

CONTENT

Keynote lectures at the 5th EUGEO Congress

Editorial (<i>Zoltán Kovács</i>).....	263
<i>Peter Meusburger</i> : Knowledge environments in universities	265
<i>Herman van der Wusten</i> : Imagined communities and practiced geopolitics.....	281
<i>Jean Poesen</i> : Soil erosion hazard and mitigation in the Euro-Mediterranean region: do we need more research?.....	293
<i>Michael A. Fullen</i> : Physical geography and closed loop recycling	301

Studies

<i>Ferenc Schweitzer</i> : Strategy or disaster: New-style river regulation as an issue of national security.....	307
<i>György Varga</i> : Changing nature of Pleistocene interglacials – is it recorded by paleosoils in Hungary (Central Europe)?	317
<i>Jelena Lončar</i> and <i>Veni Marinković</i> : Analysis of socio-economic indicators in the context of the regional development of Eastern Croatia	327

Literature

<i>Lang, T. et al. (eds.)</i> : Understanding Geographies of Polarization and Peripheralization: Perspectives from Central and Eastern Europe and Beyond (<i>Péter Balogh</i>).....	345
<i>Tammaru, T. et al. (eds.)</i> : Socio-Economic Segregation in European Capital Cities. East Meets West (<i>Márton Berki</i>)	347
<i>Meusburger, P., Gregory, D., Suarsana, L. (eds.)</i> : Geographies of Knowledge and Power (<i>Márton Pete</i>).....	349
<i>Maguš, Damir</i> : The Geography of Croatia (<i>Dániel Balizs</i>)	352

Chronicle

In memoriam Andrei Velichko (1931–2015) (<i>László Bassa</i>).....	355
--	-----

Editorial

2015 was a distinguished year both in Hungarian geography and in the development of Hungarian Geographical Bulletin (HGB). After 44 years break a major international geographical conference, the 5th EUGEO Congress, was held in Budapest. The Congress became a success story with over six hundred participants from 45 countries who discussed various aspects of geography in great number of sessions during the three day event (see detailed description of the congress in issue 3 of 2015).

The motto of the congress (“Convergences and Divergences of Geography in Europe”) reflects the way in which geography has developed in the recent past. The mushrooming of new research topics, the far-reaching specialisations and not least the strengthening co-operation between geographers and representatives of other disciplines all loosened up the traditional boundaries of geography. This is also well reflected by the growing diversity of papers published in our magazine recently. The proliferation of research topics in geography provides not only a challenge but also an opportunity for academic journals like HGB.

Present issue of HGB contains four keynote papers delivered during the EUGEO congress. They give an excellent insight into the current theoretical and practical questions of geography, be it physical or human geography. The congress provided the editors of HGB also an excellent opportunity to negotiate about future thematic issues and other co-operations within the region. We also hope that participants of the EUGEO congress had the opportunity to visit the HGB exhibition desk during the event and many of them consider future submission in our journal seriously.

Hungarian Geographical Bulletin has clearly changed over recent years. This goes not only for the layout (double column) but also for the quality of the content. The peer-review process will hopefully further improve due to the online submission system to be introduced in January 2016. We truly hope that the forthcoming issues of Hungarian Geographical Bulletin will confirm our continuous efforts towards quality and visibility.

ZOLTÁN KOVÁCS

Knowledge environments in universities

PETER MEUSBURGER¹

Abstract

Talent, motivation, and wealth of ideas are not the only characteristics determining how successfully a scholar's research and academic career develops. What we academics call creative is never the result of individual action alone. Learning processes and research are situated in environments, organisational structures, and spatial relations. We cannot study scientific creativity by isolating scholars and their works from the social and historical milieu in which their actions are carried out. A stimulating environment and a talented individual must come together and interact before a creative process can occur. This article addresses four questions: What elements constitute a local knowledge environment? How can a local knowledge environment affect learning and research processes? How can one measure the impact of a knowledge environment and avoid the trap of determinism? What theoretical concepts can contribute to the analysis of knowledge environments and the explanation of their impact?

Keywords: knowledge environment, creativity, university, network, mobility, scholars, spatial relations, learning, research, interaction analysis, institutional theory, communicative constructionism

Creative scientists can be inspired or impeded by their knowledge environment

The broad consensus is that science has a history. But does science also have a geography? Is science not supposed to be placeless? In recent years a growing number of scholars have pointed out that the generation, diffusion, and legitimisation of scientific knowledge are influenced by local contexts, knowledge environments, spatial relations, and spaces of interaction (GIERYN, T.F. 2001, 2002; LIVINGSTONE, D.N. 1995, 2000, 2002, 2003; MEUSBURGER, P. 2008, 2009b, 2012a,b; MEUSBURGER, P. and SCHUCH, T. 2010a,b, 2012a,b; OPHIR, A. and SHAPIN, S. 1991; SHAPIN, S. 1998, 2001; WITHERS, C.W.J. 2002). When research on creativity was still in its infancy, it focused on the attributes of geniuses, gifted persons, creative artists, and scientists; creative performance; and problem-solving. Few scholars found it necessary to include the environment in their considerations. At best, they admitted that talented individuals could not develop their creativity in repressive societies.

The way to the interactional and environmental study of creativity was prepared by environmental psychologists concentrating on the relation between actor, situation, and environment, especially by BARKER's concept of action settings (BARKER, R.G. 1968). Scholars pursuing management studies, organisational research, and institutional theory, too, became interested in the psychological climate of organisations, in institutional logics, and in rules and informal norms that structure behaviour (BATILANA, J. 2006; BITEKTINE, A. and MILLER, D. 2015; LAWRENCE, T. *et al.* 2011; MINTZBERG, H. 1979; SUDDABY, R. 2010; SUDDABY, R. and GREENWOOD, R. 2005). They found that creative persons are very sensitive and responsive to formal and informal sets of mutual expectations between people, to quality conventions and evaluation criteria prevailing at their place of work (see RAUDSEPP, E. 1958).

Since the 1980s, more and more scholars have acknowledged that the creative scientist does not work in a social, cultural, and economic vacuum. They have pointed out that people cannot study creativity by isolating in-

¹ Department of Geography, Heidelberg University. Berliner Strasse 48. D-69120 Heidelberg, Germany. E-mail: peter.meusburger@geog.uni-heidelberg.de

dividuals and their works from the social and historical milieu in which their actions are carried out (AMABILE, T.M. 1983a,b; AMABILE T.M. and GYSKIEWICZ, N. 1989; AMABILE, T.M. *et al.* 1990; AMABILE, T.M. 1996; BODEN, M. 1994, 2004; CSIKSZENTMIHALYI, M. 1988, 1990, 1999; HENNESSEY, B.A. and AMABILE, T.M. 1988; MALECKI, E.J. 2013; MATTHIESEN, U. 2009; MEUSBURGER, P. 2009a; MEUSBURGER, P. *et al.* 2009; MUMFORD, M.D. 1995; RUNCO, M.A. 1988; RUNCO, M.A. and OKUDA, S.M. 1988; SIMONTON, D.K. 1975; STERNBERG, R.E. and LUBART, T.I., 1991, 1999). It has been accepted that creative individuals are inspired or impeded by societal and organisational structures and that they depend on evaluators, critical audiences, research infrastructure, support of key persons, and financial resources. It has been recognised that creative people and research projects may meet with incomprehension, competition, hostility, and social conflict, that interactions play a very important role, that what we call creative is never the result of individual action alone, and that learning processes and research are situated in environments, spatial structures, and spatial relations.

Today most scholars agree that scientific practices vary from place to place and that universities and other sites of knowledge generation and knowledge distribution are not simply locations but social spaces, epistemic venues, and nodes of scientific networks.² In each discipline university locations differ in reputation; endowment with resources; and the incentives, role models, and career opportunities they offer. They also differ in the degree to which their scholars are part of national and international scientific networks (CHARLE, C. 2004; GLÜCKLER, J. 2013) and in the quality and motivation of their students. Different places³ or knowledge environments have a bearing on whether and how soon new scientific concepts, practices, or techni-

cal innovations are accepted and acted upon and whether it is possible to discuss contested ideas, conduct expensive experiments, hear promptly of crucial developments, and meet with agreement, benevolent tolerance, or criticism upon airing new ideas or breaking the conventions of one's discipline.

Talent, motivation, and wealth of ideas are not the only characteristics determining how successfully a scholar's research and academic career develops. A stimulating environment and a talented individual must come together and interact before a creative process can occur (see STERNBERG, R.E. and LUBART, T.I. 1991). The geography of science is interested in a number of questions. For example, why has a specific research field developed at university A and not at universities B or C? Why have some universities produced and attracted a host of outstanding scholars, whereas others have not? Why does the large majority of outstanding scholars (e.g., Nobel Prize winners) stem from only a small number of universities? Which factors, expectations, or institutional logics inhibit or promote the potential scientific creativity of actors? Which factors influence the career and spatial mobility of scholars? Why does science travel in the selective way it does? How does a local knowledge environment affect research processes and how can these effects be explained? How do international networks of scientists evolve and which long-term consequences do they have? What are the preconditions and primary sources of paradigmatic change in various disciplines and which barriers and facilitators of change can be identified?

As creativity is domain-specific, different domains (e.g., science, humanities, arts, and fashion) need different knowledge environments. This article focuses on knowledge environments of universities. A university's knowledge environment is definable as the result of systematic interdependencies and causal interactions relevant to the generation, diffusion, and application of scientific knowledge.⁴ A knowledge environment should not

² For the role of places in occupational science see ROWLES, G.D. (2008).

³ Various concepts of space and place are discussed by HARVEY, D. (2005) and MASSEY, D. (1999, 2005), for example.

⁴ Some authors prefer the term *knowledge milieu*.

be thought of as an independent variable that directly influences all actors through a direct cause-and-effect relation (if A, then B). It is rather a locally available potential or a local range of resources. It stands for incentives, challenges, stimulations, opportunities, and support networks that can be used, overlooked, or ignored. A knowledge environment can operate as it should only if the actors involved use the local resources and interact with each other. The outcomes of human interactions and experiences in life are always indeterminate. No one can predict the results of appropriation and interaction, whether and how often the local potential for integrating diverse viewpoints and knowledge bases will be activated, and how the relationships between creative agents will develop. Therefore, a knowledge environment's significance and effect can be analysed only after events have taken place, after the scientific careers and research results associated with that environment have become evident.

The article deals with four questions: What elements make up a local knowledge environment? How can a local knowledge environment affect learning and research processes? How can one measure the impact of a knowledge environment and avoid the trap of determinism? What theoretical concepts can contribute to the analysis of knowledge environments and the explanation of their impact?

What elements make up a local knowledge environment?

Personal resources

The most important elements of a knowledge environment at a given place are its human beings with their competencies, skills, experiences, emotions, networks, scientific reputation, manner of interacting with other people, and other personal characteristics. A university is a junction of the paths along which careers are pursued by the academics of various disciplines, generations, and provenances for

a specific period of time. This intersection of career paths at a particular place (for career paths of Nobel Prize winners, see MAGER, C. 2012) can channel highly diverse bodies of knowledge, research interests, theoretical concepts, international experiences, networks, quality standards, and methodological expertise into a knowledge environment, or space of thematic communication, where they undergo critical discussion and where their value is tested in research processes.

Because people are the most important part of a knowledge environment and because their interactions, learning processes, and conflicts are not foreseeable, a knowledge environment is never stable or immutable; it is constantly changing. If a university's knowledge environment is to remain attractive, competitive, and resilient in its quality and scientific reputation, it must be continually replenished by the best available candidates bringing in new ideas, new competence, new scientific methods, and new networks. Scholars socialised in other knowledge environments will question or subtly change some of the prevailing institutional logics, interpretations, and justifications and will bring in new research interests, new kinds of organisational structures, and new repertoires of scientific practices. Some scholars criticizing the theoretical mainstream in their discipline will have an interest in counter-hegemonic practices (see CLEGG, S. 2010, p. 8), and some of them will even be able to exert important effects on governance structures (DACIN, M.T. *et al.* 2002, 51–52).

A knowledge environment operates by the Matthew effect: The more you have, the more you get. The higher the scientific reputation of a university, the more it acts as a magnet attracting talent and brains, and the more impressive its global networks are. Creative, talented people tend to be attracted to certain institutions and places where they can develop their abilities and ideas, have the occasions to interact with other knowledgeable agents, procure the necessary support, be inspired, tackle challenges, and command the necessary resources.

This kind of constant renewal comes about not only through the recruitment of new scholars⁵ but also through what is known as research travel, circular mobility, such as brief periods of study or research abroad, scientific cooperation, and conferences. Mobility of scholars is extremely important for universities. It can trigger new ways of thinking and learning and can bring about new cooperation in the world of science. Mobility means gathering experience in different knowledge environments, tackling new challenges in different departments and scientific domains, exposing one's research ideas to new criticism, and familiarising oneself with issues and methods one has not yet encountered at previous places of work. Learning processes and careers of scholars do not usually take place in a single environment. Scholars are expected to work successfully at more than one university or institutional setting so that they can accrue a wealth of experience, develop extensive personal networks, and constantly broaden their methodological spectrum.

The mobility of scholars can be analysed with various methods and indicators. Some of the most frequently used are the regional provenance, career paths, and scientific travel of the people in question (ACKERS, L. 2005; BAAR-CANTONI, R. and WOLGAST, E. 2012; HARVEY, W. 2010; HEFFERNAN, M. and JÖNS, H. 2013; JÖNS, H. 2007, 2008, 2009, 2014; MEUSBURGER, P. and SCHUCH, T. 2010a,b, 2012a,b). Scientific relations can be measured by collaboration in joint research projects (BUKAU, B. and TOLLE, R. 2012; RADITSCH, L. 2012; SELTMANN, S. 2012), the distribution of coauthors in joint publications (WELLNITZ, E.M. 2012), the spatial distribution of former graduates of a professor or faculty (ECKART, W.U. *et al.* 2012), networks of scholars, the spatial distribution of an author's correspondence (KÜHLMANN, W. *et al.* 2012), and many other indicators.

⁵ There is a mutual relationship between the reputation of a university and the size and diversity of its recruitment area of professors (MEUSBURGER, P. and SCHUCH, T. 2010a,b, 2012a,b).

Material and financial resources

The next important elements of a knowledge environment are its financial resources and the quality of its research infrastructure. Whether outstanding scholars are attracted to a given university often depends on that institution's basic material wherewithal, its financial strength, the quality of its research infrastructure (e.g. physical facilities, libraries, laboratories, and computing centers), and the architecture of a campus. Many new questions can be studied only if the latest research equipment, analytical methods, or archives are on hand. The more expensive such material resources are, the lower the number of universities that are able to acquire them. However, philosophers or mathematicians are less place-dependent for their research than experimental physicists, who may find only three locations in Europe where they can conduct their costly experiments.

In order to attract the famous chemist Robert Bunsen (1811–1899) in 1852, the government of the Grand Duchy of Baden funded a state-of-the-art chemistry laboratory building, the most modern in Europe, and probably in the whole world. In the second half of 19th century, the Grand Duchy of Baden spent about 4 percent of its state budget on its two universities and a technical college, and its per capita expenditures on universities exceeded those of any other German state (PFETSCH, F.R. 1974). Robert Bunsen was a prime reason why other exceptional scientists, including Hermann Helmholtz (1821–1894), Robert Kirchhoff (1824–1887) and others joined the staff of Heidelberg University and created a research center of world-wide reputation (for details see ECKART, W.U. *et al.* 2012; HÜBNER, K. 2010; MEUSBURGER, P. 2012a,b).

Immaterial and organisational resources

Although above-average financial and material endowment is crucial to a university's attractiveness, it by no means guarantees excellent scholarship. Whether an academic

performs unusually well also depends on a site's various immaterial factors, which constitute the third element of a knowledge environment. Some of them pertain to the institutional regulations, conventions, mutual expectations, and organisational structures under which the scholars try to meet their goals. These factors extend to the questions of how key decisions on structural changes and resource distribution come about within a university. The immaterial factors also include the customary quality standards for research and teaching, the degree of academic freedom, rhetorical strategies of legitimacies (SUDDABY, R. and GREENWOOD, R. 2005), and the issue of whether there is respect for diversity among professional cultures or whether one discipline's rules for evaluating academic performance are imposed on all others. The basic nonmaterial resource of a scientific institution consists largely of the academic reputation ascribed to it.

Institutional theory and research on creativity recognise the constraining effect that institutional norms, conventions, and meaning systems have on the emergence of new theories, new research paradigms, and research methods (BITEKTINE, A. and MILLER, D. 2015, p. 117). "Actors perceive the meaning of institutions and infuse their actions with meaning based upon these perceptions" (DACIN, M.T. *et al.* 2002, p. 47). However, members of a university are not passive actors. They are involved in institutional work, and some of them are able to change the rules and meanings of their institution. There is a "dialectical interplay between ... *actions* (practices and structures), *meanings*, and *actors*" (ZILBER, T.B. 2002, p. 235; emphasis in the original; see also DACIN, M.T. *et al.* 2002, p. 48). Institutional work "describes the practices of individual and collective actors aimed at creating, maintaining, and disrupting institutions" (LAWRENCE, T. *et al.* 2011, p. 52). Individuals of high social status (high scientific reputation) are better prepared than others to resist and challenge the conforming pressures of institutions (BATTILANA, J. 2006).

How can a local knowledge environment affect learning and research processes?

