of the mountainous region is demonstrated by the fact that »no matter how great the input is, the agricultural productivity of such regions reaches at most only 60% of lowland production«. His paper dealt with the developmental issues of the Bohinj basin in central part of the Julian Alps where he mainly analyzed the changes in agriculture of the area in the post World War II period with special regard given to the grazing and shrinking of mountain pastures.

Belec is another author that was active in the nineties and at several conferences he presented the following topics:

- the problem of marginality within the context of regional development (Belec 1996),
- marginality issues in Slovenia with regard to borders and sustainable regional development in border areas (Belec 1997a) and
- the problem of geographical marginality with regard to the position of Slovenia within Europe (Belec 1997b).

He evidently focused his attention mainly on the question of regional development and primarily observed geographical marginality from an economic point of view.

His work was in a way continued by Mesec, who also wrote about the development of border regions with regard to cross-border cooperation as one of the tools of EU developmental policy (Mesec 2007). Similar to Vojvoda, she also presented a case study of a micro region Breginjski kot in pre-Alpine hills along the Slovenian-Italian border (Mesec 2005).

The author of this text wrote about marginality from different viewpoints, usually with use of case studies from Slovenia. As Belec and Mesec he also wrote several texts about marginality in border areas (Pelc 2005; 2007; 2008b; 2009b; 2010a). Another group of his texts deals with development with special regard to rural areas and programme of integral rural development. Some of the texts have more theoretical character (Pelc 1999; 2009a; 2010b), one discusses amateur cultural activities and marginality within the context of globalization (2008a), one examines suitability of demographic indicators of geographic marginality (2006) and one discusses the terms marginality and peripherality in Slovenian language and presents the field of geographical marginality research to Slovenian audience (Pelc 2004).

Some other Slovenian authors also wrote about similar problems as those mentioned above, but they did not directly put them into the context of geographical marginality. Klemenčič, Lampič and Slavič (2008) published a book about (non)vitality of Slovenian peripheral rural areas. The main topic is rural development, similarly as in many studies from the field of geographical marginality. The areas analyzed could also be defined as marginal although the authors preferred to define them as peripheral. We suppose that this way they only considered their geometrical position and avoided the concept of geographical marginality.

Slovenian contribution to the research of geographical marginality globally is certainly not insignificant. It covers different topics and gives several insights into considerations of marginality. Similarly to researches from the rest of the world, there are no ultimate findings about the definition of geographical marginality and the extent of geographically marginal areas. The difference with geographers from some western nations is that the focus of Slovenian researchers is always Slovenia and never marginal regions on a global scale (in Africa or Asia). Slovenians tend to present Slovenia and geographical marginality from Slovenian point of view rather than to explore geographical marginality worldwide. Nevertheless we may conclude that Slovenians contribute constantly to the work of IGU commission on marginality even though there is no systematic and complex research of this field in Slovenia. Therefore we do not have a complete and clear picture of marginality and marginal areas in Slovenia. However, this is no different than in other countries. There are plenty of partial insights, but no wider general overview of all of the marginality manifestations in certain region at any scale.

3 Geographical marginality from Slovenian perspective

In this chapter we are trying to synthesize different findings previously presented by the author. The question what geographical marginality really is was discussed at many annual meetings of the IGU »marginality« commission. Leimgruber (2004) stated that it cannot be defined without putting it into a certain perspective. He offered three possible concepts: economic, political and social (including cultural). He also distinguished marginality from peripherality. Within the upgraded Centre-Periphery model there are two kinds of peripheries that are marginal (Leimgruber 2004, 38–45): the »isolat« (isolated region) and the »angle mort« (the lost corner). They cannot really be attributed to the rest of the periphery even though they are a part of it. Another important issue is the perspective that we use when we observe a certain region. Something that is marginal from an economic point of view is not always marginal from a social or a cultural point of view. We can say that there is not just one and ultimately correct definition of marginality.

Our understanding of marginality (Pelc 2006) starts with the meaning of the word marginal. Margin has several meanings. One of them is »a blank space round a printed or a written matter on the page«. We believe that the difference between margin and its antonym (the written matter) is essential. Marginal according to our understanding is something that is on the margin. This means that it is essentially different than the rest of the page. The role of the margin is mainly esthetical while the role of the rest of the page is to bring the information. We can add some remarks on the margin, but this kind of information is completely different than the one in the printed text. These remarks are never a part of the text even though they correct or comment it. In a correspondence with that marginal regions are those that are essentially different from the rest of the regions within a certain macro-region, nation or continent. This does not mean that they are without any ties with other non-marginal regions. Different kind of interactions and interdependencies are always present to a certain extent. We therefore believe that marginal regions are not necessarily completely isolated from the central ones. In a modern globalized world an »isolat« (isolated periphery that is completely out of economic, social and cultural system of its central neighborhood) is in our opinion more of a theoretical concept than a possible reality.

We believe that the essential characteristics of marginal regions are:

- peripheral,
- substantially different than non-marginal regions,
- underdeveloped,
- socially and culturally excluded,
- politically unimportant and uninfluential.

Any of the above characteristic is difficult to measure. When we use different indicators for the same area they usually show a different degree of lagging behind the national average. Very often the appropriate indicators are not available at the desirable scale. Measuring marginality becomes even more difficult when we switch from an economic to a social perspective. Finally we usually do not have enough means to do an in-depth research.

When we first tried to establish where marginal areas in Slovenia could be, we used a rather provocative approach. We decided that we will use only one indicator. That was the share of illiterate inhabitants according to the population census of 1991 (Pelc 1999). Average illiteracy percentage in Slovenia in the 1990ies was very low (0.7%). We assumed that settlements with considerable share of illiterate inhabitants are so different that we can consider them as marginal. In 1991 there were 38 settlements with more than 100 inhabitants with the share of illiterate people exceeding the average for three standard deviations and more. Villages with the highest shares of illiterate inhabitants had a considerable share of Roma population (Hudeje, Dobruška vas with the highest shares and Černelavci with the highest absolute number). The chosen indicator showed us a marginal group of population that lives a different life compared to the rest of the population. Permanent settlement for Roma in Slovenia is something that started mainly in the second half of twentieth century and for many only at the end of it. Roma children are now going to Slovenian schools but many of Roma adults did not go to school and did not learn to read and write. Most of them have no proper profession. One of their typical occupations is collecting metal waste and selling it. Few of them are regularly employed and in many households social transfers provided by the government are often the main regular source of income. Their lifestyle is not well understood by the majority and there is very common stereotype that the Roma are paid for doing nothing and are not trustworthy. We can consider them as the most marginalized group in Slovenia and consequentially we can consider the places where they live as marginal. However, they do not settle larger rounded areas. They are dispersed between certain settlements mainly in north-eastern part of Slovenia (Prekmurje) and in south-eastern part (Dolenjska, lower part of Sava valley). We therefore believe that in case of Roma settlements (parts of settlements with Roma population) we have to deal with marginality, but mainly from a social (sociological) point of view and not so much from a geographical.

All other groups of settlements with extremely high shares of illiterate inhabitants were located in remote hilly areas with predominance of older population. Obviously the reason was depopulation. Young

STANKO PELC

Figure 1: The nature is »taking back« former farmland in Kostelsko region along the border with Croatia.

people moved to cities and suburban settlements and only older people with low level of education or even without it remained. These settlements were in hilly countryside in the hinterland of Koper alpine valleys in northern Slovenia and in high hilly area on the left bank of Drava river along Austrian border.

Another attempt of defining geographical marginality of Slovenian regions was made with the use of demographic indicators at the level of municipalities (Pelc 2006). Rather fragmentary analysis showed that available demographic data does not offer a possibility for the creation of reliable demographic indicators of geographical marginality. We used 5 demographic characteristics to calculate a simple aggregated »coefficient of demographic marginality« based on the relative value of an indicator according to national average. The coefficient ranges from –1 to +1. The highest calculated coefficient was 0.6 and the lowest –0.8 (municipality Trnovska vas in low hilly area in north-eastern Slovenia).

We concluded that the available demographic data for Slovenian municipalities cannot be used as a set of reliable indicators of geographical marginality. They only indicate municipalities that show more marginal characteristics than others. Undoubtedly peripheral (marginal) municipalities Osilnica, Kostel, Loška dolina and Loški potok have some unexpected demographic characteristics. In 2002 all four and in the period 1999 to 2002 three of them had a positive net migration. Municipality Kostel even had one of the highest rates (average annual rate: 18 per 1,000 inhabitants). On the other hand even undoubtedly central municipalities may have quite negative demographic characteristics.

Our researches showed that it is rather difficult and to some extent confusing to use the concept of marginality in Slovenian (European) context. There certainly are peripheries, depressed and underdeveloped places and regions, but the interaction between such areas and regions on one side and the developed central ones on the other, is always and everywhere present at least to certain extent (commuter flows, supply, migration, recreation etc.). In Slovenia (as in most of the EU) it is most unlikely to find an area that could be defined as »*Angle mort*« or »isolat«. At least if we want to define it with exact measurable criteria. There are some relatively isolated areas with few interactions with centers and with weak economic and demographic potential. Therefore we may consider them as marginalized. However, we believe that it is not appropriate to define them as marginal. It is easier to observe the process that leads to marginality (marginalization) than marginality itself (Pelc 2010a).

As the dilemma about the exact nature of geographical marginality by our opinion has never been resolved, we continued our reflection of the term with the statement that »marginality is a state of mind«. It has often been heard (Leimgruber 1994, 8; 2010, 6–7; Pelc 2010a, 97) in the discussions about geographical marginality. Marginality as a state of mind is not something that we can measure or asses. It is simply »something that is present within the population of a certain place«. It is »the sensation of

marginality«. It may occur in many forms, just as the sensation of a few or of many people in a certain area. There may be outer objective reasons for it and inner subjective as well. Marginality regarded this way may fit into the behavioral paradigm well.

From a geographical point of view the sensation of marginality has to be closely related to geographical position. This position has to be at the margin in regard to the centre of a certain activity (political, cultural, economic, demographical, ecological etc.). There may be different reasons why somebody does not participate in a desired activity, but geographical position is very likely always among them. Geographical marginality may therefore be considered as: physical distance that one cannot overcome because of the constellation of socio-economic factors and his position in geographical space. According to the scale this distance differs radically.