Young scholars and students operate in an environment of "pre-organised knowledge" (KNOBLAUCH, H. 1995, p. 15). Most of them are influenced by what the prominent members of their department or university view to be established knowledge; promising topics, methods, and experiments; and acceptable theories. These up-and-coming academics are inspired or impeded by organisational structures and institutional rules. Their scientific goals and spaces of interaction are influenced by evaluators, role models, critical audiences, institutional regulations, informal expectations of their social environment, and a multitude of other factors. Few students or prospective scientists are able to ignore the expectations and conventions communicated in their social environment.

Institutions, places, locales, and environments are ascribed an indispensable role in the generation of career paths. Just as certain time periods offer different windows of opportunities and risks, certain locales and spatial contexts (DIEKMANN, A. 2014; FRIEDRICH, J. and NONNENMACHER, A. 2014) offer different learning opportunities, role models, value systems, challenges, social networks, and opportunities for professional careers. The institutional, cultural, and social context in which a young person studies or in which a young scientist does research and teaches can be elemental in determining the research topics they will find of interest; the methodological skills they will acquire; the scientific networks they are able to join; the kind of critique and support they will encounter; and the interesting, unsolved problems they will notice. Support from key figures in their discipline will affect the initiative, resilience, and subsequent perception that these young academics have of their roles as lecturers and researchers. Daily interaction with positive (or negative) role models and personal relationships has lost none of their significance in the age of the Internet. On the contrary, the overwhelming flood of information has only increased the importance of

face-to-face contacts with leading thinkers from the relevant disciplines. As a space for experience, perception, or experimentation, the site and surroundings of a university can also give scientific stimulation crucial to research programs, especially in disciplines where field research, spatial data, or expensive experiments are vital.

Knowledge environments can influence the reading or interpretation of scientific knowledge as well. The interpretation and application of new knowledge depend chiefly on the prior knowledge, interests, and prejudices of its potential recipients. A textbook example often cited in *Science Studies* (LIVINGSTONE, D.N. 2003) concerns the reception of Darwin's main work, *On the Origin of Species* (1859). It was interpreted differently in Russia than in Canada, and differently in Belfast than in Edinburgh. In Charleston it was seen as an argument for racism; in Auckland, as one against it. Immediately after the book was published, the Heidelberg paleontologist Heinrich Georg Bronn (1800–1862), who was also the rector of Heidelberg University at the time, translated it into German, a version that appeared in 1860. Bronn enjoyed a good personal relationship with Darwin. Their bond, though, did not keep Bronn from reading Darwin's work very selectively and incorporating elements of his own perspectives into the translation (MEUSBURGER, P. 2012a, p. 16).

The places where scholars have been academically socialised are very important for their later career. However, scientific careers are not a random sequence of events but rather "contingent series of events" (WELSKOPP, T. 2002, p. 79) that follow a definite logic and rest on particular mechanisms. In individual cases certain events are therefore linked with each other, and a rationale can be found for the steps in a scholar's career. Prominent scholars indisputably play a major part in shaping the development and careers of talented students. The identity of scholars is defined not only by what they do but also by *where* they do it. People trust the academic reputation of excellent universities

or departments even if unfamiliar with any of the scholars working there. Place names such as Berkeley, Cambridge, or Heidelberg serve as a kind of shorthand for complex circumstances surrounding the practice and standards of science.

What makes a location attractive is its possible or imagined advantages, not the realised ones. Because nobody is able to unravel the complexity of interaction, learning processes, and institutional decision-making, the appraisal of a scientist's potential is closely tied to the places at which that person earned his or her doctorate, did postdoctoral work, or received a professorship. A scholar who was trained at a distinguished research department has credibility from the outset because the scientific reputation of a place or institution is reflected back onto the scholars working there. The history of science is replete with evidence of how a head start translates into a crucial advantage in a scholar's later career and creates important path dependencies.

Each university has its own academic history, body of myths, and major narratives that contribute to a collective identity and reputation. The symbolic meaning, reputation, and attractiveness of a university lie not only in its present merits and achievements but also in those gained previously by scholars no longer belonging to the context. A place is like a screen on which possibilities, expectations, benefits, and hopes are projected. These collective memories and narratives can be reinforced by an iconography of the space and by place-making. Plaques on buildings and memorials constantly remind the informed passer-by of past achievements by famous scientists or of important events in the history of science, imbuing particular places with a symbolic significance as well. An awareness of the city's iconography and recurring contact with places important in the history of science can instill in scholars and students an emotional bond and personal identification with their university. It can inspire them with scholarly role models and can create spaces of identity.

How can the impact of a knowledge environment be measured?

The study of knowledge environments is a multilevel process at various scales of aggregation, all of which are interconnected. First, the quality of a knowledge environment of academic institutions can be studied for the scientific accomplishments, professional success, or academic reputation attained by their scholars or graduates in a given period. There are numerous questions to pursue in this regard. For instance, what pioneering publications have originated in a particular institute? What new ideas, methods, and theoretical concepts have come from a given institute? How many of an institute's graduates have been appointed to professorships or prominent positions outside academia? How many of a university's scholars have received outstanding scientific awards (e.g., Nobel Prize, Fields Medal,⁶ or honorary doctorates)? How often have its members been engaged as reviewers by international journals and major institutions of research funding or in important evaluation procedures?

This first approach allows inferences about the quality of the knowledge environment without opening the black box of causes and relations and without discussing the personal experiences of the given scholars. This method communicates the external perspective and is useful especially at the highest level of aggregation or with large-scale comparative studies that cannot delve into the biographies of a large number of individual scholars. *Figure 1* shows, for example, that former doctoral candidates and assistants of Heidelberg chemist Robert W. Bunsen came to occupy numerous chairs and other prominent positions in the chemistry departments throughout Europe (ECKART, W.U. *et al.* 2012, p. 98). In addition, a number of prominent U.S. chemists had studied under Bunsen (HONECK, M. and MEUSBURGER, P. 2012).

If so many successful scientists hail from one department, one may legitimately con-

clude that a very stimulating and unusually creative knowledge environment had existed there during a certain period. Such recruitment of scientists to other universities not only promotes knowledge transfer and creates important networks but generally intensifies the sway that the home institutes have over their discipline. *Figure 1* also suggests what an international power center Heidelberg must have been in the field of chemistry during the second half of the 19th century. Such internationally important nodes of scientific networks often dominate the review process in recruitment procedures and have a strong impact on scientific journals.

The second approach for studying knowledge environments centers on the social relations, interactions, and networks of the scholars working at a given place and on the processes of *appropriation* as meant by GRAUMANN and KRUSE (GRAUMANN, C.F. 1996, 2002a,b,c; GRAUMANN, C.F. and KRUSE, L. 2003). A local cluster of illustrious and globally networked scientists does not automatically equate with knowledge exchange, scientific cooperation, mutual inspiration across disciplines, or a creative environment. Although proximity can facilitate unplanned, spontaneous, face-to-face contact, it does not guarantee interaction. What counts is whether and to what extent the scientists at a university interact and engage in cross-disciplinary discussion (CHRISTMANN, G.B. 2013; KELLER, R. *et al.* 2013; KNOBLAUCH, H. 2013; LEPSIUS, M.R. 2012; TREIBER, H. and SAUERLAND, K. 1995), how they manage their social relations in that environment, and whether the area's creative potential is activated. A knowledge milieu does not emerge until the actors communicate and interact with each other; come to grips with the structural conditions, institutional regulations, and organisational cultures in which they find themselves; and prove themselves willing and able to activate the locally available potential and change organisational structures and conventions. The key words are not *cluster* or *proximity* but *communicative interaction* and *ways to transcend the silo mentality*. It is the potential to communicate with

⁶ International Medal for Outstanding Discoveries in Mathematics.

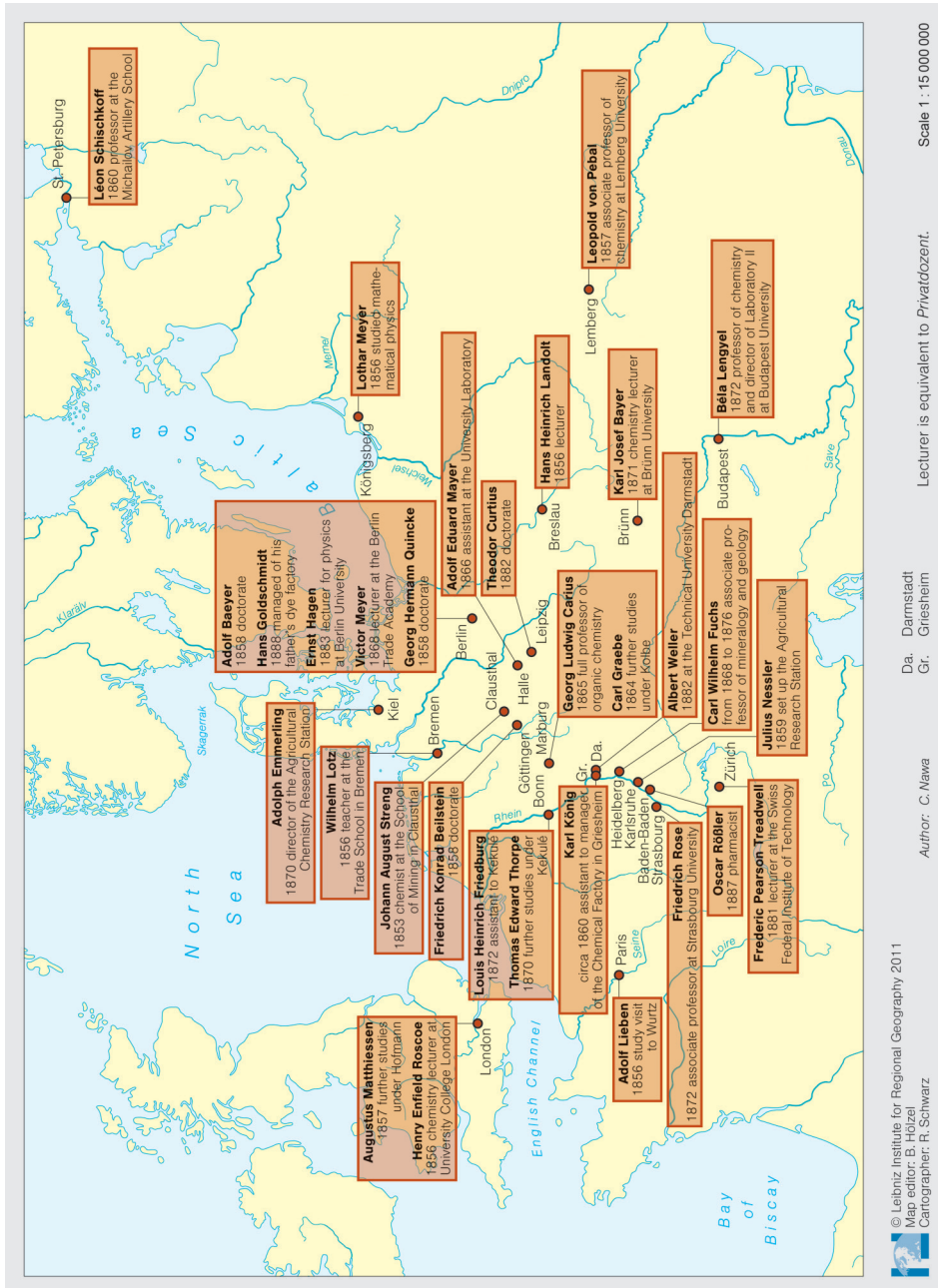


Fig. 1. Chairs and other prominent research positions of former doctoral candidates and assistants of Heidelberg chemist Robert Bunsen (1811–1899). Source: ECKART, W.U. et al. 2012, p. 98.

other highly creative persons that attracts artists and scientists from elsewhere.

Processes of appropriation are often taken for granted and underrated, but there are many local opportunities, resources, stimuli, support, services, and challenges that academics may fail to use to their own advantage. Research equipment whose potential is not exploited, books that remain unread, and contacts that are never activated cannot have any effect on learning and research. Without the processes of appropriation, knowledge transfer is impossible in many cases.

The main theories and methodologies of this second approach to the study of knowledge environments are interaction analysis, the micro-scale of institutional theory⁷ and network analysis. “The dimension of interaction analysis is about clarifying the conditions under which effective problem-solving is achieved or not in the institutionally structured interaction of actors at the meso- and macrolevels” (SCHARPF, F.W. 2002, p. 213). This second approach turns attention to several questions: How do scholars interact with each other? How much are the life worlds of various disciplines at a university or in a knowledge city communicatively interlinked? Which persons or departments are the ones bridging between disciplines or serving as the key nodes in networks? How do people engage with the basic local conditions and power structures under which they try to reach their objectives? How have institutions or individual actors affected these very conditions?

The third way to analyze knowledge environments revolves around the professional career of individual scholars, taking into account what they have subjectively experienced, how they have personally evaluated

their knowledge environment. According to WELSKOPP “All structural interrelations must . . . be tracked through the consciousness of the participants as it were, although multiple discerning rounds of translation and decoding will be necessary” (WELSKOPP, T. 2002, p. 76).

This approach involves the attempt to reconstruct the influences and watersheds that shaped the academic aspirations, research interests, methodological expertise, and career trajectory in various phases of the particular scholar’s career. Most academics are able to recall with relative accuracy who they were decisively influenced and inspired by as students; what personal strengths and weaknesses their professors had; what intellectual standard the doctoral seminars had; the times, places, and people of the critical junctures in their professional success or failure; the time and circumstances relating to their development of a new scientific idea; the way in which their immediate social environment and their academic discipline responded to new ideas; and the reasons that particular research projects could not be pursued. The research taking this approach is based on interviews, memoirs, and correspondence; on the scholar’s own account of his or her professional career; on biographies and autobiographies; on minutes of meetings; and on reports by persons from the social context. This third approach has a long tradition in the history of science but has been only rarely used to describe knowledge environments.

Most scholars will agree that it is much easier to count organizational structures, financial resources, career steps, networks, scientific awards, scientific accomplishments, patents, impact factors, or the success of a professor’s students than it is to measure meaning systems, academic aspirations or the exchange of ideas.

Theoretical concepts contributing to the understanding of knowledge environments

Anyone interested in the influence of knowledge environments on the learning process-

⁷ Issues of power and dominance are widely excluded in the macro-perspectives of institutional theory (see HUDSON, B.A. *et al.* 2015; WILLMOTT, H. 2015). “In most institutional theory, examination of the relatedness of knowledge and power is deemed to be largely irrelevant; the self-understanding of institutional theory as politically neutral is self-evident; and the silence of institutional theory on contentious issues, such as the institutionalization of domination, oppression, and exploitation in modern work organizations, passes unnoticed” (WILLMOTT, H. 2015, p. 106).

es, academic socialization, and the careers of scholars seeks theoretical approaches that can bring out the patterns of interaction and communication between actors, institutions and their environment, and the underlying general mechanisms. These approaches must be able to deal with the tension between a knowledge milieu's conditionality, which is in principle historical and local, and "efforts to formulate generalizing concepts and generic explanations" (ESSER, H. 2002, p. 128).

The study of knowledge environments is a multilevel enterprise comprising a broad range of methods and theoretical concepts. It has already been mentioned that creativity research, organization theory, and institutional theory can explain the relations between structure and agency to a certain degree (LAWRENCE, T. *et al.* 2011; MINTZBERG, H. 1979; SUDDABY, R. 2010; SUDDABY, R. *et al.* 2010; ZILBER, T.B. 2002). Institutional theory provides "new understandings of the manner in which institutions are created, transformed, and extinguished and the way in which institutional processes interact to affect institutional change" (DACIN, M.T. *et al.* 2002, p. 45).

"The concept of institutional work insists on the need to consider the permanent recursive and dialectical interaction between agency and institutions. This invites researchers to not only account for the institutional embeddedness of actors but also for their capacity to reflect on this embeddedness, relate to their own self, and develop conscious intentionality. Agency is neither just an effect of the actors' institutional embeddedness nor isolated from this embeddedness. It is an ongoing activity whereby actors reflect on and strategically operate within the institutional context where they are embedded" (LAWRENCE, T. *et al.* 2011, p. 55).

In addition to frequently applied concepts focusing on individual actors (e.g., biographical studies), institutions, and organisations, there is a need for concepts focusing on social macrophenomena and holistic explanations (e.g. gestalt psychology, environmental phenomenology). Some scholars hold that one cannot describe place experience, knowledge environments, or life worlds by precisely dis-

secting them into constituent parts and then quantitatively "measuring" and modeling the significance of the discrete variables.

Due to the complexity and historicity of the subject, students of knowledge environments are less concerned with the discovery of causalities in the sense of universal laws than with the causal reconstruction of the network of interactions (see MAYNTZ, R. 2002, p. 22). According to MAYNTZ, what is sought in the empirical analysis of social macrophenomena is "not abstraction and maximal simplification but rather specification and adequate complexity of the explanation" (MAYNTZ, R. 2002, p. 13). "Causal reconstruction is not about seeking statistical relations between variables but rather about explaining the macro-phenomenon by identifying the processes and interdependencies involved in its having arisen" (MAYNTZ, R. 2002, p. 13). Systemic interdependences are about mutual dependence and influence in the relations between different simultaneous processes or between different institutions. The discrete processes or institutions are parametrically linked with each other as it were; that is, they can reciprocally change important basic conditions for each other (MAYNTZ, R. 2002, p. 33).

In gestalt psychology perception and other mental processes are regarded as holistic rather than atomistic in nature. That is, complex perceptual and cognitive patterns are grasped in their entirety as integral wholes (gestalts), rather than pieced together from simpler sensations or "atoms of experience." A musical melody, for example, is not simply a summation of the individual notes that it contains. The melody is given in experience as a whole, and the character of each individual note is determined by its place within that whole (SCHROEDER, H.W. 2007, p. 295).

"The starting point for FULLER's phenomenological account of gestalt psychology is the life world of human experience (FULLER, A.R. 1990). "Life world" (*Lebenswelt*) is a term coined by HUSSERL to denote the original, meaningful, everyday world in which people actually live. The task of phenomenological description and interpretation is to explicate hidden

structures of life world meaning that hitherto have been lived only in an implicit, unreflective way" (SCHROEDER, H.W. 2007, p. 299; see also HUSSERL, E. 1986).

SEAMON characterises environmental phenomenology as striving for a holistic view of place, in which the various parts of environmental experience are understood as reciprocally related to each other and to the larger geographical whole to which they belong (SEAMON, D. 1987). He describes the phenomenological essence of place as "a psycho-social environmental whole larger than the sum of its parts" (p. 20; see also KEEN, E. 1975; McCALL, R.J. 1983; SCHROEDER, H.W. 2007; SEAMON, D. 1982).

Communicative constructivism is an approach to explaining how reality (*Wirklichkeit*) accrues through elaborate processes of transmitting, exchanging, and negotiating thoughts, information, ideas, and messages. Communication is not reduced to language but rather understood as a human practice by which identity, relationship, society, and reality are ascertained, evaluated, and categorized (BERGER, P.L. and LUCKMANN, T. 1967; CHRISTMANN, G.B. 2013; KELLER, R. *et al.* 2013; KNOBLAUCH, H. 2013).

Conclusion

Research on knowledge environments will neither replace traditional science studies nor studies about the biographies and careers of individual scholars or studies about academic networks. But studying venues, environments, or social spaces of academic knowledge generation opens up new horizons for explaining interrelations and path dependencies of academic careers and academic achievements.

As with historical theories, knowledge environments can be credited with "a retrospective forecasting ability" (WELSKOPP, T. 2002, p. 83; see also THELEN, K. 2002). In other words, it is possible to formulate a post hoc explanation of how relational networks between human and institutional agents have

affected observable scientific practice (see WELSKOPP, T. 2002, 76–77). The reconstruction and description of knowledge environments after the fact, however, is tied to "epistemological and discursive conditions of the present" (WELSKOPP, T. 2002, p. 78) and can therefore be revised the moment new information surfaces or scientific standards and criteria of judgment change.

REFERENCES

- ACKERS, L. 2005. Moving people and knowledge: Scientific mobility in the European Union. *International Migration* 43. 99–131.
- AMABILE, T.M. 1983a. *The social psychology of creativity*. New York, Springer, 245 p. DOI: 10.1007/978-1-4612-5533-8
- AMABILE, T.M. 1983b. The social psychology of creativity: A componential conceptualisation. *Journal of Personality and Social Psychology* 45. 357–376.
- AMABILE, T.M. and GRYSKIEWICZ, N. 1989. The creative environment scales: The work environment inventory. *Creative Research Journal* 2. 231–254.
- AMABILE, T.M., CONTI, R., COON, H., LAZENBY, J. and HERRON, M. 1996. Assessing the work environment for creativity. *The Academy of Management Journal* 39. 1154–1184.
- AMABILE, T.M., GOLDFARB, P. and BRACKFIELD, S. 1990. Social influences on creativity: Evaluation, co-action, and surveillance. *Creativity Research Journal* 3. 6–21.
- BAAR-CANTONI, R. and WOLGAST, E. 2012. Migration of professors between 1550 and 1700. In *Wissenschaftsatlas of Heidelberg University. Spatio-temporal relations of academic knowledge production*. Eds.: MEUSBURGER, P. and SCHUCH, T. Knittlingen, Bibliotheca Palatina, 66–69.
- BARKER, R.G. 1968. *Ecological psychology. Concepts and methods for studying the environment of human behavior*. Stanford, CA, Stanford University Press, 242 p.
- BATTILANA, J. 2006. Agency and institutions: The enabling role of social position. *Organization* 13. 653–676.
- BERGER, P.L. and LUCKMANN, T. 1967. *The social construction of reality: a treatise in the sociology of knowledge*. New York, Doubleday, 249 p.
- BITEKTINE, A. and MILLER, D. 2015. Methods, theories, data, and the social dynamics of organizational research. *Journal of Management Inquiry* 24. 115–130. DOI: 10.1177/1056492614546897
- BODEN, M. 1994. What is creativity? In *Dimensions of Creativity*. Ed.: BODEN, M. Cambridge, MA, MIT Press, 75–117.
- BODEN, M. 2004. In a nutshell. In *The Creative Mind*. Ed.: BODEN, M. London–New York, Routledge, 1–24.

- BUKAU, B. and TOLLE, R. 2012. The Center for Molecular Biology (ZMBH). In *Wissenschaftsatlas of Heidelberg University. Spatio-temporal relations of academic knowledge production*. Eds.: MEUSBURGER, P. and SCHUCH, T. Knittlingen, Bibliotheca Palatina, 225–227.
- CHARLE, C. 2004. The intellectual networks of two leading universities: Paris and Berlin, 1890–1930. In *Transnational intellectual networks*. Eds.: CHARLE, C., SCHRIEWER, J. and WAGNER, P. Frankfurt–New York, Campus, 401–450.
- CHRISTMANN, G.B. 2013. Das theoretische Konzept der kommunikativen Raum(re)konstruktion. Eine Synthese. In *Zur kommunikativen Konstruktion von Räumen. Theoretische Konzepte und empirische Analysen*. Ed.: CHRISTMANN, G.B. Wiesbaden, Springer VS, 89–108.
- CLEGG, S. 2010. The state, power, and agency: Missing in action in institutional theory? *Journal of Management Inquiry* 19. 4–13. DOI: 10.1177/1056492609347562
- CSIKSZENTMIHALYI, M. 1988. Society, culture, and person: A systems view of creativity. In *The nature of creativity*. Ed.: STERNBERG, R.J. Cambridge, MA, Cambridge University Press, 325–339.
- CSIKSZENTMIHALYI, M. 1990. The domain of creativity. In *Theories of creativity*. Eds.: RUNCO, M.A. and ALBERT, R.S. Newbury Park, CA, Sage, 190–212.
- CSIKSZENTMIHALYI, M. 1999. Implications of a systems perspective for the study of creativity. In *Handbook of creativity*. Ed.: STERNBERG, R.J. New York, Cambridge University Press, 313–335.
- DACIN, M.T., GOODSTEIN, J. and SCOTT, W.R. 2002. Institutional theory and institutional change: Introduction to the special research forum. *Academy of Management Journal* 45. 45–57.
- DIEKMANN, A. 2014. Die Anderen als sozialer Kontext. Zur Bedeutung strategischer Interaktion. *Kölner Zeitschrift für Soziologie und Sozialpsychologie* (Suppl.) 66. 47–66. DOI 10.1007/s11577-014-0258-5
- ECKART, W.U., HÜBNER, K. and NAWA, C. 2012. The rise of the natural sciences – Bunsen, Kirchhoff and Helmholtz. In *Wissenschaftsatlas of Heidelberg University. Spatio-temporal relations of academic knowledge production*. Eds.: MEUSBURGER, P. and SCHUCH, T. Knittlingen, Bibliotheca Palatina, 96–99.
- ESSER, H. 2002. Was könnte man (heute) unter einer "Theorie mittlerer Reichweite" verstehen? In *Akteure – Mechanismen – Modelle. Zur Theoriefähigkeit makrosozialer Analysen*. Schriften des Max-Planck-Instituts für Gesellschaftsforschung Köln, Band 42. Ed.: MAYNTZ, R. Frankfurt–New York, Campus, 128–150.
- FRIEDRICH, J. and NONNENMACHER, A. 2014. Die Analyse sozialer Kontexte. *Kölner Zeitschrift für Soziologie und Sozialpsychologie* (Suppl.) 66. 1–16. DOI: 10.1007/s11577-014-0260-y
- FULLER, A.R. 1990. Insight into value: *An exploration of the premises of a phenomenological psychology*. Albany, NY. State University of New York Press, 236 p.
- GIERYN, T.F. 2001. Sociology of science. In *International Encyclopedia of the Social & Behavioral Sciences*. Vol. 20. Eds.: SMELSER, N.J. and BALTES, P.B. Amsterdam, Elsevier, 13692–13698.
- GIERYN, T.F. 2002. Three truth-spots. *Journal of the History of Behavioral Sciences* 38. 113–132. DOI: 10.1002/jhbs.10036
- GLÜCKLER, J. 2013. Knowledge, networks and space: Connectivity and the problem of non-interactive learning. *Regional Studies* 47. 880–894.
- GRAUMANN, C.F. 1996. Aneignung. In *Ökologische Psychologie. Ein Handbuch in Schlüsselbegriffen*. Eds.: KRUSE, L., GRAUMANN, C.F. and LANTERMANN, E. WEINHEIM, Psychologie Verlags Union, 124–130.
- GRAUMANN, C.F. 2002a. Zwischen den Disziplinen. Dilemma und Chancen der Umweltpsychologie. *Umweltpsychologie* 6. 154–161.
- GRAUMANN, C.F. 2002b. The phenomenological approach to people–environment studies. In *Handbook of Environmental Psychology*. Eds.: BECHTEL, R.B. and CHURCHMAN, A. New York, Wiley, 95–113.
- GRAUMANN, C.F. 2002c. Auf dem Wege zu einer humanökologischen Psychologie. Zu Florian Kaisers Replik. *Umweltpsychologie* 6. (2): 82–83.
- GRAUMANN, C.F. and KRUSE, L. 2003. Räumliche Umwelt. Die Perspektive der humanökologisch orientierten Umweltpsychologie. In *Humanökologie: Ansätze zur Überwindung der Natur-Kultur-Dichotomie*. Erdkundliches Wissen, Vol. 135. Eds.: MEUSBURGER, P. and SCHWAN, T. Stuttgart, Steiner, 239–256.
- HARVEY, D. 2005. Space as a key word. *Hettner Lectures* 8. Stuttgart, Steiner, 93–115.
- HARVEY, W. 2010. British and Indian scientists moving to the United States. *Work and Occupations* 38. 68–100.
- HEFFERNAN, M. and JÖNS, H. 2013. Research travel and disciplinary identities in the University of Cambridge, 1885–1955. *The British Journal for the History of Science* 46. 255–286.
- HENNESSEY, B.A. and AMABILE, T.M. 1988. The conditions of creativity. In *The nature of creativity*. Ed.: STERNBERG, R.J. Cambridge, England, Cambridge University Press, 11–38.
- HONECK, M. and MEUSBURGER, P. 2012. American Students up to 1914. In *Wissenschaftsatlas of Heidelberg University. Spatio-temporal relations of academic knowledge production*. Eds.: MEUSBURGER, P. and SCHUCH, T. Knittlingen, Bibliotheca Palatina, 296–299.
- HÜBNER, K. 2010. *Gustav Robert Kirchhoff. Das gewöhnliche Leben eines außergewöhnlichen Mannes*. Schriften, Archiv und Museum der Universität Heidelberg 16. Heidelberg, Verlag Regionalkultur, Ubstadt-Weiher, 311 p.
- HUDSON, B.A., OKHUYSEN, G.A. and CREED, W.E.D. 2015. Power and institutions: Stones in the road and some yellow bricks. *Journal of Management Inquiry* 24. 233–238. DOI: 10.1177/1056492614565240

- HUSSERL, E. 1986. *Phänomenologie der Lebenswelt*. Stuttgart, Reclam, 303 p.
- JÖNS, H. 2007. Transnational mobility and the spaces of knowledge production: A comparison of global patterns, motivations and collaborations in different academic fields. *Social Geography* 2. 97–114.
- JÖNS, H. 2008. Academic travel from Cambridge University and the formation of centres of knowledge, 1885–1954. *Journal of Historical Geography* 34. 338–362.
- JÖNS, H. 2009. Brain circulation' and transnational knowledge networks: Studying long-term effects of academic mobility to Germany, 1954–2000. *Global Networks* 9. 315–338.
- JÖNS, H. 2014. Talent mobility and the shifting geographies of Latourian knowledge hubs. *Population, Space and Place*. Published online in Wiley Online Library (wileyonlinelibrary.com) DOI: 10.1002/psp.1878
- KEEN, E. 1975. *A primer in phenomenological psychology*. New York, Holt, Rinehart and Winston, 184 p.
- KELLER, R., KNOBLAUCH, H. and REICHERTZ, J. 2013. Der Kommunikative Konstruktivismus als Weiterführung des Sozialkonstruktivismus – eine Einführung. In *Kommunikativer Konstruktivismus. Theoretische und empirische Arbeiten zu einem neuen wissenssoziologischen Ansatz*. Eds.: KELLER, R., KNOBLAUCH, H. and REICHERTZ, J. Wiesbaden, Springer VS, 9–21.
- KNOBLAUCH, H. 1995. *Kommunikationskultur. Die kommunikative Konstruktion kultureller Kontexte*. Berlin, de Gruyter, 338 p..
- KNOBLAUCH, H. 2013. Über die kommunikative Konstruktion der Wirklichkeit. In *Zur kommunikativen Konstruktion von Räumen. Theoretische Konzepte und empirische Analysen*. Ed.: CHRISTMANN, G.B. Wiesbaden, Springer VS, 29–53.
- KÜHLMANN, W., HARTMANN, V. and EL KHOLI, S. 2012. The golden age of late Humanism (ca. 1560 to 1622). In *Wissenschaftsatlas of Heidelberg University. Spatio-temporal relations of academic knowledge production*. Eds.: MEUSBURGER, P. and SCHUCH, T. Knittlingen, Bibliotheca Palatina, 60–61.
- LAWRENCE, T., SUDDABY, R., and LECA, B. 2011. Institutional work: Refocusing institutional studies of organization. *Journal of Management Inquiry* 20. 52–58. DOI: 10.1177/1056492610387222
- LEPSIUS, M.R. 2012. Intellectual circles at the beginning of the 20th century. In *Wissenschaftsatlas of Heidelberg University. Spatio-temporal relations of academic knowledge production*. Eds.: MEUSBURGER, P. and SCHUCH, T. Knittlingen, Bibliotheca Palatina, 112–113.
- LIVINGSTONE, D.N. 1995. The spaces of knowledge: Contributions towards a historical geography of science. *Environment and Planning D: Society and Space* 13. 5–34.
- LIVINGSTONE, D.N. 2000. Making space for science. *Erkundung* 54. 285–296.
- LIVINGSTONE, D.N. 2002. *Knowledge, space and the geographies of science*. Hettner Lectures 5. Heidelberg, Department of Geography, Heidelberg University, 7–40.
- LIVINGSTONE, D.N. 2003. *Putting science in its place. geographies of scientific knowledge*. Chicago, University of Chicago Press, 234 p.
- MAGER, C. 2012. Heidelberg Nobel Prize winners. In *Wissenschaftsatlas of Heidelberg University. Spatio-temporal relations of academic knowledge production*. Eds.: MEUSBURGER, P. and SCHUCH, T. Knittlingen, Bibliotheca Palatina, 250–253.
- MALECKI, E.J. 2013. Creativity: who, how, where? In *Knowledge and the economy*. Knowledge and Space, Vol. 5. Eds.: MEUSBURGER, P., GLÜCKLER, J. and EL MESKIOU, M. Dordrecht, Springer, 79–93.
- MASSEY, D. 1999. *Philosophy and politics of spatiality: Some considerations*. Hettner Lectures 2. Heidelberg, Heidelberg University, Department of Geography, 27–42.
- MASSEY, D. 2005. *For space*. London, Sage, 222 p..
- MATTHIESEN, U. 2009. Knowledge Scapes: A new conceptual approach and selected empirical findings from recent research on knowledge milieus and knowledge networks. *disP – The Planning Review* 177. (2): 10–28.
- MAYNTZ, R. 2002. Zur Theoriefähigkeit makro-sozialer Analysen. In *Akteure – Mechanismen – Modelle. Zur Theoriefähigkeit makro-sozialer Analysen*. Schriften des Max-Planck-Instituts für Gesellschaftsforschung Köln, Band 42. Ed.: MAYNTZ, R. Frankfurt–New York, Campus, 7–43.
- MCCALL, R.J. 1983. *Phenomenological psychology: An introduction*. Madison, WI, The University of Wisconsin Press, 140 p.
- MEUSBURGER, P. 2008. The nexus between knowledge and space. In *Clashes of knowledge. Orthodoxies and heterodoxies in science and religion*. Knowledge and Space, Vol. 1. Eds.: MEUSBURGER, P., WELKER, M. and WUNDER, E. Dordrecht, Springer, 35–90.
- MEUSBURGER, P. 2009a. Milieus of creativity. The role of places, environments, and spatial contexts. In *Milieus of Creativity. An Interdisciplinary Approach to Spatiality of Creativity*. Knowledge and Space, Vol. 2. Eds.: MEUSBURGER, P., FUNKE, J. and WUNDER, E. Dordrecht, Springer, 97–153.
- MEUSBURGER, P. 2009b. Spatial mobility of knowledge: A proposal for a more realistic communication model. *disP - The Planning Review* 177. (2): 29–39.
- MEUSBURGER, P. 2012a. Wissenschaftsatlas of Heidelberg University – An Introduction. In *Wissenschaftsatlas of Heidelberg University. Spatio-temporal relations of academic knowledge production*. Eds.: MEUSBURGER, P. and SCHUCH, T. Knittlingen, Bibliotheca Palatina, 12–17.
- MEUSBURGER, P. 2012b. Heidelberg: Relations between a town and its university. In *Wissenschaftsatlas of Heidelberg University. Spatio-temporal relations of aca-*