When people feel that they are not allowed to participate in a certain activity because of their geographical position this may result in a sensation of marginality. This may happen both in peripheral and in central areas. In the 1990ies Maribor (the second most important centre in Slovenia) suffered severe economic depression while Ljubljana became a capital of a new nation and gained new opportunities. Therefore a »sensation of marginality« occurred in Maribor and in some other Slovenian towns (Pelc 2010a, 98). Many people there were convinced that their town is lagging behind because of Ljubljana and its central position. The feeling that because of its geographical position their region cannot participate in economic development was very common at that time. We considered that as a »sensation of geographical marginality«. That does not mean that Maribor should be considered as geographically marginal. However, the sensation of marginality may be a clue that shows the emergence of basic conditions for marginalization.

In cases of peripheral areas the sensation of marginality is undoubtedly the expression of an advanced process of marginalization. Such areas have unfavorable economic and demographic characteristics, poor accessibility to working places as well as to all basic services. In case of border areas the process of marginalization may even be accelerated and the sensation of marginality strengthened.

We tried to establish whether there is a sensation of marginality in remote peripheral areas along the Slovenian border with Italy in hilly and mountainous relief. Conditions for profitable market ori-

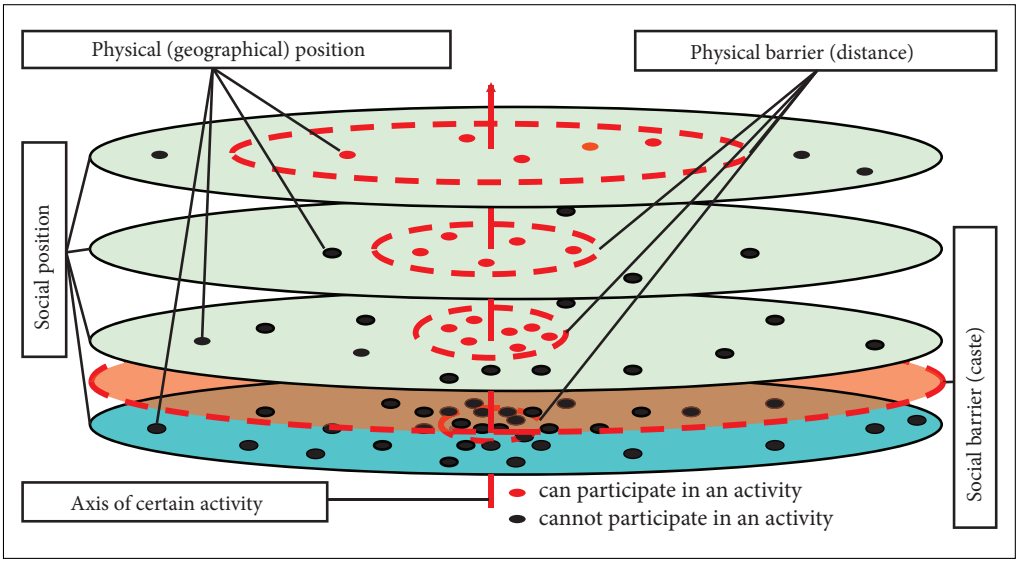

Figure 2: Ability for participation in an activity with regard to physical and social barriers – nonparticipation in many activities may produce a sensation of marginality (Pelc 2010a).

ented agriculture there are unfavorable and there is also a lack of good accessible working places. Therefore the depopulation and change of demographic structure were expected consequences. On the other side the natural beauty of these areas makes them attractive for part time dwellers (either by emigrants from the area or urban people from other parts of Slovenia and the EU). The border is no longer an obstacle and enchantingly beautiful Soča valley is literally lying at ones feet. From this point of view these areas are central because their peripherality is filled with natural beauty and recreational opportunities. This may be the reason that even people from most depopulated village in this area (Robidišče) did not express any kind of sensation of marginality.

Natural beauties and environmentally well preserved peripheral areas bring us to the discussion on the problem of environmental centrality and marginality (Pelc 2010b). We believe that there are two possible points of views of environmental importance. One is the 'naturocentric' and the other is the 'anthropocentric'. The second one is appropriate when we talk about environmental centrality. In this case it is in close connection with the accessibility of environmentally well-preserved areas and with their attractiveness and importance for the (urban) population. Centrality in this case is the degree to which these areas serve to its neighboring urban centers (agglomerations).

Environmentally marginal areas are supposed to be completely opposite of the one described above. In 1980ies an example for that could be Slovene »Dead valley« (Žerjav in Meža valley in northern part of Slovenia, 55 km northeast of Ljubljana) that was damaged by the extraction of lead ore and the refining of lead. It is now being revived again since the refinery has been closed. In global context the best example is probably Chernobyl after its nuclear disaster.

With the last patch in a patchwork of our research of geographical marginality we want to present another viewpoint that marginality may be observed from. We investigated the relation between globalization and marginalization with special regard on amateur cultural activities and their importance for preservation of national identity (Pelc 2008a). These activities have a long tradition in Slovenia and we stated that they are equally important today as they used to be in the past before the independence when Slovenian culture and identity was under pressure of dominant nationalities within the Hapsburg Empire and Yugoslavia. Trough mass media popular culture mainly of USA origin endangers national cultures and languages worldwide. We consider this to be a cultural marginalization and amateur cultural activities tended to be an important supporter of national culture and identity. However, they are already under the pressure of global trends and cultural marginalization is on its way.

If we put all the above fragments of marginality research together we get a picture with many missing parts, but the least that we can see is that it is better to use term marginalized than marginal. It is easier to find different characteristics showing marginalization of an area or social group than to find exact indicators of geographical marginality. An area or region may show marginal characteristics from some aspects while from other it may be even central. Slovenia is too small to fit into ideal scheme of centre-periphery-marginal areas, but that does not mean that it has no marginalized regions.

4 Conclusions

Research of geographical marginality in Slovenia is relatively sporadic and unsystematic. Only the author of this text has continually researched different topics from this field. However, his approach was also not systematic. Nevertheless we can conclude that different approaches to establish what and where marginal areas (regions) are did not bring a positive result. Slovenia is small and travelling distances to regional centers by car are relatively short. We can state something similar for the distances between regional centers and the capital. It is therefore most unlikely to have a peripheral region that has to live on its own with few contacts with the center. On the other hand Slovenia is integrated into EU and is neither at its periphery neither it is a marginal member.

In our opinion the concept of geographical marginality in the Slovenian context can only be implemented to describe the process of marginalization that may be present in certain parts of the country. The concept is a useful tool for geographical research of problematic regions as it gives us a possibility to use different perspectives. We believe that further investigation of factors of different kind of marginalization at the regional level has to be done in future research of this field. The presented findings and views above are a modest contribution to the worldwide research of geographical marginality and the basis for further upgrade of research in this field in Slovenia.

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ARTICLES

FROM ETHNIC TO NATIONAL: POLITICAL GEOGRAPHY IN SLOVENIA

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ABSTRACT
From ethnic to national: political geography in Slovenia
Early geographic research has made the Slovenian ethnic component in Austria, Italy and Hungary a laboratory of studies on the minority-majority relations within nation-states, as well as on ethnic migration processes. Later, studies made during the »cold war era«, on the multiple development opportunities cross-border co-operation enables, have shown ways to overcome political divisions and cultural diversity. Recently, the integration and disintegration processes within the frame of Europe, and in particular in the Western Balkans, have come into the spotlight of research in political geography. At the same time the multi-cultural aspects of border regions, the territorial identity and the ethnic components continue to play an important role in the studies of Slovenian political geographers.

KEY WORDS
political geography, ethnic studies, border studies, cross-border co-operation, Slovenia, Western Balkans, European Union

IZVLEČEK
Od narodnega k nacionalnemu: politična geografija v Sloveniji
Zgodnje raziskovanje političnogeografskih problemov je v ospredje postavilo etnično ozemlje Slovencev v Italiji, Avstriji in na Madžarskem. Območja ob državnih mejah Slovenije/Jugoslavije z omenjenimi državami so postala družbenogeografski laboratorij proučevanja odnosov manjšina : večina v zaokroženem prostoru zgodovinsko pogojene avtohtone poselitve le-te. V času »hladne vojne« so obmejna območja še vedno ostajala v vizirju političnih geografov, vendar tokrat kot mostiščne regije med Vzhodom in Zahodom. Čezmejna gospodarska kooperacija je zmanjšala politična nasprotja in vzpostavila kulturno sobivanje ob odprti meji. Ob koncu 20. stoletja je integracija in disintegracija evropskih držav usmerila pogled slovenskih geografov v smer Zahodnega Balkana. Istočasno ostajajo poprejšnje vsebinske razprave – kot so multikulturnost, obmejne regije in družbeno stična območja – še vedno v središču proučevanja politične geografije.

KLJUČNE BESEDE
Politična geografija, etnične študije, obmejna območja, čezmejno sodelovanje, Slovenija, Zahodni Balkan, Evropska zveza (EU)

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1 The frame

In 2012, Slovenia is still the youngest nation-state within the European Union (EU). The Republic of Slovenia was constituted in 1991, as the former Yugoslav federation broke apart. The country was recognized by the international community (by the EU and UN, among others) in 1992, was successful in its application to join the EU and NATO in 2004, eliminated border controls to other EU member-states and introduced the European currency (Euro) in 2007. This was the first time in history that ethnic Slovenes claimed nationhood; the territory they have occupied for about 1500 years has been controlled by various European powers like Austro-Hungary, the Venetian Republic and the Yugoslav federation.

Political geography is, in this article, observed from the general, from the subject's core point of view. Three classical spheres of research are highlighted: 1) border disputes and cross-border relations, 2) ethnic and minority issues, including assimilation and migration patterns and 3) topics on spatial/political integration and disintegration. Even in this frame of discussion we might have missed one or the other important research. We apologize to colleagues which works/discussions we've left out. We consider them as similarly important themes in political geography. Several other topics – like the works of hundreds of human geographers, regional planners, »eco-environmentalists«, etc. can be considered within the broader frame of political geography as well. We recognize that monographs, guidebooks, the national atlas and other material on Slovenia, in particular if published in a foreign language, could be – out of promotional reasons – considered within the subject of political geography as well.