- ademic knowledge production. Eds.: MEUSBURGER, P. and SCHUCH, T. Knittlingen, Bibliotheca Palatina, 18–35.
- MEUSBURGER, P. and SCHUCH, T. 2010a. Karrieren, soziale Herkunft und räumliche Mobilität der Heidelberger Professoren 1803–1932. In *Akademische Lebenswelten. Habitus und Sozialprofil von Gelehrten im 19. und 20. Jahrhundert*. Eds.: DEMM, E. and SUCHOPLES, J. Frankfurt am Main, Peter Lang Verlag, 217–249.
- MEUSBURGER, P. and SCHUCH, T. 2010b. From mediocrity and existential crisis to scientific excellence: Heidelberg University between 1803 and 1932. In *Geographies of science. Knowledge and Space 3*. Eds.: MEUSBURGER, P., LIVINGSTONE, D.N. and JÖNS, H. Dordrecht, Springer, 57–93.
- MEUSBURGER, P. and SCHUCH, T. 2012a. Regional provenance and social background of professors 1803 to 1932. In *Wissenschaftsatlas of Heidelberg University. Spatio-temporal relations of academic knowledge production*. Eds.: MEUSBURGER, P. and SCHUCH, T. Knittlingen, Bibliotheca Palatina, 78–81.
- MEUSBURGER, P. and SCHUCH, T. 2012b. Whence they came: Heidelberg University's professors 1945 to 2010. In *Wissenschaftsatlas of Heidelberg University. Spatio-temporal relations of academic knowledge production*. Eds.: MEUSBURGER, P. and SCHUCH, T. Knittlingen, Bibliotheca Palatina, 262–265.
- MEUSBURGER, P., FUNKE, J. and WUNDER, E. 2009. Introduction: The spatiality of creativity. In: *Milieus of Creativity. An Interdisciplinary Approach to Spatiality of Creativity*. Knowledge and Space, Vol. 2. Eds.: MEUSBURGER, P., FUNKE, J. and WUNDER, E. Dordrecht, Springer, 1–10.
- MINTZBERG, H. 1979. *The structuring of organizations: A synthesis of the research*. Englewood Cliffs, NJ, Prentice Hall, 512 p.
- MUMFORD, M.D. 1995. Situational influences on creative achievement: Attributions or interactions? *Creativity Research Journal* 8. 405–412.
- OPHIR, A. and SHAPIN, S. 1991. The place of knowledge: The spatial setting and its relations to the production of knowledge (Special issue). *Science in Context* 4. 3–21.
- PFETSCH, F.R. 1974. *Zur Entwicklung der Wissenschaftspolitik in Deutschland, 1750–1914*. Berlin, Duncker and Humblot, 359 p.
- RADITSCH, L. 2012. European Molecular Biology Laboratory (EMBL). In *Wissenschaftsatlas of Heidelberg University. Spatio-temporal relations of academic knowledge production*. Eds.: MEUSBURGER, P. and SCHUCH, T. Knittlingen, Bibliotheca Palatina, 288–289.
- RAUDSEPP, E. 1958. The industrial climate for creativity: An opinion study of 105 experts. *Management Review* 47. 4–8, 70–75.
- ROWLES, G.D. 2008. Place in occupational science: A life course perspective on the role of environmental context in the quest for meaning. *Journal of Occupational Science* 15. 127–135.
- RUNCO, M.A. 1988. Creativity research: Originality, utility, and integration. *Creativity Research Journal* 1. 1–7.
- RUNCO, M.A. and OKUDA, S.M. 1988. Problem discovery, divergent thinking, and the creative process. *Journal of Youth and Adolescence* 17. 213–222.
- SCHARPE, F.W. 2002. Kontingente Generalisierung in der Politikforschung. In *Akteure – Mechanismen – Modelle. Zur Theoriefähigkeit makro-sozialer Analysen*. Schriften des Max-Planck-Instituts für Gesellschaftsforschung Köln, Band 42. Ed.: MAYNTZ, R. Frankfurt–New York, Campus, 213–235.
- SCHROEDER, H.W. 2007. Place experience, gestalt, and the human–nature relationship. *Journal of Environmental Psychology* 27. 293–309.
- SEAMON, D. 1982. The phenomenological contribution to environmental psychology. *Journal of Environmental Psychology* 2. 119–140.
- SEAMON, D. 1987. Phenomenology and environment–behavior research. In *Advances in environment, and behavior design*, Vol. 1. Eds.: ZUBE, E.H. and MOORE, G.T. New York, Plenum Press, 3–27.
- SELTMANN, S. 2012. The German Cancer Research Center (DKFZ). In *Wissenschaftsatlas of Heidelberg University. Spatio-temporal relations of academic knowledge production*. Eds.: MEUSBURGER, P. and SCHUCH, T. Knittlingen, Bibliotheca Palatina, 284–285.
- SHAPIN, S. 1998. Placing the view from nowhere: Historical and sociological problems in the location of science. *Transactions of the Institute of British Geographers* 23. 5–12.
- SHAPIN, S. 2001. Truth and credibility: Science and the social study of science. In *International encyclopedia of the social and behavioral sciences*. Vol. 23. Eds.: SMELSER, N.J. and BALTES, P.B. Amsterdam, Elsevier, 15926–15932.
- SIMONTON, D.K. 1975. Sociocultural context of individual creativity: A transhistorical time-series analysis. *Journal of Personality and Social Psychology* 32. 1119–1133.
- STERNBERG, R.E. and LUBART, T.I. 1991. An investment theory of creativity and its development. *Human Development* 34. 1–32.
- STERNBERG, R.E. and LUBART, T.I. 1999. The concept of creativity: Prospects and paradigms. In *Handbook of creativity*. Ed.: STERNBERG, R.J. New York, Cambridge University Press, 3–15.
- SUDDABY, R. 2010. Challenges for institutional theory. *Journal of Management Inquiry* 19. 14–20. DOI: 10.1177/1056492609347564
- SUDDABY, R. and GREENWOOD, R. 2005. Rhetorical strategies of legitimacies. *Administrative Science Quarterly* 50. 35–67.
- SUDDABY, R., ELSBACH, K.D., GREENWOOD, R., MEYER, J.W. and ZILBER, T.B. 2010. Organizations and their institutional environments. Bringing meaning, values, and culture back in: Introduction to the special research forum. *Academy of Management Journal* 53. 1234–1240.
- THELEN, K. 2002. The explanatory power of historical institutionalism. In *Akteure – Mechanismen*

- Modelle. Zur Theoriefähigkeit makro-sozialer Analysen. Schriften des Max-Planck-Instituts für Gesellschaftsforschung Köln, Band 42. Ed.: MAYNTZ, R. Frankfurt–New York, Campus, 92–107.
- TREIBER, H. and SAUERLAND, K. 1995. *Heidelberg im Schnittpunkt intellektueller Kreise. Zur Topographie der „geistigen Geselligkeit“ eines Weltdorfes*. Opladen, Westdeutscher Verlag, 563 p..
- WELLNITZ, E.M. 2012. Medical faculty Mannheim. In *Wissenschaftsatlas of Heidelberg University. Spatio-temporal relations of academic knowledge production*. Eds.: MEUSBURGER, P. and SCHUCH, T. Knittlingen, Bibliotheca Palatina, 166–169.
- WELSKOPP, T. 2002. Die Theoriefähigkeit der Geschichtswissenschaft. In *Akteure – Mechanismen – Modelle. Zur Theoriefähigkeit makro-sozialer Analysen*. Schriften des Max-Planck-Instituts für Gesellschaftsforschung Köln, Band 42. Ed.: MAYNTZ, R. Frankfurt–New York, Campus, 61–90.
- WILLMOTT, H. 2015. Why institutional theory cannot be critical. *Journal of Management Inquiry* 24. 105–111. DOI: 10.1177/1056492614545306
- WITHERS, C.W.J. 2002. The geography of scientific knowledge. In *Göttingen and the Development of the Natural Sciences*. Ed.: RUPKE, N.A. Göttingen, Wallstein Verlag, 9–18.
- ZILBER, T.B. 2002. Institutionalization as an interplay between actions, meanings, and actors: The case of a rape crisis center in Israel. *Academy of Management Journal* 45. 234–254.

AQUINCUM

Ancient landscape – Ancient town

Edited by
KATALIN H. KÉRDŐ and FERENC SCHWEITZER

Geographical Institute Research Centre for Astronomy and Earth Sciences HAS

Budapest, 2014. 188 p.

Geomorphological–paleoenvironmental studies supporting archeological excavations and investigations are to be considered a new trend within the broader sphere of studies on environment and geomorphology. By publishing the latest achievements of researches of this kind carried out on the territory of Aquincum and in its wider surroundings this book may equally reckon on the interest of professional circles and inquiring audience.

Therefore the publication of such a volume of somewhat unusual character is welcome. The project could be completed as a result of the close cooperation of two important branches of studies, notably geography and archeology. They both have long lasting traditions in our country and on this occasion were represented by two prominent institutions, the Geographical Institute of the Hungarian Academy of Sciences, and the Aquincum Museum of the Budapest History Museum. Their contribution has made possible the publication of this book.

The studies were aimed to clear up the role of those natural factors which exerted a profound influence on the development of the settlement structure during the Roman Period. Romans had a special ability to realize advantages provided by geomorphological characteristics and they had made a good use of natural waters, flood-plain surface features and parent rocks for their creativity.

The volume is also deemed as a pioneering work with regard to the richly illustrated presentation of geological, geographical and other natural features exposed in several places in the course of archeological excavations. A short summary shows the most important objects of the Roman Period related to natural endowments and traces of activities of the time leading to environmental transformation.

Based on geomorphological evidence a new answer is proposed to a previously raised problem whether the Hajógyári Island existed as an islet already in the time of the Romans. Another intriguing issue tackled is the purpose of the system of trenches found in several places along the Danube River.

Price: EUR 20.00

Order: Geographical Institute of RCAES
HAS.H-1112 Budapest, Budaörsi u. 44.
E-mail: magyar.arpad@csfk.mta.hu

AQUINCUM

Ancient landscape – ancient town

Edited by:
Katalin H. Kérdő – Ferenc Schweitzer



Geographical Institute
Research Centre for Astronomy and Earth Sciences
Hungarian Academy of Sciences

Imagined communities and practiced geopolitics

HERMAN VAN DER WUSTEN¹

Abstract

Political geographers have done a lot of work on both ‘nationalism’ and ‘geopolitics’ but they have by no means been the only users of these terms. Based on the massive data-set collected by Google’s book digitization program the paper first draws a quick picture of the spread of these terms in different languages since 1900. It then provides some analysis of the substance of these terms as used in the social science literature and in political geography in particular. In a next section the current Ukrainian conflict formation is introduced as a case to illustrate the usefulness of these concepts. Internal Ukrainian relations are taken into account with respect to nationalist sentiment as well as geopolitical practice as well as the contrary geopolitical visions of the major external actors involved. Some suggestions on the shifting significance of nationalism and geopolitics are finally made as a consequence of changed circumstances resulting from globalization and the concomitant weakening of the national state as the firm foundation of the political order.

Keywords: nationalism, geopolitics, imagined community, Ukraine

Introduction

Political geographers have spent a lot of time with nationalism and geopolitics. In this paper I return to that legacy and confront it with the ongoing conflict in Ukraine. Obviously, the views on this current episode have to be provisional as we deal with a highly volatile situation. I look at nationalism as the manifestation of a shared belief in commonality – past, present and future - among large groups of people, far too large to get to know each other personally. As far as geopolitics is concerned I concentrate on geopolitics as a practice by power holders to engage in policies inspired by spatial configurations that should either be maintained or altered.

Political geographers have by no means been the sole interested parties in nationalism and geopolitics. Historians, political scientists, sociologists and others were also engaged in their study. This applies to both words although geographers played a relatively prominent role in the case of geopolitics. We can see the general use frequencies

of the words ‘nationalism’ and ‘geopolitics’ in the English language literature since 1900 in some graphs derived from Google’s set of 5 million digitized books by way of the N-gram viewer (<https://books.google.com/ngrams>). The curves roughly show the number of times the words have been used per year corrected for the number of books digitized, thus correcting for the continuous increase in the published literature. The curves in fact show scores as moving averages thus suppressing outliers.

There are some variations in their precise shapes in this and subsequent figures depending on spelling (capitals or not) and adjective forms added (yes or no), but the major features remain the same. The curve for ‘geopolitics’ is shown twice to underline the differences between the frequencies in the use of both words (*Figure 1a*) and to provide a more detailed impression of the curve for ‘geopolitics’ (*Figure 1b*).

The literature on nationalism is much larger than that on geopolitics as suggested by the scores for the culminating points: top rat-

¹ Department of Geography, Planning & International Development Studies, University of Amsterdam, 1001 NC Amsterdam, Netherlands PB 15629. E-mail: h.h.vanderwusten@uva.nl

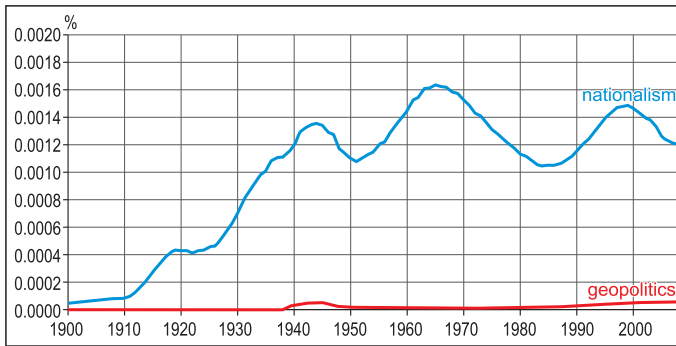


Fig. 1a. N-gram 'nationalism' and 'geopolitics' 1900–2008 (English corpus).
Source: <https://books.google.com/ngrams/info>

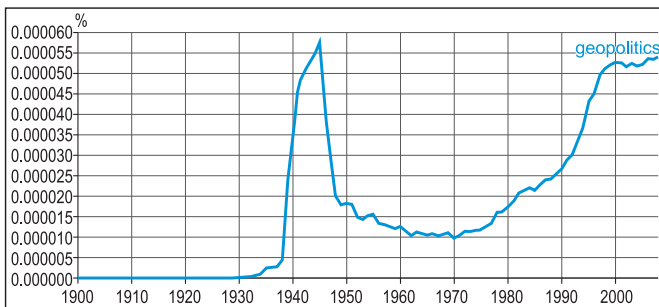


Fig. 1b. N-gram 'geopolitics' 1900–2008 (English corpus).
Source: <https://books.google.com/ngrams/info>

ings are more than 30 times higher for nationalism (it is rather improbable that the word nationalism is used much more frequently in books on nationalism than geopolitics in books on that particular subject). But I am more intrigued by the shape of the curves. Nationalism has three culminating points in 1943, 1965 and 1998. They apparently reflect current affairs more than internal academic developments, notably: nazi inspired expansionist imperialism and World War II in 1943, the massive process of decolonialisation in 1965, and finally the upsurge of ethno-regionalism all across Europe and particularly the demise of the USSR and Yugoslavia in the 1990s. Geopolitics has a sharp culminating point in 1944 and a provisional second high point in 2008, the last year with data. It suggests yet another state of intensified reflection on the presumed contributors or accompani-

ments of nazism that sharply diminishes as the war ends and another upsurge of the use of this word in a completely altered context from the 1970s. The more recent growth is still unfinished but since about 2000 trailing at a high level that is less easy to interpret.

Nationalism

For my recap on nationalism I use two authors: Benedict ANDERSON who in fact introduced the notion of imagined communities as the basis for nationalism and Robert J. KAISER. ANDERSON first appeared as the wave of studies reflecting decolonization had come to an end (ANDERSON, B. 1983). KAISER published his 'Geography of nationalism in Russia and the USSR' three years after the collapse of the Soviet Union (KAISER, R.J.1994). He took the major theoretical contributions of the preceding years by e.g. Karl W. DEUTSCH (1953), Walker CONNOR (1978), Anthony D. SMITH (1986), Miroslav HROCH (1985) and Ernest GELLNER (1983) and also ANDERSON (1983) into account.

Nations, so ANDERSON, are necessarily imagined communities; they are much too large to allow mutual personal acquaintance for all individuals supposedly belonging to the community. The nation is necessarily imaginary but the image may be strong. ANDERSON considers the printing press and territorial government to be the major initial foundations of the emergence of the national idea. The nation is a fruit of the late 18th century. The press stimulates the standardisation of a written language, provides a more or less uniform perspective on the world and introduces its readership to a nearly simultane-

ous, frequently repeated example of that perspective. Territorial government implies the demarcation of administrative boundaries and thereby determines the spatial range of the use of administrative languages plus the trajectories of the professional careers of those in state employment. The resulting nations are imagined maximally autonomous. This idea has become the central vehicle for nationalist ideologies and social movements in the past two centuries.