1.1 Introduction

The area between the Alps, the Danubian Lowlands and the Mediterranean Sea has been in the focus of geographic research since the 17th century. In »The Glory of the Duchy of Carniola« (original: »*Die Ehre des Herzogtums Crain*«), the Carniolian nobleman Johann Weikhard Freiherr von Valvasor (Janez Vajkard Valvasor) wrote an outstanding description of the ethnically central territory of the Slovene settlement; due to the excellent description of the hydrology on one of the karstic lakes (Cerkniško jezero), he became Fellow of the (London) Royal Society. The outer parts of the ethnic territory (like the provinces Styria, Carinthia, and the Gorizia/Trieste hinterlands) did not have geographic or cartographic studies made by Slovenian geographers until the mid 19th century, as the Styrian Blaž Kocen introduced geographic textbooks and as the Carniolian Peter Kozler printed, according to Austrian rulers, a controversial map »*Zemljovid Slovenske dežele in pokrajin*« (»A map of the Slovene Land and Regions«) in a scale 1 : 576,000 on the territorial dispersion of the Slovenian ethnicity (Slovenski šolski muzej 2011). This excellent work in cartography was inspired by the Spring of Nations (1848) and today could be labeled as irredentistic, as the author claimed ethnically mixed lands as Slovene's own. It resembled the nationalistic ideal of *Zedinjena Slovenija* (The Unified Slovenia), claiming that provinces within the 19th century Habsburg monarchy with Slovene population should become united as one single, ethnic/national unit (within the frame of the Empire).

After WW1, several territories settled by the Slovene ethnicity remained outside the predominantly Slavic state of Yugoslavia: South Carinthia in Austria, the Mediterranean and Sub-Mediterranean pre-alpine areas in NE Italy and the Raabe region in Hungary. Geography was within the post-WW1 Kingdom of Serbs, Croats and Slovenes (= Yugoslavia) among the rare sciences that constituted the newly created universities (i.e. University of Ljubljana), but the sub-discipline of political geography had not received any attention – with one exception: the ethnically predominantly Slovene areas in neighboring states. The cartographic exhibition on Slovene territories (»*Kartografska podoba slovenskega ozemlja*«), organised by Valter Bohinec in 1954, focused in particular on the »lost regions« (NUK 2011). The post-WW2 communistic Yugoslavia was particularly interested to ignite this issue as, for one, Austria and Italy were westerly oriented nation-states, and secondly and most-

ly, as the assimilation processes (often initiated by nation-state acts) in Austria, Italy and Hungary rapidly started to reduce the number of ethnic Slovenes »behind the borders« (Si. *zamejski Slovenci*). Maps on Carinthia (Klemenčič V. 1972), the Trieste/Gorzia Upper Adriatic and the western Friuli-Venetia Giulia region (Si. *Beneška Slovenija*) (Medved 1974; Medved and Ingolič 1978) with bilingual names (of towns, areas and attractions) were published and guide-booklets printed (Gosar 1983). With the exception of Slovene colonists who settled the emptied German villages in Vojvodina (Serbia) (Pak 1963), the position of ethnicity within the »Yugoslav socialist federation« was otherwise never seriously studied.

Inspired by the democracy movements in Eastern Europe, the geography-led eco-awareness movement (»*Zeleni Slovenje*«) joined the Slovene intellectual elite in overthrowing the communist regime in 1989. Geographers took leading positions in the political establishment. Political geography was applied »*in situ*« by two geographers – Lojze Peterle, who took the position of Prime-minister, and Dušan Plut, who became politically responsible within the 5 member nation-state's Presidency.

2 The early days of political geography

The modern geography in teaching and research started within the University of Ljubljana in 1919. Courses in Political geography were not taught until late 20th century. Anton Melik (1890–1966) embodied Slovenian geography for nearly half of this century. His excellent descriptions of geographic features were later complemented by Svetozar Ilešič (1907–1985), an outstanding teacher on classical geographic thought. Both university professors denied Political geography as sub-discipline, but in their publishing, two topics undoubtedly should be placed within this frame: 1) initial research on Slovenian Diaspora and 2) regionalization of the territory settled by Slovenes. In Melik's basic work on Slovenia (*Slovenija – geografski opis* 1963), the number of Slovenian emigrant nationals within Yugoslavia was represented at 66.963; 380.000 subjects were believed to be living in other countries of the world (2/3 in the US). In his work for, the first time, the Slovene ethnic border in Austrian Carinthia was drawn (p. 357) as the territory was named »*Slovenska Koroška*« (Slovenian Carinthia). Melik and Ilešič worked intensively on the issue of natural and physiognomic divisions of Slovenia (Si. *Regionalizacija Slovenije*) as well. In all of their »regionalizations« (1946; 1954; 1958), the areas described did not end at the Slovenian/Yugoslav border but included natural areas and, in part, cultural centers of nearby nation-states (Hungary, Austria, Italy) (Ilešič 1972). Interestingly, »Slovenian regions« did not enter into the bordering Yugoslav republic of Croatia. This is a contradiction in itself, considering that, in the book named above, the non-natural Croato-Slovene border setting and the number of 43.000 Slovenians living in Croatia is pointed out. Much later, in a second regionalization attempt, Ivan Gams (1986) framed his regionalization within the borders of than (still) Yugoslavia. The young generation of Slovenian geographers follows the trend set by Gams (Kladnik 1996), and recently some younger geographers have discussed Slovenian regions within the macro divisions (cross-border-like) of Europe (Gosar and Klemenčič V. 1994; Klemenčič V. et al. 1990; Gulič and Praper 1998; Lorber 2003).

The Slovene minority issue in neighboring countries was, among other research topics, the driving force behind the creation of the Institute of Geography in 1962. The lead researcher of the institute, Vladimir Klemenčič (1960) studied, at the beginning of his academic career, Austrian censuses and followed the assimilations process spatially. Klemenčič's research was based on socio-geographical methods and included detailed demographic and spatial analyses of the post-WW2 Carinthia. Later, his interest turned to the Italian and Hungarian border regions as well, but his love for the initial topic remained until today; the problem of the Carinthian Slovenes has now become internationalized (Klemenčič M. and Klemenčič V. 2010). The general direction of the institute provoked research on the border regions in general. In the 1970s and 1980s, several geographers studied the negative and positive effects of the initially closed, then semi-closed, and finally open border of Slovenia/Yugoslavia to the West. Spatial

changes induced by the open border in border regions, in particular at border crossings and in ethnically mixed areas, have become major research topics of the institute. Slovenian research on cross-border traffic and impacts on the urban/rural landscape (Klemenčič M. M. 1979), the intensity of the cross-border shopping (Jeršič 1970), tourism (Gosar 1979) and the broad band of the cross-border cultural exchange, visits and culinary experience (Bufon 1994), just to name a few topics, has been praised within and outside of the profession. The remaining closed border towards Hungary was less eagerly studied, but several geographers from the then newly formed University of Maribor pointed out its negative effects. Olas (1973; 1985) blamed the steady emigration of the border area population, in search for seasonal work in Austria and Germany, for the degradation of the rural landscape.

Just ahead of the proclamation of nation-state sovereignty, studies on ethnic Slovenian populations abroad moved (partly) away from focusing on the ethnically mixed territory along borders. The Slovene ethnicity abroad has become a complex field of study. Zupančič stated that ethnic Slovenians in the Austrian capital Vienna (and in some industrial centers) outnumber towns/villages in Carinthia, where this group is autochthonous (Zupančič 1997; 2008). The Slovene Diaspora (Si. *izseljenci*) and the economic migration subjects (Si. *zdomci*) have become a single study object, disregarding their initial migration motive (often political!) and relation to the existing state of Slovenia/Yugoslavia (Velikonja 1974; Gosar 1979; Genorio 1991). Instead, their cultural and economic impacts within the host country and in the region of origin are placed in the foreground of studies. Also, the autochthonous ethnic minorities living within the Yugoslav Slovenia, in particular Italians and Hungarians, have come into the spotlight of geographic research. Along with it, the development of regions along borders (cross-border regional planning) has become objects of studies with colleagues of universities in western Italy and southern Austria (Klemenčič V. et al. 1990).

3 The contemporary political geography

Political Geography was introduced into the geography curriculum of the University of Ljubljana in 1993; the first course companion was published in 1998 and the first textbook printed in 2001. The two volumes of Milan Bufon's »*Osnove politične geografije*« (Fundamentals in Political Geography) were inspired by Julian Minghi and other American textbook writers (Bufon 2001a; 2001b). Geography at the other two Slovenian universities, in Maribor and Koper, soon becomes enriched with courses on political geography. In particular has this content gained ground at the University of Primorska, in Koper where the initial undergraduate and graduate study programs in geography were entitled »Geography of Contact Areas« (in 2008 changed to »Geography«). Since creation in 2005, the seat of the Association of Political Geographers of Slovenia is located there.

As mentioned in the introduction, several geographers have become politically active since Slovenia's independence. In their position as members of political parties and/or within commissions established to solve disputed territorial and/or cross-cultural problems, they have played important roles. They have contributed to nation-state policies involving minority rights for the Italian and Roma population (Franco Juri; Jernej Zupančič), led negotiations on disputed topics with the EU (Rado Genorio; Ivo Piry), and contributed to the solving of territorial and political problems with the neighboring countries. In particular the relationship with Croatia was tense. In the Croato-Slovene bi-partisan border commission, constituted in 1992, two geographers become members: Croatian Mladen Klemenćić and Slovenian Dušan Fatur. Geographer Milan Orožen Adamič has become Ambassador of the Republic of Slovenia to Croatia in 2004.

Since political establishments of Slovenia and Croatia often acted unilaterally, following their own interests, scientific expertise on the border issue was needed. The provisional border in the Mediterranean Adriatic (Piran Bay and its continental hinterland) was predominantly under the observation of geographers from both countries (Klemenčić and Gosar 2000). In part, other segments of the land-based

border also did not comply with the interest of the local population and/or nation-state policies. All in all, about a dozen relatively small border areas were disputed, and research was needed. In particular, the real-estate rural ownership in the north-easterly section was thoroughly studied (Belec 1996; 1997; Gosar L. 2009). Some solutions, produced by geographers were forwarded to responsible institutions of the nation-states – like the proposal of the Joint Zone of Management in the Upper Adriatic – but they have ended up in the drawers of governments. Finally, in 2010 both governments, supported by the positive outcome of the referendum on this issue in Slovenia (51.5% in favor), decided to forward this issue to an international arbitrary court.

New migrants, to some extent of Yugoslav heritage, have come into the spotlight of geographical research in the 1990's. The immigrant communities of Croats, Bosniaks/Muslims, Serbs, Albanians and others from the territory of the former Yugoslavia make a substantial number of residents in some smaller industrial centers of Slovenia – like in Koper, Jesenice and Velenje, for example, where their share exceeds one-third of the overall municipality population (Dolenc 2003; Mlekuž 2005; Josipovič 2006). Geographers and other colleagues at the University of Primorska had the privilege in 2008 to introduce Slovenia's presidency to the European Union by organizing a conference on the (European) Intercultural Dialogue (Gosar 2008). The issue of New Minorities has become of international interest due to the fact that, in the mid 1990's, the young nation-state's government erased (Si. »*izbrisani*«) several thousand ethnically non-Slovenian residents because of the failure to forward documentation on their prime residency and citizenship in proper time. Despite the fact that, since 2008, this issue has been lawfully solved, on this matter several law suits are pending at the EU courts in Strasbourg.

At the dawn of the 21st century, geographers have also continued to study other minority issues, in particular, that of the Roma (Zupančič 2007) in Slovenia and Slovenians in neighboring countries (Bufon 2006). The Slovenian Diaspora has continued to be a study subject as well; roots tourism has been placed among the priorities of this particular research topic (Koderman 2011). Before its closure in 2002, the basic research on the mentioned topics was initially based at the Institute of Geography in Ljubljana. The most cited articles from that research period are published in the proceedings of the conference »Political Geography in the 21st Century – Understanding the Place – Looking Ahead« (Gosar 2001). At present, interdisciplinary ethnic and migration studies are part of the geographical and sociological curriculum and research at the universities in Ljubljana and Koper within which co-operation with several recognized institutions of the same character in Europe and North America was established. Maribor colleagues concentrate research efforts on the cross-border co-operation in the Danubian/Pannonian lowlands and its hilly hinterland (Lorber 2004; Drozg 2001).

One of the tasks of geographers at the young University of Primorska in Koper, where the core of political geography is located now, was to promote their own research on several subjects of political geography through conferences and subsequently in related proceedings, including: »Globalized Europe« (2005), and »Development Opportunities of Slovenian Border Regions« (2009). As the titles suggest, the latest interest of Slovenian political geographers follows two paths: 1) Slovenia's regions/nation-state's position within the European Union (Bufon 2008; Berdavs and Kerma 2009; Kerma 2009; Vrtovec 2010), and 2) Western Balkans' political/economic consolidation and EU integration. The Sarajevo conference (in 2005) on the occasion of the 10th anniversary of the Dayton accords, and the 2006 proceedings »The Western Balkans – A European Challenge« (Bufon et al. 2006), have gained attention of the international community of researchers, as there the path towards restructuring of Bosnia and Herzegovina into a viable nation/country was set. Several Slovenian authors have succeeded therewith in widening the East European Shatter Belt theory by discussing the disintegration of Yugoslavia (Rogelj 2006; Tunjič 2007). Within the frame of the »Adriatic Forum« – an annual meeting of political and human geographers of the region (Italy, Austria, Hungary, Romania, Croatia, Bosnia and Herzegovina, Serbia, Montenegro, Albania and Slovenia), initiated by Slovenian geographers in 2008 – discussions relate to the planning of cross-border co-operation and territorial integrity.

4 Conclusion

The contemporary political geography in Slovenia is alive and well. Political geographers have their own, about fifty members strong, association as part of the national association of geographers (Si. *Zveza geografov Slovenije*). Slovenian academicians are long-time members of the Steering Committee of the Commission on Political Geography of the International Geographical Union (CPG IGU); the author of this presentation is at present president of the CPG IGU. Slovenian geographers are members of several professional international institutions related to topics of political geography. Slovenia as a nation-state has several country representatives in international offices and in domestic political offices. If we look back on the one century old profession of political geography, we can conclude that Slovenian professionals have contributed a lot to their development and existence. Early geographic research has made the Slovenian ethnic component in Austria, Italy and Hungary a laboratory of studies on the minority-majority political relations within nation-states. Later, studies made during the »cold war era«, on the multiple development opportunities cross-border co-operation enables, have shown ways how to overcome political divisions and cultural diversity. Recently, the integration and disintegration processes within the frame of Europe and in particular in the Western Balkans have come into the spotlight of research. At the same time the multi-cultural aspects of border regions, the territorial identity and the ethnic components continued to play an important role in the studies of Slovenian political geographers.

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ARTICLES

EDUCATION FOR ACTIVE CITIZENSHIP IN SPATIAL-PLANNING PROCESSES: FROM TEACHER TO STUDENT

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ABSTRACT
Education for active citizenship in spatial-planning processes: from teacher to student
In countries with a brief democratic tradition, which also includes Slovenia, it is necessary to blaze new paths for teaching sustainable spatial development. As part of the international project R.A.V.E. Space we therefore sketched out guidelines for how information on spatial values and spatial planning can improve the learning process for geography and related subjects. Special attention was directed toward teacher education because teachers spend the most time with young people during their period of personality development. This comprehensive approach also envisioned restructuring the curriculum and seeking teaching materials and aids that can be used to bring up young people as active, responsible, and critically thinking citizens that are aware of how their everyday life practices are reflected in space and how they can be included in spatial-planning processes.

KEY WORDS
geography, education, spatial values, spatial planning, active citizenship

IZVLEČEK
Vzgoja za aktivno državljanstvo v procesih prostorskega načrtovanja: prek učitelja do učenca
V državah s kratko demokratično tradicijo, med katere sodi tudi Slovenija, je treba utirati nove poti za izobraževanje o trajnostnem prostorskem razvoju. Zato smo z mednarodnim projektom R.A.V.E. Space začrtali smernice, kako z vsebinami o vrednotah prostora in prostorskem načrtovanju nadgraditi učni proces pri geografiji in sorodnih vedah. Posebno pozornost smo namenili izobraževanju učiteljev, saj ti v obdobju osebnostnega razvoja mladih z njimi preživijo največ časa. Celovit pristop je predvidel tudi prenovo učnih načrtov in iskanje učil ter učnih pripomočkov, s katerimi lahko dijake vzgojimo v aktivne, odgovorne in kritične državljane, ki se bodo zavedali, kako se njihove vsakdanje življenjske prakse odsevajo v prostoru in kako se lahko vključujejo v procese prostorskega načrtovanja.

KLJUČNE BESEDE
geografija, izobraževanje, vrednote prostora, prostorsko načrtovanje, aktivno državljanstvo

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1 Introduction

The trends connected with the modern lifestyle clearly show that it is necessary to look for new ways to educate people about the space we live in. Accelerated economic development and striving after profit at any cost, increasing population, the consumer mentality, and individualism are placing demands not only on the environment, but also on available space. Pressing environmental protection topics such as the issues of drinking water, air pollution, or loss of biodiversity have become entrenched in social awareness in the past decade, but only rarely are people aware that our activity demands space, of which there is increasingly less. The awareness that space is a non-renewable resource that must be managed responsibly still has to find a place for itself in the collective mindset. Planning procedures also increasingly often require the inclusion of the general public (Kušar 2008, 40), whereby it is important that they be informed about spatial challenges and ways to solve them. Therefore it is necessary for formal education to include material that relates to spatial values, spatial planning, and active citizenship.

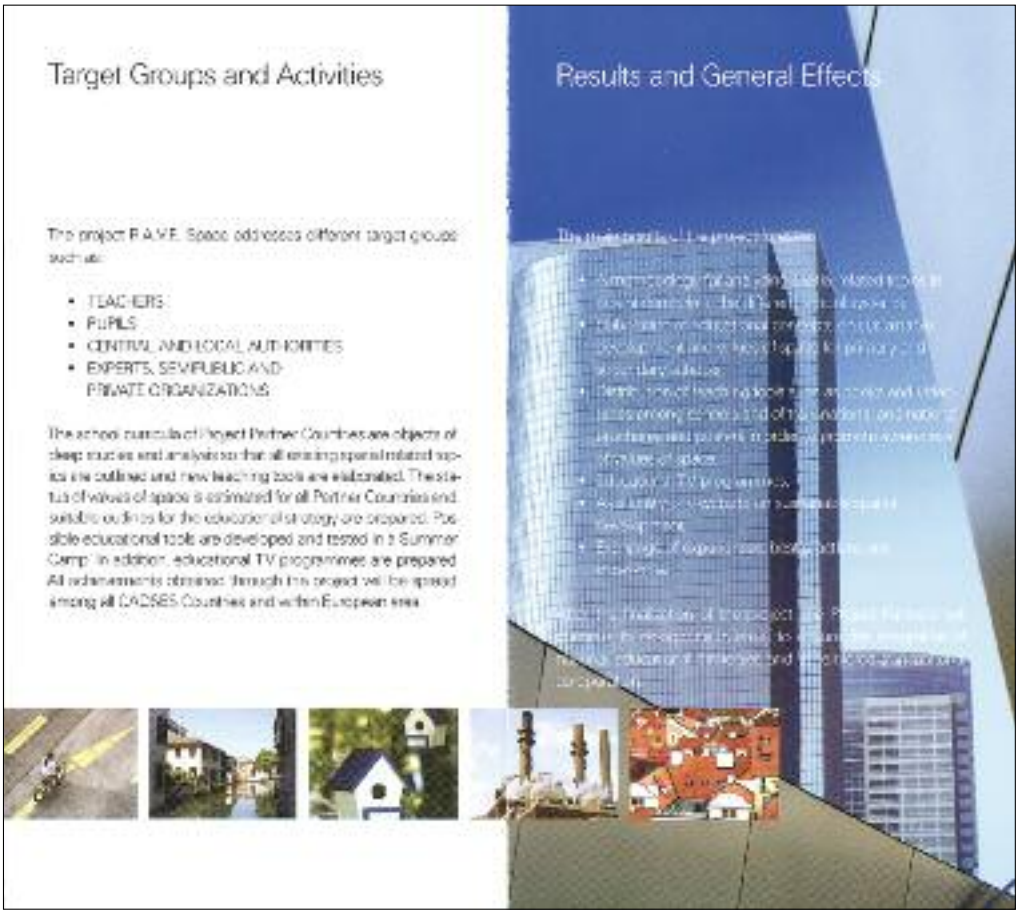

Figure 1: The international project R.A.V.E. Space (Raising Awareness of Values of Space through the Process of Education) played an important role in raising the awareness of Slovenian young people about spatial values.