Obviously, media and governing had already strongly changed by 1983 and have transformed since by the impact of globalization. ANDERSON himself has taken this into account by introducing the notion of long distance nationalism (ANDERSON, B. 1992). It refers to instances of migrant communities that despite their stable new residence quite far away from their places of origin maintain intimate links with their homeland over the longer term. They occasionally engage in extremism if their original imagined community is deemed in danger. He considers this as one consequence of globalisation enabling such contacts and the practicing of ideas uninhibited by constraints in the real old country. While this may be true the effects of globalization should not be overestimated. Irish 19th century nationalism was already nurtured to a major extent by Irish Americans (VAN DER WUSTEN, H. 1980).

Robert J. KAISER in his turn was mainly concerned with the USSR including Russia. But he started with a theoretical chapter on the meaning of homeland in the study of nationalism that draws the linkages between nation/nationalism and territory. Nationalism, once activated as an ideology and a movement, pursues the control of a homeland. Since the Bolchevik revolution KAISER found rivalry between a set of emerging nationalisms connected to the territories of the administrative divisions of the USSR with governments that had at least some socio-cultural competences and an overarching Soviet community not to be called a nation for ideological reasons but very similar in kind. In the end the lower level nationalisms turned out to be more suc-

cessful and caused the demise of the entire structure. The creation and acceptance of ethnic elites in the different parts of the federal structures and their mobilizing capacities based on growing levels of modernization doomed the entire edifice.

A major part of the explanation is the wrong diagnosis and prognosis from Lenin onwards that the diverse national feelings in the USSR could and should be accommodated in the constitutional structure of the state by means of a notional federalism. These national feelings would be undermined and wither away as a result of the modernization of Soviet society in its communist mould directed by the party. In actual fact the privileges provided by the structure of government following the (con)federal constitution to the various majority populations in the different administrative entities created the opportunities for multiple nation-building processes that overturned the system by ruining the unity of the party. It was in many respects the replay of the demise of the Austro-Hungarian Empire by the loss of the civil and military imperial organs against the various nationalisms in the regions (see Joseph ROTH's *Radetzky* [1932] for a literary representation of the process). It was the example that Lenin was trying to avoid at all cost, in vain.

Within all the administrative divisions there were ethnic minority populations. The proportions of Russians in particular were often significant. Russians of course held special positions as members of the principal nationality of the USSR and in many cases the professional elites in the various regions. It could have been an option for many people with a different ethnic background to 'russify' but particularly after 1945 this trajectory was taken by relatively few people. Although it was by then encouraged by the centre and proficiency in Russian was very important for social improvement, people mostly learned Russian as a second language only and did not opt for full 'russification'. While the idea of one Soviet people became increasingly ephemeral and most people looked to

their various national homelands as their primary place of belonging, Russians in particular could well hesitate between a national Russian homeland or the entire USSR as their national homeland.

Since 1991, on the former territory of the USSR, the territorial expression of the new state system, the very definition of the homeland in nationalist parlance, has repeatedly been strongly contested. In KAISER'S analysis of the last stages of the USSR and its disappearance, it looked too much as if the physical containers of the different nationalities had all been sufficiently strongly constructed for the homelands to emerge and provide stable residences into the future. Ukraine is the most recent dramatic counterexample.

Geopolitics

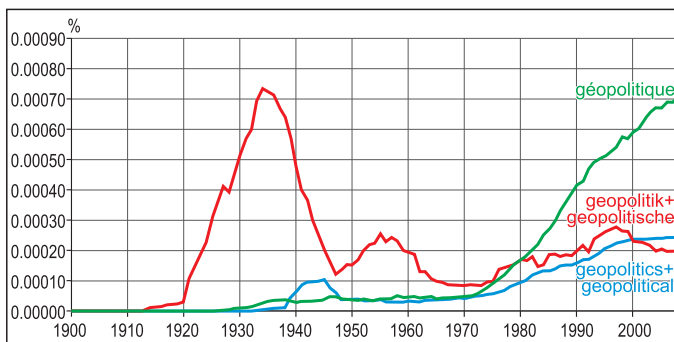
Geographers used to look at geopolitics as their own renegade and more recently perhaps more as their prodigal son but this has always been wrong. From the very beginning it was a concept also nurtured outside geography. KJELLÉN, its main inventor was a jurist with political science inclinations. He first introduced the word geopolitics in a paper in Swedish published in 1899, its most elaborate and famous treatment is in 1917 in German (HOLDAR, S. 1994; KJELLÉN, R. 1917). We can again follow the evolution of the use of the concept, now in different languages, via N-grams from the Google dataset (Figure 2).

Obviously, not quite correctly we read the corpora of books in different languages here

as a reflection of the interests in the predominant countries using that language. It is possible to make a distinction between American and British English but it does not show important differences in the nature of the curves so we consider the curve for English language books as a reflection of the US and the UK together.

The curves in Figure 2 show that the word geopolitics first took off in Germany, particularly after the end of World War I and reached its highest rating in 1934. The use frequency then fell off sharply just after Hitler had come to power in Germany. Despite clear signs of collaboration with the nazis well into the new war from the side of the protagonists of geopolitics, the significance of geopolitics fell off sharply within Germany until the end of the war. At the same time World War II unchained a geopolitical literature in the Anglo-Saxon countries mostly in response to German geopolitics and very often highly critical vastly overestimating its significance in the German war effort. Compared to the German use frequencies it remained small. From the 1970s there was a resurgence of interest in geopolitics apparently starting in France and growing at a relatively steep rate. France has remained the most sustained growth area for geopolitical discourse until the end of the period (Figure 3).

In the 1980s first in Chinese and then in Russian a steep growth curve of the use of the term geopolitics can be discerned. For comparative purposes the English language curve has again been added. It is here again pictured on a different scale. While both dominating states in these language groups (China and the USSR/Russian Federation) found themselves in much altered international positions during these years they



dominating states in these language groups (China and the USSR/Russian Federation) found themselves in much altered international positions during these years they

Fig. 2. N-grams Geopolitics German, English French 1900–2008.

Source: <https://books.google.com/ngrams/info>

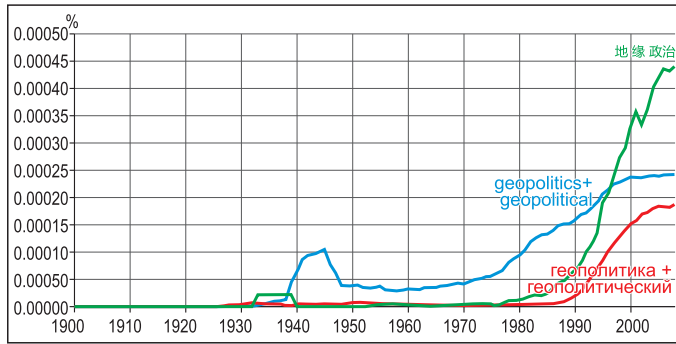


Fig. 3. N-grams geopolitics Chinese, Russian, English 1900–2008.
 Source: <https://books.google.com/ngrams/info>

quickly adapted to the renewed popularity of geopolitics in the West but presumably used it for their own purposes. The particularly steep Chinese growth rate is intriguing. I will briefly return to the Russian curve in the context of the Ukrainian case.

One way to quickly summarize the temporal trend in the shifting central interests of geopolitics may be gleaned from the perusal of works from different periods. I use three sets of authors: first MACKINDER and HAUSHOFER, subsequently DIJKINK and PAASI and finally O'LOUGHLIN, TOAL and KOLOSOV. One important differentiating point is how geopolitics connects with nationalism in these works from the pre-1945 period, the 1990s and the current era.

Shortly after KJELLÉN had put the term geopolitics to use in 1899, MACKINDER painted the first version of his celebrated thesis on the increasing importance of the Eurasian core as the pivot of the world (MACKINDER, H.J. 1904). Its importance was increasing, he said, because of the shifting balance in transport opportunities across sea lanes and train tracks with the tracks getting the upper hand. His views became a source of inspiration for Karl HAUSHOFER who used the term geopolitics for his further deliberations on the subject. HAUSHOFER dealt with the macro-regional distribution of power and influence in the world, with the position of Japan and the evolution of policies regarding the Pacific and most of all with the reparation of

Germany's position as a great power after the Versailles Treaty (HAUSHOFER, K. *et al.* 1928).

While MACKINDER was undoubtedly primarily concerned with the position of Britain in the new global spatial constellation that he saw coming, HAUSHOFER's perspective was primarily drawn to the issue of Germany's fate after a new global spatial constellation had arisen as the outcome of World War I. In MACKINDER'S

view Britain was the British nation (with a certain acceptance of internal differentiation in English, Scottish, Welsh and Irish) and a reserved huge outdoor area parcelled across the world, altogether the British empire. This was the great power and the question was how it could be preserved under the new circumstances. In HAUSHOFER'S view Germany, in Versailles, was bereft of a significant part of the homeland of the German nation and it did no longer play a role across the globe in territorial terms. It had lost its own outdoor area. It did no longer belong to the restricted club of great powers. These powers were the significant geopolitical actors and Germany's status as one of them should be restored.

In this perspective there is in the end no place for geopolitical actors outside these restricted few. Nationalism within the state central to the great power may be a source of inspiration for the great powers' geopolitics, in other cases nations may serve as stabilizers or contestants of existing state constructions but they do not play in the practiced geopolitics of these states as the conduct of great power politics lies ultimately in the hands of a restricted set of power holders and is largely constrained by a set of physical conditions.

Taking some leaves from the folder of critical geopolitics as developed by AGNEW, O'TUATHAIL, DALBY and others (O'TUATHAIL, G. and AGNEW, J. 1992, DALBY, S. and O'TUATHAIL, G. 1998), DIJKINK and PAASI

have in the later 1990s indicated the way in which nationalism expressed in feelings of national identity on the one hand and geopolitical visions and practiced geopolitics on the other are co-constituted over time in a long process of shared experience. DIJKINK reconstructed the maps of pride and pain as he calls them for eight different countries (DIJKINK, G.J.W. 1996), PAASI considered the consequences of Finnish territorial loss for its geopolitical practice and national identity (PAASI, A. 1996). State actors have here been deconstructed in a series of policy makers, their institutions and the fine grained enormous body of opinions that goes under the title of public opinion. It has been generally recognised that all sorts of representations held by these various actors result in visions and practices regarding territories. At the same time all these people supposedly share to some extent a sense of commonality that evolves in the imagined community which forms the mainstay of nationalism. This nationalism channels the visions, the visions enrich the commonality.

In the last couple of years O'LOUGHLIN, KOLOSISOV and TOAL have extensively studied a large number of territorial conflicts on the territory of the former USSR (O'LOUGHLIN, J., KOLOSISOV, V. and TOAL, G. 2011; O'LOUGHLIN, J., TOAL, G. and CHAMBERLAIN-CHENGA, R. 2013; TOAL, G. and O'LOUGHLIN, J. 2013a,b). Ethno-national rivalries play out generally but there are other issues as well: religion, nostalgia of the Soviet past. A recurring feature in many of their surveys is the widespread positive memory of the Soviet era. A number of issues between conflicting parties have been frozen in a state of suspended conflict resolution. Despite the ethno-national identification of many of the issues and the main protagonists, massive mobilisation is generally low. The central Russian government acts as a kind of arbiter on its own territory and in the surrounding zones with the aim to remain the predominant and indispensable power. It results in semi-sovereign, feeble governing constructions that may nonetheless long survive. This form of negli-

gent supremacy used to be called suzerainty in earlier great power days. Nationalism may be instrumentally called upon for a while but the ultimately relevant actor is the presumed great power brought to life by a small set of closely connected institutions (intelligence services, police, military) (O'LOUGHLIN, J., KOLOSISOV, V. and TOAL, G. 2011).

In sum, practiced geopolitics has been the preserve of different actors over time. As geopolitics emerged it was mainly, sometimes exclusively considered the business of great powers. Within a great power nationalism was an important conditioning factor, but certainly not the only one. More recently, as nationalism had spread throughout the world resulting in the process of decolonisation, the potential power of imagined national communities was sharper realised.

There was a degree of recognition of all states as principally equal partners and a universal and intimate relation of imagined communities and practiced geopolitics was more or less assumed. Now, on the territory of the former USSR efforts are made to restore a spatial constellation of geopolitical relations very much like that within the great power constructions of the past. This is to repair 'the greatest geopolitical disaster of the 20th century' as Putin has called it since 2005. For Russia to play its full role in the new league, the disaster damage has to be repaired and the old foe, the US and the new potential, the EU, kept at bay.

Ukraine in light of imagined communities and practiced geopolitics

The current Ukraine conflict formation was initiated when president Yanukovich abruptly suspended the final preparations for the signing of the EU-Ukraine Association agreement under Russian pressure. This was followed by mass protests at first limited to a central square in Kiev (Maidan) and a further series of dramatic episodes – a widening of the protests across the country, the flight of Yanukovich, the reincorporation of Crimea

in the Russian federation, the attempts at revolt against 'Kiev' in East Ukraine notably Donetsk and Luhansk, the Ukrainian military campaign against separatist territory and the different kinds of support from the side of Russia, the diplomatic effort and the monitoring by the OSCE.

A recent paper in this journal (KARÁCSONYI, D. *et al.* 2014, 99–134) has some very interesting maps (particularly 13, 14) on the early part of the conflict. One astounding feature – astounding for the suggested initial density of these items – is the number of Lenin monuments destroyed between November 2013 and February 2014 in major parts of the country though less frequently in the West (where such monuments had already been removed in earlier years) and in the East where they apparently were left alone. Surprisingly, the map shows a number of such destructions in Crimea. In further comments based on the previous sections I will particularly focus on the apparent relevance and manifestation of Ukrainian nationalism in the ongoing conflict and thereafter add some comments on the apparent geopolitical visions inspiring the practiced geopolitics of the three most immediate external powers: Russia, the US and the EU.

In late 1991 the Ukrainian leadership was a main contender in the anti-Gorbachev compact that finally secured the dissolution of the USSR. Ukraine became an independent state. Apparently KAISER's model of ethnic nationalism also applied to the Ukraine. But there had always been language differences between West and East Ukraine, also variations in the geographical distribution of groups with a different ethnic status. The regions of Ukraine had been variously involved in industrialisation and urbanisation and in the blood-lands episodes of the 1930s and 1940s (SNYDER, T. 2010). In addition, Ukraine's current territory has a checkered earlier territorial history (JANSEN, M. 2014). Allegiance to a unitary Ukrainian state is more widespread in the West and among the better educated and younger age groups but it is uncertain to what extent this is generally based on strong nationalism. It may just as well result from a preference to be unequivocally

part of the West. KARÁCSONYI *et al.* provide a detailed overview of the East–West dichotomy in Ukraine (KARÁCSONYI, D. *et al.* 2014, 99–134). They consider the current East–West political fault line as conditioned by earlier physical, cultural and socio-economic geographical variation. Similar differences can be found in other post communist societies, but in Ukraine they are expressed in unusually strong regional variations. In the end they do not interpret the Ukrainian conflict as an example of the clash of civilizations that HUNTINGTON foresaw (HUNTINGTON, S. 1993).

In the Maidan protests there was a diversity of views. The initial protesters and always a strong fraction in the subsequent stages were interested in a more open society where the law would be respected, democracy taken seriously, pervasive corruption would be countered and a free entrepreneurial spirit would be encouraged. Nationalism was not an end to pursue, but some form of national unity would be needed to accomplish the real aims. This was the non violent part of the protest. But other fractions were primarily interested in the realisation of the nation in one of its available founding myths. This gave rise to violent forms of protest, armaments and tight organisation in the end leading to the different voluntary battalions that took part in the Ukrainian military campaign. Some of the initial non violent protesters also became part of new Ukrainian battalions opposing the separatists and Russian forces, notably some driven from their homes in separatist held territory who gathered in the Donbass battalion. Efforts have been made to incorporate all of them in the standing army but this has occasionally been resisted for ideological reasons as well as for the meagre facilities that the regular army is able to provide. There have apparently been successes over time but there are also signs of armed resistance by fighters returned from the front line against the Kiev regime. In fact there is a whole variety of subsequent situations, reactions and loyalties with many lives disrupted by traumatic experiences (SCHUELLER, K. 2015).

In their latest survey TOAL and O'LOUGHLIN have found levels of allegiance to Ukraine by implication, asking for the attitudes of their respondents to the notion of Novorossiia. Their surveys were held in Crimea and in the six oblasts that together with Lkhansk and Donetsk (too insecure to provide reliable responses at the time) form the region that has by the Russian side been labelled Novorossiia for a while. The results show a very low level of Ukrainian allegiance in Crimea but much higher levels in all the six south-eastern oblasts with a bit more hesitation in Kharkiv and Odessa than elsewhere. Other research from the end of 2013 shows low levels of Ukrainian allegiance in the city of Lkhansk but relatively higher levels among the local young and the better educated (TOAL, G. and O'LOUGHLIN, J. 2015).

If any national feeling toward their newly launched republics has been accomplished in those parts of the Donetsk and Lkhansk oblasts that are under rebel control, is an open question. The rebels have never been a completely united force and there have been serious incidents of local chiefs eliminated by others in attempts to gain ground. Other conflicts opposed volunteers arrived from Russia and indigenous leaders. A story written during the early part of the Ukrainian campaign in June 2014 provides an overview (SCHUELLER, K. 2014). Although later on the collection of participants shifted slightly, the story remained essentially the same. There is not much evidence of great popular enthusiasm. The general feeling seems to be more oriented towards an ending of the violence from all sides than anything else and a widespread nostalgia to the stability of Soviet times. The networks of the oligarchs who have controlled major parts of the region for many years are apparently still partly intact.