In countries with a short tradition of including the public in decision-making processes it is necessary to prepare citizens for active involvement. This is also clearly shown in the current situation in Slovenian society, characterized by unreasoned opposition to any kind of proposal or spatial change (Fridl, Urbanc and Pipan 2009, 370). The first reason for this is bad experiences from the past, especially the political misuse of expert findings and not taking the public into account, and the second reason is the materialistically oriented society, whereas space has a distinctly post-materialist value (Resnik Planinc 2006, 13). It is therefore necessary to raise people's awareness that proper spatial management may be more expensive in the short term but it is the only reasonable path in the long term. The third reason, which cannot be neglected, is that in the educational system the sustainable perspective was largely treated as relating to environmental protection, whereas spatial aspects were completely overlooked (Kasimov, Malkhazova and Romanova 2005). In general as well, the sustainability concept is often treated with an emphasis on environmental principles (Higgitt, Haigh, and Chalkley 2005, 14). Slovenia is no exception in this regard, and therefore in 2005 the Ministry of the Environment and Spatial Planning assumed leadership of the international project R.A.V.E. Space (Raising Awareness of Values of Space through the Process of Education) as part of the Interreg IIIB program. The project's activities were based on the premise that raising awareness is especially effective if it becomes part of the educational process (Demšar Mitrovič et al. 2007). This article seeks to present the key findings of this project and some further activities; for example, restructuring the Slovenian curriculum, educating teachers at seminars, and raising general public awareness with the help of research articles and discussion papers.

The process of raising awareness must start intensively especially among young people as the most receptive group because in a few years they will assume the burden of responsibility for future development. It is essential for individuals to be aware of how their lifestyle influences the use of space and development of activities, and indirectly also influences costs and accessibility. For example, living in a single-family house with a yard is considerably more expensive and demanding for the individual and for the community than living in an apartment building because this substantially increases the per capita costs of public utilities and it also reduces accessibility to activities, especially for children and the elderly (Fridl et al. 2007, 202). Therefore this project outlined several measures at various levels: preparing strategies, improving the curriculum, educating teachers, and selecting suitable teaching methods and materials. By suggesting new teaching methods or improving existing ones, we primarily built on skills and not on teaching facts. Many researchers have emphasized the importance of experimental learning, including Kotval (2003) and Michiko Hama et al. (2005).

To achieve the goals set, it is clearly most important to train teachers, who spend a substantial amount of time with young people during the period when they are shaping their view of life and the living environment based on the information they have received and the experiences they have had. At both the conscious and unconscious levels, teachers build their perspectives, values, and world views into the educational process, whereby these values primarily depend on time (they are not permanent), culture (evaluation criteria change in line with social changes), and participants (individual or social values).

How to integrate new material into the existing curricula of the countries participating in the project was a demanding question because school systems differ considerably between countries, especially regarding their receptivity to innovations. Of course, children already learn about space in school, and so we did not consider a special new subject, but instead looked for opportunities to make connections between subjects and links to outside sources of knowledge (Marentič Požarnik 2005, 4).

2 Teachers' values

Intentionally or not, teachers' personal points of view are reflected in their classroom work (Zimmer et al. 1994; Bayard and Jolly 2008, 124), and so as part of the R.A.V.E. Space project we con-

ducted an extensive international study that included 1,897 teachers from Slovenia, Italy, Poland, Greece, and Montenegro. Here we will emphasize only a few content areas that apply to the responses received from Slovenian teachers in the survey and, as needed, will draw parallels with the situation in other countries.

Just over three decades ago, Inglehart (1977) defined the difference between materialist and post-materialist values as the starting point for understanding cultural changes in advanced industrialized countries after the Second World War. According to Inglehart, rapid economic development and the expansion of prosperity increased the economic security of postwar generations, and thus the values of the masses have been gradually shifting from materialist to post-materialist. In contrast to materialist values, which emphasize the importance of economic and physical security, post-materialist values place freedom of expression and quality of life in first place (Resnik Planinc 2008b, 27).

In order to determine what teachers' values were, the survey first asked which developmental goals of the county should take priority. The respondents, who were able to choose among various answers, put economic growth in first place (54%), followed by the opportunity for people to make decisions (35.8%), and then urban beautification (10%) and finally national defense (0.2%). A comparison shows that Slovenian teachers value post-materialist priorities higher than their Greek colleagues, and that the Slovenian results especially stand out from the results of their Polish and Montenegrin colleagues.

For the general social question, four options were also given: preservation of law and order in the country, the voice of the people in government decision-making, fighting against rising prices, and freedom of speech. In this part the Slovenian responses ranged between materialist and post-materialist values. All in all, Slovenian society is comparable with Greek society, more postmodern than Polish and Montenegrin, and more materialist than Italian.

In determining the values connected with living space, among the eighteen options offered Slovenian teachers ranked quality of the environment first (air, water, soil, biodiversity) and waste management second, from which it can be concluded that teachers are very well informed about the environment. This was followed by exploitation of natural resources (energy, water, space) and economic growth with the creation of high-quality jobs. The ratio between environmentally and economically oriented teachers was 60 : 40.

The next question applied to evaluating landscape elements. Natural heritage was followed by countryside, hydrological elements, and finally cultural heritage and the urban landscape. Teachers expressed greater inclination toward the natural landscape and the rural landscape closely associated with it. At the same time, they expressed great willingness to contribute to improving the situation in their living space if they received appropriate guidance for this.

Summing up the findings of the survey, one can say that Slovenian teachers are well aware of the importance of environmental and spatial matters, but that they would like to receive additional guidance on how to expand elements of sustainable development with spatial themes.

3 Premises for education about sustainable spatial development

Through education for sustainable development we primarily wish to disseminate knowledge of spatial values and guide students to think about spatial problems and ways to solve them. At the same time, they must be aware of the consequences of various interventions in space, understand the interconnectedness and interdependence of activities in space, and develop a responsible relationship to space. Through a wide variety of activities as part of the project presented, such as analyzing the situation, restructuring the curriculum, educating teachers, and using various teaching materials, we sought to find the most comprehensive approach to solving the problem. We were aware that the goals set can be most easily achieved if already established environmental education in the Slovenian schools is expanded to education of young people with a view to sustainable development.

3.1 Restructuring the curriculum

Restructuring the curriculum at the beginning of 2007 was an ideal opportunity to include spatially oriented material (i.e., material on spatial values, sustainable development, and spatial planning) in the curriculum of various subjects (Demšar Mitrovič, Resnik Planinc and Urbanc 2007, 5). An international study has shown that the curriculum is a key element that guarantees the successful inclusion of new values in the education process (Resnik Planinc 2008a).

According to most experts participating, it was reasonable to add new material (e.g., use of space, planning spatial development, spatial management, conflicts of interest in space) only to a small degree, especially to geography as the core subject, but of course indirectly to others as well. In general, a need was shown to build on already existing material with spatial dimensions (e.g., use of natural resources, settlement, natural and cultural heritage, traffic, tourism and free time, pollution and waste management, economic development). In education for sustainable development, it was especially important to include understanding and solving problems and conflicts caused by lifestyle changes and socioeconomic and technical development in relation to the environment and space.

Many circumstances favored introducing topics about spatial values into the curriculum, but the majority of teachers felt under time pressure when teaching because of the large amount of material required. It was therefore necessary to take care not to overload the curriculum, which could have resulted in students not learning all the material.

We arrived at a broader selection of material by analyzing strategic spatial development documents and using the »brainstorming« method at four institutions (The Spatial Planning Directorate at the Ministry of the Environment and Spatial Planning (the name of the institution at that time), the Geography Department at the University of Ljubljana's Faculty of Arts, the Anton Melik Geographical Institute at ZRC SAZU, and the Ljubljana Urban Planning Institute). Proposals for improving the material in the curriculum were prepared for geography (the entire vertical progression from sixth to ninth grade of elementary school, at four-year secondary vocational schools, at vocational-technical schools, and at general upper secondary schools) and for related or connected subjects: social studies/science, natural science and technology, natural science, environmental education, social studies for three-year secondary vocational schools, and education for sustainable development as an interdisciplinary curricular area.

Table 1: Suggestions for new topics in the curriculum (Fridl, Ilc and Kušar 2007a, 14).

Thematic area	Topics
Space	Spatial values, spatial limitations, spatial complexity, sustainable spatial development
Settlement	Settlement typology, spatial pattern of settlement, system of central settlements, building typology, architecture, building materials, quality of life, green spaces, cultural heritage, cultural monuments
Infrastructure	Natural resources (renewable/non-renewable), traffic infrastructure, public transport, parking, sports and recreation infrastructure
Landscape	Land use, protected areas, degraded areas, afforestation, natural disasters (floods, earthquakes, landslides, slumping)
Man: environment and space	Wastewater, hazardous waste, source separation of waste, global changes, influence of spatial changes
Social environment	International, cross-border, and inter-regional cooperation, individual and group responsibility
Spatial planning	Spatial-planning system, democracy of planning, public participation, harmonizing interests

3.2 Teachers' seminars

Under the aegis of the Slovenian Ministry of the Environment and Spatial Planning and the R.A.V.E. Space project, three two-day seminars were held for teachers in which we wished to present certain not-yet-established forms and methods of work and teaching materials that could more effectively orient students to recognize the values of space, engage in proper environmental management, comprehensively understand the causes and effects of human interventions in space, and realize the importance of spatial planning. The idea of holding seminars immediately showed itself to be extremely useful because the majority of teachers understood »sustainability« merely as environmental sustainability.

We designed the teachers' seminars such that the activities were primarily oriented toward (Urbanc and Fridl 2007, 227):

- Presenting methodological approaches to teaching that are based on research from the R.A.V.E. Space project;
- Registering spatial values in four selected study areas with various activities;
- Simulating possible educational processes that can be carried out with students;
- Testing certain teaching materials and methods of presenting sustainable spatial development and spatial planning;
- Playing out the roles of the public vs. spatial planners;
- Collecting proposals and opinions regarding the selection and preparation of teaching materials by teachers.

The seminar took place for two days in the form of workshops and deskwork in small groups. The presentation of the R.A.V.E. Space project and concepts such as »sustainable development,« »spatial values,«

PRIMOŽ PIPAN

Figure 2: Fieldwork in the two-day seminar for elementary- and secondary-school teachers in Portorož emphasized the recognition of spatial values. The photo shows a group at the Sečovlje Saltpans.

and »spatial planning« were followed by explanations of certain teaching methods and materials used in the seminar. The activities continued in small groups with applied fieldwork at four selected locations: the Lucija Marina, Seča, the Portorož Airport and its surroundings, and the Sečovlje Saltpans. The fieldwork was primarily oriented toward experiencing, observing, studying, and interpreting the landscape with an emphasis on various spatial values defined in the morning part of the seminar and in seeking new values. After finishing the fieldwork the individual groups presented their findings. The second day of the seminar was exclusively dedicated to deskwork; specifically, to presenting and solving an imaginary case of seeking the most suitable location for placing a new activity in space, taking into account perceptions and information received from the field inspection from the previous day, and thinking about conflicts of interest in space. At the conclusion of the seminar a discussion developed on how the activities, methods, and teaching materials presented could be implemented in learning processes. We invited the teachers present to try out the forms and methods of work and teaching materials during the current school year in their classes.

3.3 Teaching materials

Teaching must also be supported with suitable teaching materials such as books, manuals, worksheets, videotapes, multilingual brochures, web pages, and so on that shed light on spatial topics. Among other things, the R.A.V.E. Space project also planned the design of new teaching materials and the analysis of existing ones, and so the survey included some questions that were also directed at the most frequently used teaching materials, aids, and methods.

The results of the survey indicate that there is too little emphasis on recognizing spatial topics in the curriculum, which could also be ascribed to a lack of suitable teaching materials and literature about

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Figure 3: A »Gulliver map« that includes additional features perceived in the field offers a complex image of existing and future spatial development.

spatial topics. Slovenian teachers still use textbooks as teaching material to the greatest extent (18.9%), followed by worksheets (16.4%) and books (14.6%). According to them, students prefer to use modern media such as CDs, DVDs, videos, and software (30.5%). The discrepancy between the actual situation and what students want is therefore interesting because teaching materials should also be a means of motivation.

With the publication of a special handbook for teachers and a collection of worksheets for students titled *Raising Awareness of Values of Space*, the R.A.V.E. Space project tried to at least partially fill this gap. As part of the seminars we also gave teachers guidelines for using existing material. In addition to field trips, either during classroom hours or school outings, it is advisable to use cartographic teaching material for recognizing spatial values and various elements and changes in a region. Aerial photos can play a double role: put together and enlarged, they can be used as a »Gulliver map« in which children play the role of a giant that looks at the landscape from up high (Fridl and Urbanc 2008, 658). In this way they receive a more comprehensive impression of the space and the distribution of activities in it than by observing them in the field. After finishing their fieldwork on the »Gulliver map« they can also mark the location of values that they perceive in the space.

Aerial photos and topographic maps are generally important for orientation in space and for marking field observations, as well as for various web applications; for example, for the Slovenian interactive online atlas Geopedia. In order to determine the state and distribution of activities in space in past time periods and to understand spatial processes, useful materials also include nineteenth-century cadastral maps and eighteenth-century military maps. A comparison of maps from various time periods makes it possible to recognize changes in space, especially in land use, and to more easily understand the changing values of space.

According to the survey results, 3D animation is the most attractive to students. This also offers a better visual concept of space than a two-dimensional presentation. Google was of great help in offering general access to a 3D model of the Earth's surface through free user access to its Google Earth application.

Similarly illustrative and interesting are simulated presentations of spatial development, which are of great use to architects when preparing conceptual projects and are already accessible on websites and in promotional material. These help students better conceptualize the consequences that an anticipated development will have in a particular space.

4 Conclusion

Education for active citizenship in spatial-planning processes, especially for young people, is the only guarantee for balanced economic, environmental, spatial, and social development of individual areas, regions, or the entire country. The goals that we wish to achieve through education for sustainable development are primarily connected to disseminate knowledge about spatial values, thinking about spatial problems and ways to solve them, being aware of the consequences of spatial development, understanding the interconnectedness and mutual dependence of activities in space, and developing a responsible attitude toward space. In this we must be aware that the idea of educating and informing the public to achieve sustainable spatial development can only be slowly realized. According to the teachers that participated in the seminars, there are major obstacles to this: the classes are too large, there is a lack of suitable staff and funding, the curriculum is overloaded, and there is too little fieldwork. In general, however, teachers are convinced that the stated goals will be achieved, despite everything, if the aforementioned topics, methods, and teaching materials can find a place in the standard teacher-education program.

It is necessary to especially emphasize that the purpose of active citizenship in spatial-planning processes is not to educate future spatial planners, but merely users of space that will be aware that their lifestyle has an influence on the living space and environment, and that, as stakeholders, will be appropriately included in the spatial-planning processes.

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ARTICLES

SLOVENIAN GEOGRAPHY AND GEOGRAPHICAL NAMES

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ABSTRACT
Slovenian geography and geographical names
Slovenian geographers have dealt with geographical names for a long time. Their several centuries of activity can be divided into several phases. In the early phase this topic was addressed by politicians, missionaries, and polymaths. Then in the mid-nineteenth century, with the national awakening, the first educated Slovenian geographers came to the forefront together with linguists. After this, all leading Slovenian geographers were involved in this topic to various extents, among whom Anton Melik and Ivan Gams stand out. In the past two decades a leading role has been assumed by certain younger geographers, who seek to integrate Slovenian toponymy within modern global trends in the use of geographical names. In doing so, we are relying on United Nations resolutions and taking part in the work of the UNGEGN not only in working groups, but also at the regional level as part of the East Central and South-East Europe Division.

KEY WORDS
geography, geographical names, exonyms, standardization, UNGEGN, Slovenia

IZVLEČEK
Slovenska geografija in zemljepisna imena
Slovenski geografi se že dolgo srečujemo z zemljepisnimi imeni. Večstoletno aktivno obdobje lahko razčlenimo v več faz. V zgodnji so to tematiko pokrivali politiki, misijonarji in polihistorji, z narodnim preporodom sredi 19. stoletja pa so v prvi plan skupaj z jezikoslovci stopili prvi slovenski geografski izobraženci. Potem so se z njo različno intenzivno ukvarjali vsi vodilni slovenski geografi, pri čemer lahko izpostavimo Antona Melika in Ivana Gamsa. V zadnjih dveh desetletjih smo vodilno vlogo prevzeli nekateri predstavniki nove generacije, ki si slovensko toponimiko prizadevamo vpeti v sodobne svetovne težnje rabe zemljepisnih imen. Pri tem se opiramo na resolucije Združenih narodov in se vključujemo v delo UNGEGN-a (Skupine izvedencev Združenih narodov za zemljepisna imena), tako v delovnih skupinah kot na regionalni ravni v okviru Vzhodnosrednjeevropskega in jugovzhodnoevropskega jezikovno-zemljepisnega oddelka.

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1 Researchers, polymaths, and early maps

The first Slovenians encountered foreign geographical names in an authentic environment because they participated in discovering parts of the world previously unknown to Europeans. In the sixteenth century, Baron Sigismund von Herberstein (Žiga Herberstein; 1486–1566) from Vipava revealed Russia, and his work *Rerum Moscoviticarum commentarii* (Notes on Muscovite Affairs) contained the first detailed maps of the European part of Russia, titled *Moscovia* (Muscovy; Korošec 1978, 49–51; Longyka 1999, 457). Centuries later, the missionary Frederic Baraga (1797–1868) worked in the Great Lakes area of North America, and his younger colleague Ignatius Knoblecher (Ignacij Knoblehar; 1819–1858) participated in discovering the upper course of the Nile.

Two maps of Carniola and its wider surroundings had already appeared by the late sixteenth century: a 1573 map by Abraham Ortelius and a 1589 map by Gerardus Mercator (see Longyka 1999). Like other early maps of Slovenian territory, their cartographic value is not especially good. This is especially the case for the geographical names, which in most cases are non-Slovenian and imprecisely located, making it difficult to compare them with their actual locations today.

In the seventeenth and eighteenth centuries, familiarity with the form and characteristics of Slovenian territory was greatly improved thanks to the efforts of individuals motivated by love for their immediate homeland and affiliation to the province they lived in. Until the mid-nineteenth century, the study of onomastics had no ethnic connotations, neither Slovenian nor German. Toponymy was uncharted territory and so every detailed contribution to local studies and natural science was welcome.

In the second half of the seventeenth century, Slovenians benefitted from the contributions of the polymath Johann Weichard Valvasor (Janez Vajkard Valvasor; 1641–1693). His local histories of Carniola and Carinthia, and even more so his monumental work *Die Ehre deß Hertzogthums Crain* (The Glory of the Duchy of Carniola, 1689), created a treasury of inestimable value. His works were the first detailed sources for Slovenian geographical names. He also planned to produce a large map of Carniola, but was unable to achieve this before his death. His estate included a modest 1 : 500,000 illustration of Carniola (Longyka 1999, 461–464). Even though the place names on it are written in German, many of them reveal their Slovenian origin. Valvasor's approximately 1 : 75,000 map of White Carniola titled *Der Culpstram in Crain* (The Kolpa River in Carniola), which appeared in volume three of *The Glory of the Duchy of Carniola*, is considerably richer in Slovenian geographical names (Longyka 1999, 464–465).

2 The national awakening

The first detailed map covering all of Slovenian territory with a rather large number of geographical names was *Ducatus Carnioliae Tabula Chorographica* (Chorographic Map of the Duchy of Carniola) at a scale of approximately 1 : 100,000. It was published in the mid-eighteenth century in twelve sheets by the priest Joannes Dismas Floriantschitsch de Grienfeld (Janez Dizma Florjančič; 1744). Because the names on the margins of the individual sheets are written out in full, it is possible to bind it into an atlas.

In his four-part work *Oryctographia carniolica oder Physikalische Erdbeschreibung des Herzogthums Krain, Istrien und zum Theil der benachbarten Länder* (A Physical Geographical Description of the Duchy of Carniola, Istria, and Parts of Neighboring Lands, 1778–1789), the French natural historian Balthasar Hacquet included maps at scales of approximately 1 : 360,000 and 1 : 500,000 (Bohinec 1925, 2; Longyka 1999, 470–473; Gašperič 2007). These were the first geological maps of Slovenian territory and they contained almost exclusively Slovenian geographical names; for example, *Goreinsku* 'Upper Carniola', *Bleid* 'Bled', *Kroppa* 'Kropa', *Vishnagora* 'Višnja Gora', and *Poſtoina* 'Postojna'. Only a few names are bilingual, such as *Celautz oder Klagenfurt* 'Celovec or Klagenfurt', or German, such as *Marburg* 'Maribor'.