The practiced geopolitics in the Ukraine case are by no means only those of the Ukrainian contenders. Major roles are played by the EU (also in this case largely but not completely guided by German diplomacy). Its performance as a negotiating party in the

association agreement with Ukraine was of central importance in setting the conditions for the conflict formation. The Russian federation actively opposed the agreement, was already deeply involved in Ukrainian politics and then steeply escalated the crisis by taking possession of the Crimea and taking an active part in the armed rebellion in Eastern Ukraine from spring 2014. The US acted as the great power always deemed indispensable by many of its European partners and in the end often ready for activist intervention at least at the diplomatic level and with repeated public references to military options at least by congressional politicians. EU, Russia and US carry dominant geopolitical visions that provide general guidance and in fact show contrary tendencies.

The EU's geopolitical vision for its adjacent zone in the East and the South had been from 2004 the so called European Neighbourhood Policy (ENP). It was inspired by the notion that instead of future membership of the Union it would be better to develop good neighbour relations. The EU would play the benevolent partner helping the neighbours on a trajectory toward more convergence with EU norms. This would create peace and stability across its borders. The Association agreement was the latest step in that direction as regards Ukraine. The current Ukraine conflict ensued. Elsewhere in the zone of the European Neighbourhood Policy the Syrian war and the continuing Libyan crisis after Khadaffi's disappearance show no signs of subsiding. For a long period already the EU is additionally confronted with unmanageable immigration movements arriving through and from its zone of neighbours culminating in the current large scale disaster. The ENP is now being revamped but the problems to overcome are clearly immense (the most recent self report on this re-orientation is http://eeas.europa.eu/top_stories/2015/300615_enp_consultation_en.htm).

In the Russian Federation geopolitics has won quite some traction since the demise of the USSR as we saw earlier in de Google based graphs. Now that Russia found itself

in circumstances comparable to the German position after World War I, it was attractive to follow in HAUSHOFER's footsteps. Geopolitical visions of Russia's fate in the contemporary world based on classical German geopolitics were combined with the indigenous notion of Russia as the unique combination of European and Asian features due to its geographical position developed by geographers and others before the revolution and then mainly continued in the circles of emigrants.

One early protagonist was Alexander DUGIN who has been a steady inspiration for others but who has also provoked much resistance (DUGIN, A. 1997). Long considered a weird, local voice (he is hardly taken seriously in TRENIN, D. [2002], a prominent voice at the time in these matters), he got an international following in more recent years mostly in extreme right circles by his strong advocacy of resistance against Anglo-Saxon capitalism. Knowledgeable observers call him a fascist. DUGIN has for many years taken radical positions vis à vis Ukraine re-commending its wholesale incorporation in the Russian federation. Putin has proposed his geopolitical disaster thesis of the USSR since 2005. Particularly after the repossession of the Crimea he has on a few occasions engaged in geopolitical visions inspired by these autocratic Tsarist and Eurasianist notions mixing ethno-national, Orthodox and territorial notions. It is a vision with high risk implications for a peaceful resolution of the Ukraine situation as long as its potential claims for a further occupation of some version of Novorossiia not to speak of the political position of other former parts of the USSR are not put on ice.

It is by no means certain with how much conviction such visions are now put forward by Russia's power holders. For the time being they have aroused considerable popular support. But even their mere announcement creates further problems for Russia's strained economy that does not allow it to perform as a great power for any sustained period of time. In autumn 2015 the emphasis in Russian foreign policy abruptly shifted

to Syria and the Middle East. In Ukraine a cease fire, finally, seemed to take hold, apparently facilitated by an enhanced willingness for compromise solutions from the side of various parties, but the situation remains highly volatile.

In US policy-making circles, there are still remnants of the memory of World War II when the geopolitical vision on how to prevail against the German and Japanese threats was developed. In my view, Nicholas SPYKMAN's *American's Strategy in World Politics. The US and the Balance of Power* (SPYKMAN, N. 1942) is a key text on the subject that has unjustly been a bit forgotten despite a reprint in 2007. The book was published just after Pearl Harbour. It reacted to the global situation but also looked beyond the war's end. SPYKMAN stated in no uncertain terms that the US after winning the war under no circumstances should withdraw completely from the Eurasian rimlands and in particular from the industrial concentrations in and around Germany and Japan. It would need to play a permanent role in the balance of power in those areas. This was when the USSR was an ally. In the end the US remained present on the Eastern shores of the Atlantic and the Western shores of the Pacific.

In the West practiced geopolitics subsequently resulted in NATO. As the Cold War receded NATO was retained, and eventually extended across much of Eastern Europe not in the least upon the request of countries that had recently lost the overlordship of the USSR. It was apparently not only this series of requests that rolled NATO forward (seen from the Russian perspective). It was also America's need to affirm that the Cold War had a winner. Russia was given some consulting role in NATO that was clearly insufficient to prevent the souring of relations. The OSCE was instituted as a new all-European platform including the US and Canada but it remained a pretty weak organization.

It could have been otherwise. NATO could have withered away and OSCE developed as the assurance of American presence in Europe. After all, SPYKMAN's aim had not

been a bloc, but a balance of power. Such a course could perhaps have altered the calculations on the other side. This is certainly a highly contentious issue across Europe as the relevant assessments will certainly differ between East and West Europe. Under the circumstances the Americans perceive the Ukraine situation largely through a NATO lens while the OSCE, that does the difficult work on the ground, could use more generous backing.

Final remarks

I close with three notions that I got out of all this:

Nationalism, Benedict ANDERSON wrote, was a question of imagined communities and they were the basis for a preference for absolute political autonomy: the nation state. These communities won out over other communities due to the printing press and territorial government. Now, the predominance of printing press and territorial government has in many places subsided, social media and governance has emerged. Perhaps, the dominance of politically relevant nationalism is also somewhat receding, with religiously based, sports based and other commonalities competing fiercely for primary attention and allegiance.

It is globalisation that has transformed the media environment and relativises territorial government and thus undermines the conditions for nationalism. But at the same time globalisation undermines general conditions of existential stability and thereby unleashes attempts to restore the certainties of yesterday, e.g. the imagined national community. The final outcome of this dual process is highly contingent.

As territorial government becomes enmeshed in a cloud of governance by all kinds of governing arrangements occupied with different kinds of governors and subjects and a nationalist ideology is no longer the self-evident vessel for a geopolitical vision, geopolitical visions may well become more ephemeral and temporary; and their adher-

ence may crumble. The transition to more differentiated systems of governance implies a multiplication of geopolitical practices. This may well result in irresolvable knots of competence rivalry that inhibit more or less harmonious social development. Such transitions are, however, actively resisted by authoritarian regimes that suppress diversity and impose simplification thus also harming smooth social functioning. Avoiding these two unsatisfactory states of affairs is the true art of contemporary politics.

REFERENCES

- ANDERSON, B. 1983. *Imagined communities: Reflections on the origin and spread of nationalism*. London, Verso.
- ANDERSON, B. 1992. *Long-distance nationalism: world capitalism and the rise of identity politics*. Wertheim lecture. Amsterdam, CASA.
- CONNOR, W. 1978. A nation is a nation, is a state, is an ethnic group, is a ... *Ethnic and Racial Studies* 1. 377–400.
- DALBY, S. and O'TUATHAIL, G. (eds.) 1998. *Rethinking geopolitics*. London, Routledge.
- DEUTSCH, K.W. 1953. *Nationalism and social communication*. Cambridge, Mass., MIT Press.
- DIJKINK, G.J.W. 1996. *National Identity and Geopolitical visions: maps of pride and pain*. Routledge, London
- DUGIN, A. 1997. *Osnovy geopolitiki: geopoliticheskoe budushchee Rossii* (The foundations of geopolitics: the geopolitical future of Russia). Moscow, Arktogeia.
- European External Action Service 2015. Revision ENP: http://eeas.europa.eu/top_stories/2015/300615_enp-consultation_en.htm
- GELLNER, E. 1983. *Nations and nationalism*. Ithaca, Cornell University Press.
- HAUSHOFER, K., OBST, E., LAUTENSACH, H. and MAULL, O. 1928. *Bausteine zur Geopolitik*. Berlin, Kurt Vowinckel Verlag, Berlin.
- HOLDAR, S. 1994. Lemmas Geopolitik – Origins and Kjellén, Rudolf. In *Dictionary of Geopolitics*. Ed.: O'LOUGHLIN, J., Westport, Greenwood Press, 93–95, 138–142.
- HROCH, M. 1985. *Social preconditions of national revival in Europe*. Cambridge University Press, Cambridge.
- HUNTINGTON, S. 1993. The clash of civilizations? *Foreign Affairs* 72. (3): 22–49.
- JANSEN, M. 2014. *Grensland. Een geschiedenis van Oekraïne*. Amsterdam, Van Oorschoot.
- KAISER, R.J. 1994. *The Geography of Nationalism in Russia and the USSR*. Princeton, N.J., Princeton University Press.

- KARÁCSONYI, D., KOCSIS, K., KOVÁLY, K., MOLNÁR, J. and PÓTI, L. 2014. East–West dichotomy and political conflict in Ukraine – Was Huntington right? *Hungarian Geographical Bulletin* 63. (2): 99–134.
- KJELLÉN, R. 1917. *Der Staat als Lebensform*. Leipzig, S. Hirzel.
- MACKINDER, H.J. 1904. The geographical pivot of history. *Geographical Journal* 23.421–437.
- N-gram VIEWER: <https://books.google.com/ngrams>
- O'LOUGHLIN, J., KOLOSOV, V. and TOAL, G. 2011. Inside Abkhazia: Survey of Attitudes in a De Facto State. *Post-Soviet Affairs* 27. (1): 1–36.
- O'LOUGHLIN, J., TOAL, G. and CHAMBERLAIN-CHENGA, R. 2013. Divided Space, Divided Attitudes? A Comparative Analysis of Simultaneous Surveys in the Republics of Moldova and Pridnestrovie (Transnistria). *Eurasian Geography and Economics* 54. (2): 227–258.
- O'TUATHAIL, G. and AGNEW, J. 1992. Geopolitics and discourse: practical geopolitical reasoning and American foreign policy. *Political Geography* 11. 190–204.
- PAASI, A. 1996. *Territories, Boundaries and Consciousness. The changing geographies of the Finnish-Russian border*. Chichester, John Wiley.
- ROTH, J. 1932. *Radetzky marsch*. Berlin, Gustav Kiepenheuer Verlag.
- SCHUELLER, K. 2014. Mehr Grenzen als Grenzer. *Frankfurter Allgemeine Zeitung* 11.06.2014 <http://www.faz.net/aktuell/politik/ausland/europa/os-tukraine-mehr-grenzen-als-grenzer-1282579.html>
- SCHUELLER, K. 2015. Der Krieg verändert sie alle. *Frankfurter Allgemeine Zeitung* 12.09.2015. http://www.faz.net/aktuell/politik/ausland/europa/krieg-in-der-ukraine-besuch-im-donbass-bataillon-13797806.html?printPagedArticle=true#pageIndex_2
- SMITH, A.D. 1986. *The ethnic origin of nations*. Oxford, Blackwell.
- SNYDER, T. 2010. *Bloodlands. Europe between Hitler and Stalin*. New York, Basic Books.
- SPYKMAN, N. 1942. *America's Strategy in World Politics. The US and the Balance of Power*. New York, Harcourt, Brace & Co.
- TOAL, G. and O'LOUGHLIN, J. 2013a. Land for Peace in Nagorny Karabakh? Political Geographies and Public Attitudes Inside a De Facto State. *Territory, Politics, Governance* 1. (2): 158–182.
- TOAL, G. and O'LOUGHLIN, J. 2013b. Inside South Ossetia: Survey of Attitudes in a De Facto State. *Post-Soviet Affairs* 29. (2): 136–172.
- TOAL, G. and O'LOUGHLIN, J. 2015. *Blogpost Washington Post on S.E. Ukraine*, 25 May 2015: <https://www.washingtonpost.com/blogs/monkey-cage/wp/2015/05/25/what-people-in-southeast-ukraine-really-think-of-novorossiia/>
- TRENIN, D. 2002. *The end of Eurasia. Russia on the border between Geopolitics and Globalization*. Washington - Moscow, Carnegie Endowment for International Peace.
- VAN DER WUSTEN, H. 1980. The United Kingdom and its Irish contenders (1800–1922). *Netherlands Journal of Sociology* 16. 171–184.

Minsk and Budapest, the two capital cities

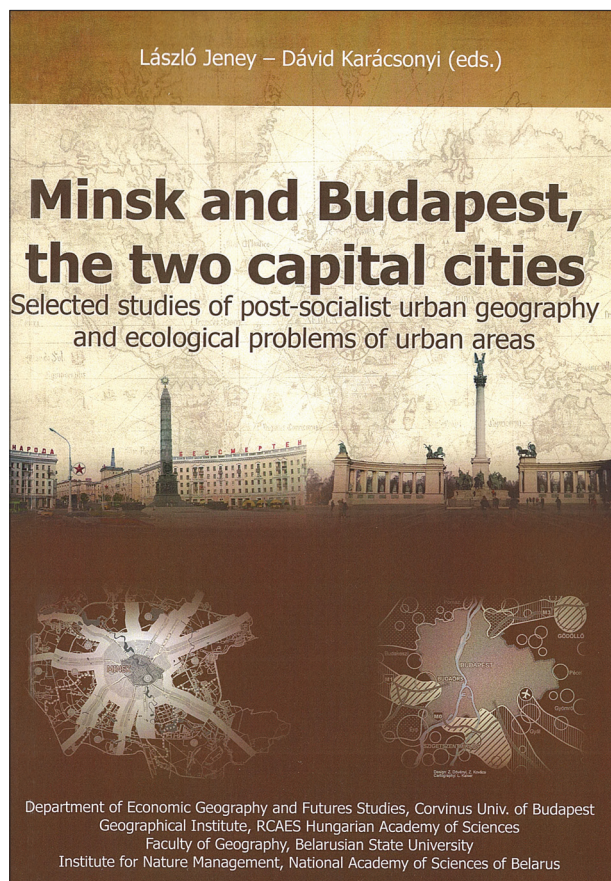
Edited by

LÁSZLÓ JENEY and DÁVID KARÁCSONYI

*Department of Economic Geography and Futures Studies, Corvinus University of Budapest;
Geographical Institute RCAES HAS; Faculty of Geography, Belarusian State University;
Institute for Nature Management, National Academy of Sciences of Belarus*

Budapest, 2015. 194 p.

While Budapest used to be the bridge between the West and East in Central Europe, Minsk seems to be in a similar role between the Russian and the EU-Polish influence zones. It means that both capitals are situated on the frontiers between the Euro-Atlantic and the Euro-Asian macro regions. Besides their situations, their similarity in size renders the comparison and the cooperation obvious to proceed. This book is based



on the mutual co-operation of Hungarian and Belarussian geographers and gives a scientific outlook not only on the socio-economic development of the two cities but on the urban climate, environment and ecology as well. Hungarian authors of the book introduce Budapest as a Central European metropolis with its historical trajectories and the results of the post-socialist transformation. They also demonstrate the main features of large housing estates and the results of their rehabilitation. Authors from Belarus show the major issues of spatial structure planning of Minsk in a similar context, describing the past and the present changes taking place in the spatial structure of the metropolis. The integrated assessment of the state of urban environment in Minsk is examined also focusing on the ecological frame of the environmental planning in urban agglomerations. The volume serves as a good starting point of a fruitful co-operation between Belarussian and Hungarian geographers dealing with a social and physical urban environment, the state of which deserves extra attention especially in East Central and Eastern Europe.

Copies are available:
Library, Geographical Institute of RCAES
HAS, H-1112 Budapest, Budaörsi u. 44.
E-mail: magyar.arpad@csfk.mta.hu

Soil erosion hazard and mitigation in the Euro-Mediterranean region: do we need more research?

JEAN POESEN¹

Abstract

Soil erosion represents a geomorphological and geological hazard that may cause property damage, loss of livelihoods and services, social and economic disruption, or environmental damage. Erosion of our soils not only lowers the quality of soils on site, resulting in a drastic reduction of their ecosystem functions that play a vital role in daily life, but causes also significant sediment-related problems off site. To curb soil erosion problems, a range of soil conservation techniques and strategies are applied. So far, ca. 7,000 papers on soil erosion and ca. 15,000 papers on soil conservation in the Euro-Mediterranean region have been published (Web of Science, 2015). One might therefore conclude that we now know almost everything about the various soil erosion processes, their factors and consequences as well as their control so that little new knowledge can still be added to the vast amount of available information. We refute this conclusion by pointing to some major research gaps that need to be addressed if we want to use our soils in the Anthropocene in a more sustainable way and improve environmental conditions worldwide. More specifically the following research needs are addressed: 1) improved understanding of soil erosion processes and their interactions, 2) scaling up soil erosion processes and rates in space and time, 3) innovative techniques and strategies to prevent or reduce erosion rates.