The cadastral and military survey of the entire Habsburg Monarchy also produced precise 1 : 2,880 cadastral maps for Slovenian territory as well as detailed 1 : 28,000 and 1 : 75,000 military maps (Longyka 1999,

474). Both the cadastral and military maps – the latter were long top secret and were not issued with their accompanying toponymic descriptions until the end of the twentieth century, when a seven-volume facsimile version was produced under the editorship of the historian Vincenc Rajšp (1995–2002) – are an inexhaustible source for the study of geographical names. At the order of Emperor Joseph II, the names were transcribed into the »language of the land,« which makes it possible to compare them with the names on the maps by Floriantschitsch and Hacquet.

The Idrija native Heinrich Freyer (1802–1866), a geologist and mineralogist, and also the curator of the Ljubljana Provincial Museum, published a large 1 : 113,500 map of the Duchy of Carniola in sixteen sheets (Bohinec 1925, 6; Longyka 1999, 476–477). The map is titled in German as *Special-Karte des Herzogthums Krain* (Detailed Map of the Duchy of Carniola), but the naming of places is mostly in Slovenian and German names are added only in parentheses; here and there Slovenian doublets are also given in parentheses. The map also has a bilingual list of Carniolan places and castles, comprising 3,220 alphabetically arranged names of settlements and hamlets. In 1844 an excellent German map of Carniola was also published, titled *Karte von Herzogthume Krain* (Map of the Duchy of Carniola), prepared by Gottfried Loschan, an officer in the 17th Ljubljana infantry regiment (Longyka 1999, 477–479).

During the period before 1848, educated Slovenian geographers also largely used German. Due to the limited conditions in their native province, where there was hardly any call to apply their achievements, educated Slovenians were mainly directed to Vienna and Prague, where they could apply their potential and satisfy their creative urges, primarily in the service of the empire. A somewhat later representative of this period was Blasius Kozenn (Blaž Kocen; 1821–1871), a leading Austrian cartographer. While he was establishing himself he was aided by the fact that German cartography had not taken any real interest in the Austrian Empire. His school atlas was reprinted hundred-four times, although it never appeared in a Slovenian edition. Among Kozenn's many other maps there are none in Slovenian, although from the perspective of Slovenian toponymy his 1861 map of the Alpine countries is important. He drew the Slovenian ethnic border on this map, and in the lower right corner he also gave a list of Slovenian place names, but not Czech or Polish, for example (Bohinec 1925, 8; Bratec Mrvar et al. 2011).

3 After the spring of nations

The watershed year of 1848 awakened and strengthened the consciousness of European ethnic groups, including the Slovenians, and so they started to publish cartographic products and professional volumes that had been unthinkable until then; these presented and described the territories inhabited by individual ethnic groups in great detail. Societies and professional organizations were founded, and they took an organized approach to establishing the role of individual languages. The central role in Slovenia was played by the Slovenian Society (*Slovenska matica* or *Matica Slovenska*).

The greatest credit for spatially presenting ethnic Slovenian territory goes to the Kočevje German Peter Kosler (also Kozler; 1824–1879), who was educated as a lawyer but went on to study geography and cartography in Italy (Bohinec 1925, 10). He was a cofounder of the Vienna Slovenian Assembly (*Slovenski zbor v Beču*), a society dedicated to the goal of uniting all areas where Slovenians lived into an administrative unit called United Slovenia (*Zedinjena Slovenija*), which also created a need for the cartographic presentation of this territory.

Kosler had already collected Slovenian place names by 1848. Based on the anticipated scale of about 1 : 600,000, it was necessary to collect about 5,000 names. His only aid was Freyer's map, which had covered only Carniola. Parts of Kosler's map were ready the same year, but the finished map (Kozler 1853; Figure 1) was confiscated in 1854 by court order by the bureaucracy of Minister of the Interior Alexander von Bach because Kosler drew the boundaries of his United Slovenia far into Carinthia, into Istria, and even into Hungary (Bohinec 1925, 12). Permission for a new edition was granted only in 1861. As a supplement to the map, Kosler wrote his *Kratek slovenski zemljopis* (Concise Slovenian

Figure 1: Detail from Kosler's map (1853).

Figure 2: Detail from Cigale's map of North America (1871).

Figure 3: Detail from the map by the Slovenian Society (1921).

Geography; Kozler 1854), to which he added a gazetteer of Slovenian and German names of settlements.

Slovenianized foreign geographical names started to appear in school textbooks in the first half of the nineteenth century. The first one to present a large number of these systematically was Janez Jesenko, whose regional geography textbook (1865) gave the Slovenian names of the continents and major seas; for the individual continents he provided the names of the major peninsulas, capes, and countries or the best-known regions, and for the major seas the names of smaller adjacent seas and major bays. He also named the main islands and most important straits. For each continent he named the major lakes and rivers, mountain ranges, major peaks, and major lowlands. All of the major European cities and the largest cities on each continent are also given in tabular format.

Jesenko's selection of several hundred geographical names was surely an important model for the lawyer and linguist Matej Cigale (1819–1889) in the preparation of his *Atlant* (1869–1877). One of the most important achievements of this first Slovenian world atlas was the use of Slovenian geographical names on the maps because Cigale Slovenianized over 4,000 foreign geographical names (Kladnik 2005; Figure 2). Despite its exceptional importance for the development of Slovenian, *Atlant* was not appropriately valued later on and it was almost completely forgotten. A few years ago the Anton Melik Geographical Institute of the Scientific Research Centre of the Slovenian Academy of Sciences and Arts reissued a facsimile edition of the atlas (Atlant 2005). The facsimile edition of the original maps was accompanied by a publication with articles about Cigale and the significance of *Atlant*, as well as a newly prepared index of names.

Quite some time passed until the publication of the next Slovenian-language atlas (Rutar and Orožen 1899). The editing of the names in Vinzenz von Haardt's atlas and on his wall map of Austria-Hungary was first undertaken by Simon Rutar (1851–1903), a geographer and historian from the Littoral, although the relevant ministry did not approve his 1896 work due to the phonetic transcription of the geographical names. Because Rutar did not want to change this, the atlas and the wall map were published a few years later in a further reworking by Fran Orožen (1853–1912). In addition to the wall maps of the Earth's hemispheres, Europe, Austria-Hungary, and Palestine, Orožen also adapted a 1 : 130,000 map of Carniola and the Littoral. He also created the first globe with Slovenian labels, with a scale of 1 : 50,000,000 (Bohinec 1925, 17).

Towards the end of the nineteenth century, the Slovenian Society wished to supplement the book series *Slovenska zemlja* (Slovenian Land) with a large map of Slovenian ethnic territory, and so by 1876 it started the organized collection of Slovenian place names, which stretched out over several decades (Kranjec 1964). While preparing the map, they organized a special network of field informants whom the compilers of the map turned to with additional inquiries regarding names that were unreliable or questionable for any reason. The linguist Maks Pleteršnik (1840–1923) played an outstanding role in standardizing the forms of names following the historical-etymological principle. Because of professional disagreements, technical and financial problems, the outbreak of the First World War, the abolition of the Slovenian Society, and other factors (Šivic-Dular 2003, 27), the 1 : 200,000 map in four sheets was not published until 1921 (Figure 3). A year later, Rikard Svetlič's companion booklet *Kazalo krajev na Zemljevidu slovenskega ozemlja* (Index of Places on the Map of Slovenian Ethnic Territory) was also published.

4 Slovenians within Yugoslavia

The interwar years were a period when research in Slovenian geography flourished, and to a large extent it fulfilled its mission together with geography experts from the two other major ethnic groups comprising the Kingdom of the Serbs, Croats, and Slovenes, later known as Yugoslavia. Analytical studies predominated, supported by what were still meager databases. The synthetic approach culminated

in Anton Melik's work geographically describing Slovenia (1935). After the Second World War, this was also followed by detailed regional geographical descriptions of individual parts of Slovenia (Melik 1954; 1957; 1959; 1960), containing an enormous amount of place-name material. Anton Melik was also the first to systematically draw attention to the difficulties of transcribing foreign place names, a problem viewed to have arisen after the First World War (Melik 1928).

Geographers also played a leading role in preparing the work *Krajevni leksikon Slovenije* (Lexicon of Slovenian Places), which appeared between 1968 and 1980 in four volumes under the editorship of Roman Savnik and contained many place names and other geographical names. These extensive volumes (*Krajevni leksikon Slovenije* 1968, 1971, 1976, 1980) are an inexhaustible resource for Slovenian geographical names, although they still have not been processed through a linguistic filter.

For a long time, Slovenians did not have a world atlas in their own language, aside from small school atlases, until at least 1972, when the publisher 'Mladinska knjiga' issued its *Veliki atlas sveta* (Great World Atlas). The two editors, Jakob Medved and Borut Ingolič, followed the resolutions of the United Nations Conference on the Standardization of Geographical Names, perhaps somewhat too consistently, with regard to reducing the number of exonyms. Strictly following this principle in the 1970s and 1980s resulted in a serious disagreement between Slovenian geographers and linguists, who advocated linguistic autonomy. The disagreement between the geographers and linguists only abated with the »golden age« of Slovenian atlas material from the 1990s onwards, spurred on by Slovenian independence.

As far as the standardization of geographical names is concerned, for Slovenian toponymy it was an unfortunate circumstance that information from the centrally managed Yugoslav federation – which made possible participation at international conferences on geographical names where important decisions were adopted – was scant and slow in coming. Slovenian professionals did not have access to the original versions of the documents, but only to the reports by the representatives of the Yugoslav delegation. The saving grace was that the head of the delegation was a Slovenian, the geodesist Miroslav Peterca, who was also the administrative head of the Military Geographical Institute in Belgrade.

A conference on issues in the standardization of geographical names in Yugoslav languages was held in Sarajevo in 1984 (Gams 1984a; 1984b; Kunaver 1984). At the conference there were presentations on the need to harmonize standardization procedures among the Yugoslav federal and republic, or regional, committees for the standardization of toponyms. The first Yugoslav republic to establish such a body was Macedonia. The Slovenian Committee for the Standardization of Geographical Names was established at the proposal of the Slovenian Surveying and Mapping Authority with a resolution from the Executive Council of the Assembly of the Socialist Republic of Slovenia and by a decision of the head of the Executive Council in November 1986 (Kladnik 2006).

5 Independent Slovenia

In 1990 the Committee for the Standardization of Geographical Names was reappointed. Due to staffing changes and reorganization of the bodies participating in it, initially the committee did not operate for a few years, although the Slovenian government reappointed it in the fall of 1995. It was comprised of geographers, linguists, geodesists, cartographers, statisticians, and lawyers. Since 2001 it has had the status of a permanent working body of the Slovenian government. During the past decade, geographers have also been very active in it, indicated by the fact that its seat was transferred to the Anton Melik Geographical Institute of the Scientific Research Centre of the Slovenian Academy of Sciences and Arts.

As part of the committee's work, we have standardized the Slovenian names of countries and their main appertaining territories (Perko 1996), as well as nearly 5,000 geographical names in Slovenia recorded on the 1 : 250,000 *Državna pregledna karta Republike Slovenije* (National Index Map of the Republic of Slovenia, 2008).

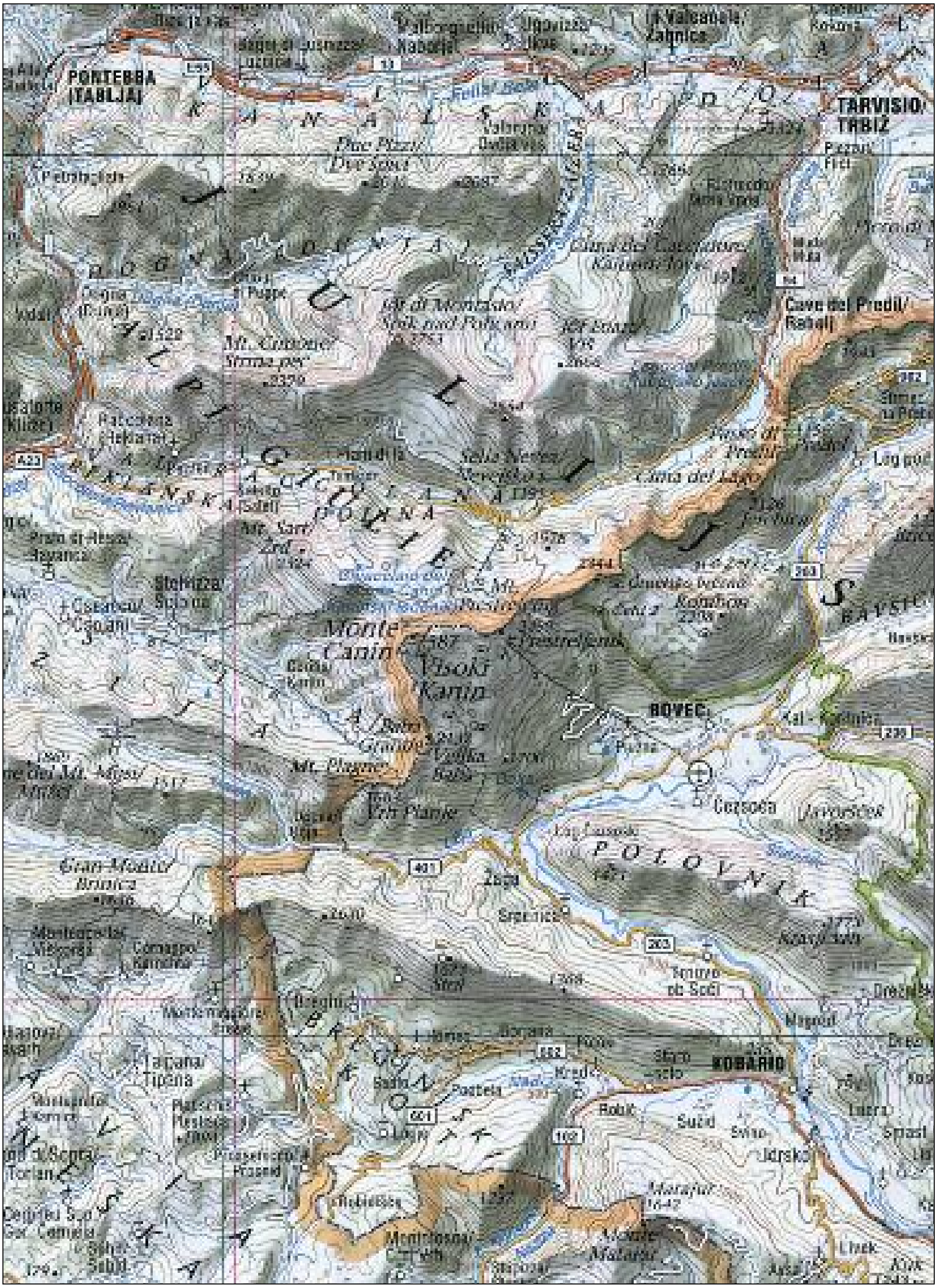

Figure 4: Detail from the National Index Map of the Republic of Slovenia (2008).

Slovenian independence increased the need for the spatial representation of new political realities. It was a fortunate turn of events that the development of computer science made the production of books cheaper, and the development of digital cartography enabled faster and cheaper publication of atlases. Publishers also commercially exploited the changeover to the 2000s with new publications. Geographers had a hand in almost all of these editions, and younger professionals unburdened by the disagreement between geographers and linguists dedicated themselves to the work of editing, translating, and dealing with toponyms.

These younger geographers were mainly responsible for editing geographical names in the preparation of atlases, and they started examining the Slovenianization of foreign geographical names from a variety of perspectives, including the tradition of names in Slovenian, the rules of the Slovenian normative guide, and the UN resolutions on exonyms, and so it is not surprising that in recent years their solutions for Slovenianizing geographical names have become considerably more similar in various publications, which is a good basis for standardizing these names.

More extensive general world atlases were published by various presses in 1991 (Cankarjeva založba), 1992 (DZS), 1997 (Mladinska knjiga), 2001 (Slovenska knjiga), 2003 (Mladinska knjiga), 2004 (Modita), 2005 (DZS), and 2008 (Mladinska knjiga). Only the years of publication of first editions are cited here; the majority of these have also been reprinted. They were also joined by school atlases because under the new market-oriented conditions every self-respecting publisher prided itself on producing its own school atlas (DZS 1998; Tehniška založba 2002; Mladinska knjiga 2002; Učila 2003).

At that time there also appeared a new one-volume edition of *Krajevni leksikon Slovenije* (Lexicon of Slovenian Places 1995) in which the geographical names were linguistically consolidated. This was also the first Slovenian geographical work of all to appear in an electronic version as well. The two-volume *Krajevni leksikon Slovencev v Italiji* (Lexicon of Slovene Places in Italy 1990; 1995) is also indispensible for Slovenian onomastics. The first volume, on the Trieste region, was co-edited by the geographer Milan Bufon.

After the independence of Slovenia in 1991, the opportunities for active international participation in dealing with geographical names improved significantly through the Committee for the Standardization of Geographical Names because Slovenians started independently taking part in the United Nations Group of Experts on Geographical Names (UNGEGN), both in the regional linguistic and geographical working group for the East Central and South-East Europe Division and in various working groups. They have been especially active in the Working Group on Exonyms, which was founded in 2002.

After publishing an influential paper (Orožen Adamič 2000), the first convener of the group was Milan Orožen Adamič, who in this role was also an intermediary in clarifying internationally disputed geographical names (Orožen Adamič 2004; Orožen Adamič and Kladnik 2010). At the first official conference of the working group in 2003 in Prague, two Slovenian papers were presented (Kladnik 2003; Orožen Adamič 2003). The fourth conference took place in 2005 in Ljubljana (Pipan 2005), where meetings of the regional linguistic and geographical working group for the East Central and South-East Europe Division were held in 1999 and 2001. At the tenth-anniversary meeting of the Working Group on Exonyms in 2010 in Tainach, Austrian Carinthia, a Slovenian paper was presented on the semantic differentiation between the concepts of endonym and exonym (Kladnik and Urbanc 2011).

Considerably more attention is also being dedicated to systematic studies. A presentation paper on geographical names and how they arise and are used was published (Peršolja 2003). Another result of these orientations was an article on changes in Slovenian place names, especially those named after saints (Urbanc and Gabrovec 2005). Several articles seek to shed light on the issue of exonyms and their creation (Kladnik 2007a; 2007d; 2009a; 2009b), and two volumes have also been published on this topic (Kladnik 2007b; 2007c).

Last but not least, mention must also be made of Slovenian geographers' efforts to preserve the internationally accepted name *Bay of Piran*, for which a few years ago the Croatians wished to introduce the newly coined name *Bay of Savudrija* (Kladnik and Pipan 2008; 2009).

6 Slovenian geographers and toponomastics

Only a few Slovenian geographers have actively dealt with toponomastics, which has nearly a century-long tradition in Slovenian geography. A pioneer in this area was Henrik Tuma (1925; 1929), who emphasized direct fieldwork and cooperation with the local people as a precondition for the proper transcription and use of geographical names, and who was also aware of the need for the closest possible interdisciplinary cooperation.

In more recent times, Anton Sore and Julij Titl have done the most detailed work with toponomastics. Sore dealt with place names, choronyms, and hydronyms in the Savinja-Sotla area of Slovenia (1993; 1994). Titl was even more thorough, with the results of his research producing three volumes. The first (1998) covers northwest Istria, the second (2000) covers the Koper Littoral (*Koprsko primorje*), or the Šavrini/Koper Hills, and the third (2006) covers the Karst area. One should also mention Borut Peršolja, who dealt with onomastic issues in the Kamnik-Savinja Alps (1998).

7 Conclusion

Geographical names continue to interest Slovenian geographers, although most only deal with them on the side because they specialize in other branches of geography. On the other hand, there are few other topics that can attract and engage so many geographers. It is interesting that these are representatives of a wide range of orientations because they include physical, social, and regional geographers. For some individuals, their interest in geographical names often increases as they get older because of increasing thematic specialization. The most systematic and organized treatment of geographical names is being carried out at the Anton Melik Geographical Institute of the Scientific Research Centre of the Slovenian Academy of Sciences and Arts.

Unfortunately, no Slovenian university offers any kind of education, even at the elective level, on geographical names. Currently the University of Ljubljana's Faculty of Arts offers a graduate course in Slovenian onomastics in its Comparative Slavic Languages track. However, this is not exclusively dedicated to geographical names and primarily has a linguistic orientation.

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