Keywords: soil erosion processes, anthropogenic soil erosion, upscaling, soil conservation

Introduction

The total number of research articles on soil erosion in the Euro-Mediterranean region amounts to ca. 7,000 papers whereas ca. 15,000 papers on soil conservation in this region have been produced (Web of Science, 2015). An overview of soil erosion processes, their controlling factors, consequences, prevention and control in Europe was produced by BOARDMAN, J. and POESEN, J. in 2006. Consequently, one may ask the question: do we still need more soil erosion research that produces even more papers? The answer is clearly “yes” and in the following sections some arguments will be provided, after defining some important terms and concepts.

Soil erosion is a geomorphic process that detaches and removes soil material (mineral

particles and associated organic matter) from its primary location by natural erosive agents or through human or animal activity. Natural erosive agents include water (ice), wind, and gravity. Human activity refers to soil tillage, land leveling, crop harvesting, road and building construction whereas animal activity comprise trampling and soil removal by burrowing animals.

Soils are a natural resource that play a vital role in daily life given that they perform several important functions, i.e. general capabilities that are crucial for various agricultural, environmental, nature protection, landscape architecture and urban applications. Scientists group these in six key soil functions (BLUM, W.E.H. 1993):

1) Food, fiber and other biomass production;

¹Division of Geography and Tourism, Department of Earth and Environmental Sciences, KU Leuven, Heverlee, Belgium. E-mail: jean.poesen@ees.kuleuven.be

- 2) Environmental interaction such as water filtering, carbon storage and transformation of substances;
- 3) Biological habitat and gene pool;
- 4) Source of raw materials;
- 5) Physical and cultural heritage and
- 6) Platform for human-made structures such as buildings and roads.

Soil quality reflects how well a soil performs these functions (TÓTH, G. *et al.* 2007). The 68th United Nations General Assembly has declared 2015 the International Year of Soils in order 1) to raise awareness of and improve teaching on the importance of soils for food security and essential ecosystem functions and 2) to stimulate sustainable soil management (soil conservation) (<http://www.fao.org/soils-2015/about/en/>).

In many parts of the world, soil erosion lowers soil quality, resulting in for instance environmental degradation and poverty. Soil erosion thus represents a geomorphological and geological hazard that may cause property damage, loss of livelihoods and services, social and economic disruption, or environmental damage (UNISDR 2009).

Erosion not only affects the quality of soils on site, resulting in a drastic reduction of their ecosystem functions that play a vital role in daily life, but causes also significant sediment-related problems off site (e.g. surface water pollution, flooding, river morphology changes, reservoir siltation and coastal development). This explains the relatively large number of soil erosion studies conducted so far.

However, given the large body of literature on this subject, one might conclude that we now know almost everything about the various soil erosion processes, their factors, consequences and their control so that little new knowledge can still be added to the vast body of information that has been collected so far.

I will refute this conclusion by pointing to some major research gaps that need to be addressed if we want to use our soils in a sustainable way and improve environmental conditions worldwide.

Need for improved understanding of soil erosion processes and their interactions

Water erosion

Assessing the impacts of climatic and land use changes on rates of soil erosion by water has been and is still the objective of many research projects. During the last 50 yrs, most research dealing with soil erosion by water has mainly focused on sheet (interrill) and rill erosion processes operating at the (run-off) plot scale. This is seen in

(1) the numerous field experiments where runoff plots have been installed in order to assess soil loss rates due to sheet and rill erosion under various climatic conditions or land use practices (e.g. for the Euro-Mediterranean zone (see MAETENS, W. *et al.* 2012a) and

(2) the use of both empirical and process-based field-scale and catchment-scale soil erosion models, addressing mainly sheet and rill erosion, for assessing soil erosion induced by environmental change or for establishing soil erosion risk maps at various scales (POESEN, J. *et al.* 2003).

However, in many landscapes under different climatic conditions and with different land use types, one can observe the presence and dynamics of various gully types, i.e. ephemeral gullies, permanent or classical gullies and bank gullies (e.g. for Hungary, see KERTÉSZ, Á. and JAKAB, G. 2011). Field-based evidence suggests that sheet and rill erosion as measured on runoff plots are therefore not always realistic indicators of total catchment erosion nor do they indicate satisfactorily the redistribution of eroded soil within a field. It is through (ephemeral) gully erosion that a large fraction of soil eroded within a field or catchment is redistributed and delivered to water courses.

Over the last decade, significant progress has been made in the understanding of the mechanisms and factors controlling gully erosion in a range of environmental conditions. However, we are still far from being capable to predict soil loss rates by gully ero-

sion. We also know very little about conditions and factors governing gully infilling. Yet we know that many gullies worldwide have undergone cut and fill cycles. In general, we understand quite well the conditions that lead to gully channel incision, but what caused gully infilling by natural processes?

Subsurface erosion leading to the development of pipes, tunnels (piping, tunneling) and possibly to (discontinuous) gully channels has been observed in a wide range of environments where it may cause very significant soil loss rates (VERACHTERT, E. *et al.* 2011). Yet we still do not fully understand all mechanisms involved nor are we capable to predict soil losses by subsurface erosion rates (VERACHTERT, E. *et al.* 2013).

Anthropogenic soil erosion

Most research efforts dealing with soil loss caused by environmental change have hitherto mainly focused on natural erosion processes, i.e. water and wind erosion, mass movements (landsliding). Much less attention has been given to anthropogenic soil erosion processes that during the last century have become more important and even dominant in a number of environments. Tillage erosion, caused by soil translocation during tillage operations, is a soil degradation process that cannot be neglected in most cropland areas located on rolling or steep topography in all continents when assessing overall soil erosion rates (e.g. GOVERS, G. *et al.* 1994; POESEN, J. *et al.* 1997). Likewise, leveling of badlands (e.g. in the Mediterranean; *Photo 1.*) to prepare cropland or grassland induces very high erosion rates (POESEN, J.W.A. and HOOKE, J.M. 1997).

Harvesting certain crop types, particularly root and tuber crops, may also induce significant soil losses leading to soil quality losses and significant off site effects (POESEN, J. *et al.* 2001; RUYSSCHAERT, G. *et al.* 2007). By far the largest erosion rates occur during soil excavations for constructing for example buildings and roads or during military activities (e.g.

CERTINI, G. *et al.* 2013). Particularly “bomburbation” (HUPY, J. and SCHAEZTL, R. 2006) and digging of trenches in soils of conflict zones causes significant erosion rates, far more important than for instance splash erosion rates. A recent study calculated the following mean soil loss rates (during 4 years) in the vicinity of the World War 1 frontline in West Belgium: i.e. 615 ton/ha due to bomb craters in a 1,262 km² affected area, 279 ton/ha due to trench digging in a 697 km² area and 114 ton/ha due to mine craters in a 109 km² area (HERMANS, L. 2015). Integrating these soil losses over a total area of 1,262 km² that was severely affected by the war resulted in a mean soil loss of 780 ton/ha/4years. Very few studies have attempted to quantify soil loss rates by such processes. It has become obvious that soil erosion in the Anthropocene mainly occurs as a consequence of not only natural erosion processes but by a combination of natural and human-induced soil erosion processes and in an increasing number of case studies mainly due to anthropogenic soil erosion processes. The latter are rarely considered in environmental impact studies.

Most studies investigating soil erosion-related topics in a particular study area, dealt with only one particular erosion process. However, in the real world often several processes causing soil loss are at play and usually they interact with each other resulting in a reinforcement or compensation in terms of soil loss. For instance, concentrated flow erosion and tillage erosion (and deposition) are two processes that often operate simultaneously on cropland and that reinforce each other (POESEN, J. *et al.* 2011). Other examples are land leveling interacting with gully erosion and shallow landsliding (BORSSELLI, L. *et al.* 2006), landsliding interacting with piping erosion (VERACHTERT, E. *et al.* 2013), or the interaction between gully erosion, landsliding and sediment export by rivers (DE VENTE, J. *et al.* 2006; VANMAERCKE, M. *et al.* 2012). In order to make more realistic assessments of soil loss rates and sediment yield at catchment scale, more research attention should go to these interacting erosion processes.



Photo 1. Land leveling of former badlands to create cropland has induced very large soil losses and soil profile truncation (Central Spain, April 2012)

Apart from these interactions, more research is also needed about how erosion processes interact with other earth surface processes. For instance, how does gully erosion affect hydrological processes such as groundwater seepage (exfiltration) or recharge (POESEN, J. *et al.* 2003)? How does soil erosion affect geochemical processes such as organic carbon storage and depletion (VAN HEMELRYCK, H. *et al.* 2011)? To what extent is catchment sediment yield controlled by seismic activity (VANMAERCKE, M. *et al.* 2014b)? There is a clear need for an improved understanding of interactions amongst different erosion processes as well as between these processes and other earth surface processes.

Scaling up soil erosion processes and rates in space and time: need for improved models and data mining

Many field studies of soil erosion are limited by the size of the study area and the period over which the observations have been made. As to water-related erosion processes the

emphasis has been on the runoff plot scale (0.001–0.01 ha; MAETENS, W. *et al.* 2012a) or relatively large catchments (10–100,000 ha; VANMAERCKE, M. *et al.* 2011). Relatively few studies have investigated entire hillslopes or relatively small catchments (0.01–10 ha). To scale up field measurements to larger areas and to longer periods, several procedures are followed, typically involving the use of erosion models. A whole range of models are available: from data-based to physics- or process-based, from simple to complex ones that need many input data (DE VENTE, J. *et al.* 2013). Building these models has aided to better understand significant factors that control erosion processes and rates. However, all of them have limitations. For instance, most water erosion models only predict soil loss by sheet and rill erosion, not by gully erosion or piping erosion.

Almost all erosion models do not incorporate anthropogenic soil erosion processes such as tillage erosion or soil loss due to crop harvesting, nor do they account for the interactions between these processes. Catchment sediment yield has been shown to both increase

and decrease with drainage area. The lack of simple relationships demonstrates complex and scale-dependent process domination throughout a catchment and emphasizes our uncertainty and poor conceptual basis for predicting plot to catchment-scale erosion rates and sediment yields. Changing process domination and process complexity occurring with increasing spatial unit is not represented in most models which are typically formulated on empirical observations made on smaller spatial units, despite the recognition of the role of scale in controlling dominant erosion processes (DE VENTE, J. *et al.* 2013).

In order to support model calibration and validation, large-scale data collection and analysis (data mining) of published data on soil erosion rates and controlling factors is now increasingly needed, because of the data availability from many case-studies (often published in the grey literature), but also because scientists lose their data at a rapid rate. The availability of research data typically declines rapidly with article age, as shown recently in ecology (VINES, T. *et al.* 2014). The same certainly holds for soil erosion and sediment yield data. Hence there is an urgent need to compile and analyze such valuable metadata before they are lost for future generations. First attempts in this research direction have been recently published: e.g. erosion plot data in Europe (MAETENS, W. *et al.* 2012b); catchment sediment yield data in Europe (VANMAERCKE, M. *et al.* 2011); topographic thresholds for gully headcut development (TORRI, D. and POESEN, J. 2014).

Innovative techniques and strategies to prevent erosion or reduce erosion rates

Overall, there has been much more research focus on rates and factors of particular soil erosion processes than on new techniques and strategies to avoid or to control these processes. Moreover, the relative efficiency of these techniques (as compared to conventional land use practices) has been poorly documented. What can be learned from failures and suc-

cesses of soil erosion control programs? Critical evaluations of past soil and water conservation programs are crucial as the past is the key to the future. Analysis of large datasets (case-studies) is one way to solve this issue (e.g. MAETENS, W. *et al.* 2012a).

Innovation in erosion control research is rather limited compared to innovation in erosion process research (POESEN, J. *et al.* 2003). For instance, we still control gully erosion with techniques (e.g. grassed waterways, check dams) that were already in use ca. 80 years ago (BENNETT, H. 1939). Application of these techniques is not always feasible. Therefore more efforts should be made to further develop or to improve erosion control techniques.

Control of soil losses in erosion hot spots (e.g. gully heads and channels, river banks, landslide scars, construction sites, rural settlements in third world countries) remains a big challenge. Traditionally, hard engineering structures (e.g. check dams, gabions, retention walls, anchors or retention ponds) have been installed in such spots as they provide an immediate solution for (gully) channel and slope stability and for reducing sediment production. However, these interventions may not necessarily be sustainable in the long run. Alternatively soft engineering structures, making use of live vegetation (i.e. plant species that have optimal above- and below-ground biomass characteristics; DE BAETS, S. *et al.* 2009; REUBENS, B. *et al.* 2009), brush layers or fascines made from live plant cuttings can be used to control erosion rates, but these take longer to fully stabilize soils.

More research is needed to combine hard and soft engineering approaches in a balanced way that helps ecological restoration of erosion hot spots and that provides a broad spectrum of ecosystem services (STOKES, A. *et al.* 2014). Along these lines, a better understanding of root properties of indigenous plant species and their potential to control soil erosion by incisive processes, such as concentrated flow erosion or shallow landsliding, is much needed (VANNOPPEN, W. *et al.* 2015).

A major factor in the implementation of soil erosion control and soil conservation techniques is the social-economic situation (e.g. poverty, level of development, status of forest transition, subsidies, ...) in a given target area (e.g. see GARCIA-RUIZ, J.M. *et al.* 2013 for the Mediterranean). What are the optimal pathways to implement soil conservation measures and to reduce soil erosion rates: a top-down or a bottom-up approach? If the latter is more effective, how can we stimulate such an approach? These questions require a better understanding of human (society) – environment interactions.

Conclusions

Despite the vast number of research papers on soil erosion and soil conservation in the Euro-Mediterranean region published so far, there are still several major challenges for soil erosion researchers which have been discussed above. If future research focuses on these research gaps, we will not only better understand processes and their interactions operating at a range of spatial and temporal scales, their rates as well as their on-site and off-site impacts (which is academically spoken rewarding), but we will also be in a better position to select the most appropriate and effective soil erosion control techniques and strategies which are badly needed for a sustainable use of our soils in the Anthropocene.

Acknowledgement: I acknowledge the support of the EUGEO 2015 organizers and of Zoltán Kovács in particular which made my participation in this congress possible. Thanks also go to the many researchers and colleagues for sharing their research experiences with me during stimulating discussions and all sponsors that funded my research projects.

REFERENCES

- BENNETT, H. 1939. *Soil Conservation*. New York, McGraw-Hill, 993 p.
- BLUM, W.E.H. 1993. Soil Protection Concept of the Council of Europe and Integrated Soil Research. In *Soil and Environment. Vol 1*. Eds.: EIJSACKERS, H.J.P. and HAMERS, T. Dordrecht, Kluwer Academic Publisher, 37–47.
- BOARDMAN, J. and POESEN, J. 2006. *Soil Erosion in Europe*. Chichester, Wiley, 855 p.
- BORSELLI, L., TORRI, D., ØYGARDEN, L., DE ALBA, S., MARTINEZ-CASASNOVAS, J., BAZZOFFI, P. and JAKAB, G. 2006. Land Levelling. Chapter 6.2. In *Soil Erosion in Europe*. Eds.: BOARDMAN, J. and POESEN, J. Chichester, Wiley, 643–658.
- CERTINI, G., SCALENGHE, R. and WOODS, W. 2013. The impact of warfare on the soil environment. *Earth-Science Reviews* 127. 1–15.
- DE BAETS, S., POESEN, J., REUBENS, B., MUYS, B., DE BAERDEMAEKER, J. and MEERSMANS, J. 2009. Methodological framework to select plant species for controlling rill and gully erosion: application to a Mediterranean ecosystem. *Earth Surface Processes and Landforms* 34. 1374–1392.
- DE VENTE, J., POESEN, J., VERSTRAETEN, G., GOVERS, G., VANMAERCKE, M., VAN ROMPAEY, A., ARABKHEDRI, M. and BOIX-FAYOS, C. 2013. Predicting soil erosion and sediment yield at regional scales: Where do we stand? *Earth-Science Reviews* 127. 16–29.
- DE VENTE, J., POESEN, J., BAZOFFI, P., VAN ROMPAEY, A. and VERSTRAETEN, G. 2006. Predicting catchment sediment yield in Mediterranean environments: the importance of sediment sources and connectivity in Italian drainage basins. *Earth Surface Processes and Landforms* 31. 1017–1034.
- GARCIA-RUIZ, J.M., NADAL-ROMERO, E., LANA-RENAULT, N. and BEGUERIA, S. 2013. Erosion in Mediterranean landscapes: changes and future challenges. *Geomorphology* 198. 20–36.
- GOVERS, G., VANDAELE, K., DESMET, P., POESEN, J. and BUNTE, K. 1994. The role of tillage in soil redistribution on hillslopes. *European Journal of Soil Science* 45. (4): 469–478.
- HERMANS, L. 2015. *Bodemverliezen veroorzaakt door bomkraters en loopgraven tijdens WO I in West-Vlaanderen*. Unpublished thesis. Leuven, Division of Geography, Catholic University of Leuven, 51 p.
- HUPY, J. and SCHAEZL, R. 2006. Introducing “bomb-turbation,” a singular type of soil disturbance and mixing. *Soil Science* 171. (11): 823–836.
- KERTÉSZ, Á. and JAKAB, G. 2011. Gully erosion in Hungary, review and case study. In *2nd International Geography Symposium – Mediterranean Environment 2010*. Eds.: EFE, R. and ÖZTURK, M. Book Series: Procedia Social and Behavioral Sciences 19. 693–701.
- MAETENS, W., POESEN, J. and VANMAERCKE, M. 2012a. How effective are soil conservation techniques in reducing plot runoff and soil loss in Europe and the Mediterranean? *Earth-Science Reviews* 115. 21–31.
- MAETENS, W., VANMAERCKE, M., POESEN, J., JANKAUSKAS, B., JANKAUSKIEN, G. and IONITA, I. 2012b. Effects of land use on annual runoff and soil loss in Europe

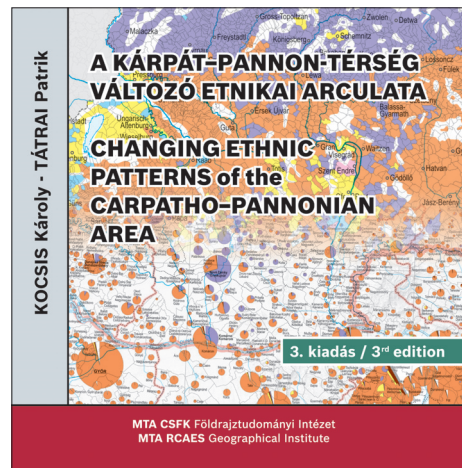
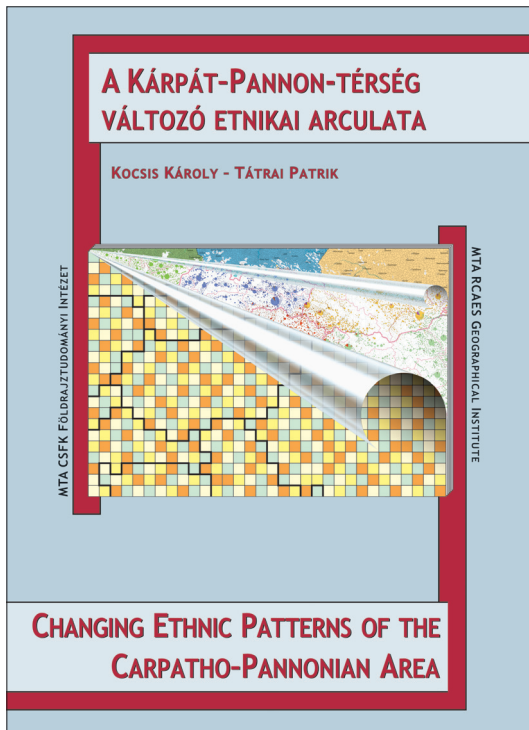
- and the Mediterranean: A meta-analysis of plot data. *Progress in Physical Geography* 36. 599–653.
- POESEN, J., NACHTERGAELE, J., VERSTRAETEN, G. and VALENTIN, C. 2003. Gully erosion and environmental change: importance and research needs. *Catena* 50. (2–4): 91–133.
- POESEN, J., TORRI, D. and VANWALLEGHEM, T. 2011. Gully Erosion: Procedures to Adopt When modelling Soil Erosion in Landscapes Affected by Gullyng. In *Handbook of Erosion Modelling*. Eds.: MORGAN, R.P.C. and NEARING, M.A. Chichester, Blackwell Publishing. Chapter 19: 360–386. + Plates 16, 17, 18 and 19.
- POESEN, J., VAN WESEMAEL, B., GOVERS, G., MARTINEZ-FERNANDEZ, J., DESMET, P., VANDAELE, K., QUINE, T. and DEGRAER, G. 1997. Patterns of rock fragment cover generated by tillage erosion. *Geomorphology* 18. (3–4): 183–197.
- POESEN, J., VERSTRAETEN, G., SOENENS, R. and SEYNAEVE, L. 2001. Soil losses due to harvesting of chicory roots and sugar beet: an underrated geomorphic process? *Catena* 43. (1): 35–47.
- POESEN, J.W.A. and HOOKE, J.M. 1997. Erosion, flooding and channel management in mediterranean environments of Southern Europe. *Progress in Physical Geography* 21. (2): 157–199.
- REUBENS, B., POESEN, J., NYSSSEN, J., LEDUC, Y., ABRAHA, A.Z., TEWOLDEBERHAN, S., BAUER, H., KINDEYA, G., DECKERS, J. and MUYS, B. 2009. Establishment and management of woody seedlings in gullies in a semi-arid environment (Tigray, Ethiopia). *Plant and Soil* 324. 131–156.
- RUYSCHAERT, G., POESEN, J., VERSTRAETEN, G. and GOVERS, G. 2007. Soil loss due to harvesting of various crop types in contrasting agro-ecological environments. *Agriculture, Ecosystems and Environment* 120. 153–165.
- STOKES, A., DOUGLAS, G., FOURCAUD, T., GIADROSSICH, F., GILLIES, C., HUBBLE, T., KIM, J., LOADES, K., MAO, Z., McIVOR, I., MICKOVSKI, S., MITCHELL, S., OSMAN, N., PHILLIPS, C., POESEN, J., POLSTER, D., PRETI, F., RAYMOND, P., REY, F., SCHWARZ, M. and WALKER, L. 2014. Ecological mitigation of hill slope instability: ten key issues facing researchers and practitioners. *Marschner review. Plant and Soil* 377. 1–23.
- TORRI, D. and POESEN, J. 2014. A review of topographic threshold conditions for gully head development in different environments. *Earth-Science Reviews* 130. 73–85.
- TÓTH, G., STOLBOVOY, V. and MONTANARELLA, L. 2007. *Soil Quality and Sustainability Evaluation – An integrated approach to support soil-related policies of the European Union*. EUR 22721 EN. Luxembourg, Office for Official Publications of the European Communities, 40 p.
- UNISDR 2009. *Terminology on Disaster Risk Reduction*. United Nations Office for Disaster Risk Reduction. <http://www.unisdr.org/we/inform/terminology>
- VAN HEMELRYCK, H., GOVERS, G. and VAN OOST, K. 2011. Evaluating the impact of soil redistribution on the in situ mineralization of soil organic carbon. *Earth Surface Processes and Landforms* 36. (4): 427–438.
- VANMAERCKE, M., KETTNER, A., VAN DEN EECKHAUT, M., POESEN, J., MAMALIGA, A., VERSTRAETEN, G., RADOANE, M., OBREJA, F., UPTON, P., SYVITSKI, J. and GOVERS, G. 2014a. Moderate seismic activity affects contemporary sediment yields. *Progress in Physical Geography* 38. (2): 145–172.
- VANMAERCKE, M., MAETENS, W., POESEN, J., JANKAUSKAS, B., JANKAUSKIENE, G., VERSTRAETEN, G. and DE VENTE, J. 2012. A comparison of measured catchment sediment yields with measured and predicted hill slope erosion rates in Europe. *Journal of Soils and Sediments* 12. (4): 586–602.
- VANMAERCKE, M., OBREJA, F. and POESEN, J. 2014b. Seismic controls on contemporary sediment export in the Siret river catchment, Romania. *Geomorphology* 216. 247–262.
- VANMAERCKE, M., POESEN, J., VERSTRAETEN, G., DE VENTE, J. and OCAKOGLU, F. 2011. Sediment yield in Europe: Spatial patterns and scale dependency. *Geomorphology* 130. 142–161.
- VANNOPPEN, W., VANMAERCKE, M., DE BAETS, S. and POESEN, J. 2015. A review of the mechanical effects of plant roots on concentrated flow erosion rates. *Earth-Science Reviews* 150. 666–678.
- VERACHTERT, E., MAETENS, W., VAN DEN EECKHAUT, M., POESEN, J. and DECKERS, J. 2011. Soil loss due to piping erosion. *Earth Surface Processes and Landforms* 36. 1715–1725.
- VERACHTERT, E., VAN DEN EECKHAUT, M., MARTÍNEZ-MURILLO, J.F., NADAL-ROMERO, E., POESEN, J., DEVOLDERE, S., WIJNANTS, N. and DECKERS, S. 2013. Impact of soil characteristics and land use on pipe erosion in a temperate humid climate: Field studies in Belgium. *Geomorphology* 192. 1–14.
- VERACHTERT, E., VAN DEN EECKHAUT, M., POESEN, J. and DECKERS, J. 2013. Spatial interaction between collapsed pipes and landslides in hilly regions with loess-derived soils. *Earth Surface Processes and Landforms* 38. 826–835.
- VINES, T., ALBERT, A., ANDREW, R., DEBARRE, F., BOCK, D., FRANKLIN, M., GILBERT, K., MOORE, J., RENAUT, S. and RENNISON, D. 2014. The Availability of Research Data Declines Rapidly with Article Age. *Current Biology* 24. (1): 94–97.
- Web of Science, 2015. All Databases, accessed on June, 21, 2015, <http://thomsonreuters.com/thomson-reuters-web-of-science/>

Changing Ethnic Patterns of the Carpatho–Pannonian Area from the Late 15th until the Early 21st Century

Edited by: KÁROLY KOCSIS and PATRIK TÁTRAI

*Hungarian Academy of Sciences, Research Centre for Astronomy and Earth Sciences
Budapest, 2015*

This is the third, revised and enlarged edition of the Changing Ethnic Patterns of the Carpatho–Pannonian Area. The work is georeferenced and comes with a CD-appendix. The collection of maps visually presents the ethnic structure of the ethnically, religiously and culturally unique and diverse Carpathian Basin and its neighbourhood, the Carpatho–Pannonian area. The volume – in Hungarian and English – consists of three structural parts. On the main map, pie charts depict the ethnic structure of the settlements in proportion to the population based on the latest census data. In the supplementary maps, changes in the ethnic structure can be seen at ten points in time (in 1495, 1784, 1880, 1910, 1930, 1941, 1960, 1990, 2001 and 2011). The third part of the work is the accompanying text, which outlines ethnic trends in the past five hundred years in the studied area. This volume presents the Carpatho–Pannonian area as a whole. Thus, the reader can browse the ethnic data of some thirty thousand settlements in various maps.



Price: EUR 12.00

Order: Geographical Institute RCAES HAS
Library
H-1112 Budapest, Budaörsi út 45.

Physical geography and closed loop recycling

MICHAEL A. FULLEN¹

Abstract

There is a growing body of research projects spanning over three decades that have provided insights into the concept of waste management, a topic standing in the focal point of environmental issues. In this paper, the 'SHASEA Project,' 'BORASSUS Project,' 'Yuanyang Project' and 'Cradle to Cradle BIZZ Project' are summarized and integrated to present a revised philosophical view that nature has no concept of 'waste.' The 'Sustainable Highland Agriculture in South-East Asia' (SHASEA) Project, funded by the European Union, was established to promote sustainable agro-environmental development in the highlands of South-East Asia. The Project examined the effectiveness of selected agronomic and soil conservation treatments by using both modified and novel cropping practices within small farmer-managed fields. The EU-funded BORASSUS Project evaluated the long-term effectiveness of biological geotextiles in controlling soil erosion and assessing their sustainability and economic viability. Biological geotextiles offer potentially novel bioengineering solutions to environmental problems (e.g. soil conservation, sustainable plant production and improved ecosystem management). Biogeotextiles may provide socio-economic platforms for sustainable development. A complex and sustainable agro-environmental system of terraced rice paddy fields in Yuanyang developed by the Hani minority people of Yunnan Province was the basis of an illuminating project which teaches us many lessons on waste management, the 'Agro-environmental sustainability of the Yuanyang rice terraces of Yunnan Province, China'. The Hani people have maintained this intricate and elaborate system for over 1,300 years. If we can understand how this system is sustained, we can learn lessons which hopefully can be applied more generally. The innovative approach of 'Cradle to Cradle' (C2C) technology promotes and develops closed loop recycling. At the end of a useful life time, C2C items are disassembled and reassembled for other uses. Lessons from the 'C2C BIZZ' Project (funded by the EU 'INTERREG IVB North West Europe Programme) are also reviewed in this study.

Keywords: biogeotextiles, cradle to cradle, recycling, resources, waste

The SHASEA Project

To promote sustainable agro-environmental development in the highlands of South-East Asia, an international multidisciplinary research team, funded by the European Union, examined the effectiveness of selected agronomic and soil conservation treatments (EU Contract Number ERBIC18 CT98 0326) (FULLEN, M.A. 2004). The team used both modified and novel cropping practises within farmer-managed small fields on a natural and representative catchment (Wang Jia) in the highlands of Yunnan Province, China (25°28'N, 102°53'E).

The 'Sustainable Highland Agriculture in South-East Asia' (SHASEA) Project involved

five co-ordinated work-packages: (i) background agricultural and environmental assessment of Wang Jia Catchment; (ii) implementation and evaluation of modified and novel watershed cropping systems for wheat, maize (corn) and soybean; (iii) cost-benefit analyses of the socio-economic impacts of cropping practice changes; (iv) comparative scientific evaluation of cropping techniques in the highlands of northern Thailand at Pang Mapa, Mae Hong Son Province (19°33'N, 98°12'E) and (v) dissemination of project outcomes and establishment of training programmes for best practise in highland rural development.

From each of these, project lessons for promoting sustainable agro-environmental

¹ Faculty of Science and Engineering, The University of Wolverhampton, Wolverhampton WV1 1LY, UK.
E-mail: m.fullen@wlv.ac.uk

development in tropical and subtropical highlands include: (a) the importance of recognizing the value of both ‘North-South’ and ‘South-South’ co-operation in development projects; (b) integrating local communities as full partners in the research programme; (c) matching the different ‘time horizons’ of the various stakeholders and (d) developing multidisciplinary teams, which included both biophysical scientists and socio-economists.

During 1999, based on field and plot experience, the team designed a composite maize cropping system to maximize both crop yield and soil/water conservation, known as the ‘Integrated Contour Cultivation, Plastic and Straw Mulch Treatment’ (INCOPLAST) (Figure 1).

The system combines contour cultivation, straw mulch and plastic mulch (FULEN, M.A. 2004). To establish early crop growth and to maximize yield, irrigation water is applied prior to monsoon rains. The INCOPLAST system is then installed, to both maximize

yield (by addition of plastic mulch) and conserve soil, water and associated nutrients (by installation of contour cultivation and straw mulch). Ridge morphology is shaped to route water towards the maize roots beneath the plastic mulch. Experiments proved soil bulk densities beneath the plastic mulch remained low throughout the growing season, thus promoting easier root penetration, higher aeration porosity, higher infiltration and lower runoff rates (SUBEDI, M. *et al.* 2009). Plot borders were grassed, to retain soil and water within the arable fields. The INCOPLAST system proved effective for soil and water conservation and significantly increased crop productivity (WANG, SHUHUI 2003) (Table 1).

The BORASSUS Project

The three-year plus (1 July 2005--28 February 2009) EU-funded BORASSUS Project (contract no. INCO-CT-2005-510745) evaluated the long-term effectiveness of biological geotextiles in controlling soil erosion and assessing their sustainability and economic viability (FULEN, M.A. *et al.* 2011). Field and laboratory studies indicated that utilization of biological geotextiles constructed from palm-leaves and other selected organic materials are an ef-

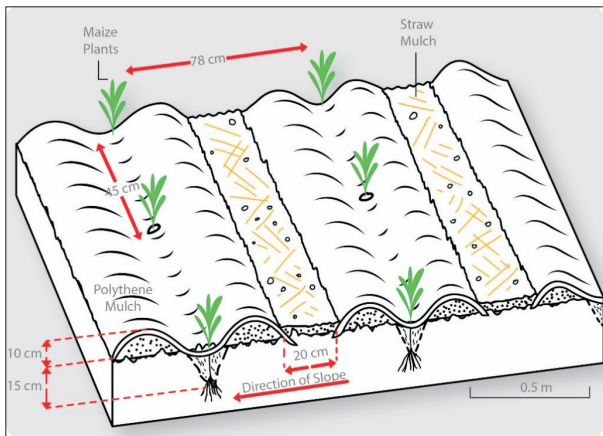


Fig.1. The INCOPLAST (INtegrated CONtour cultivation with PLastic And wheat STRaw mulch) system used on experimental fields in Wang Jia Catchment

Table 1. Grain weight (t/ha, corrected to 13% moisture) from Wang Jia Catchment plots over three seasons

Treatments*	1999	Increasing % vs. D	2000	Increasing % vs. D	2001	Increasing % vs. D
D	7.26a	0.0	7.82	0.0	6.21a	0.0
C	8.08a	11.2	8.81	12.7	6.66a	7.2
C + P	11.19b	54.0	9.49	21.4	8.27b	33.2
C + P + S	10.80b	48.7	9.70	24.0	8.42b	35.5
F	37.46	–	1.49	–	16.17	–
p	<0.01	–	0.28	–	<0.01	–
LSD	1.39 t	–	–	–	0.88 t	–

*Different letters denote significant (P <0.05) differences. D = Downslope cultivation without mulch; C = Contour cultivation without mulch; C+P = Contour cultivation with polythene mulch; C+P+S = Contour cultivation with polythene and wheat straw mulch (INCOPLAST). Source: WANG, SHUHUI 2003.

fective, sustainable and economically viable soil conservation technique. These studies progressed in 10 countries, both in the 'industrial north' (in Europe) and in the 'developing south' (Africa, South America and South East Asia). The studied countries in the 'developing south' included Brazil, China, Gambia, South Africa, Thailand and Vietnam. The 'industrial north' countries included Belgium, Hungary, Lithuania and the UK.

Biological geotextiles offer potentially novel bioengineering solutions to environmental problems, including technologies for soil conservation, sustainable plant production and use of indigenous plants, improved ecosystem management by decreasing deforestation, improving agroforestry and cost-effective biogeotextile applications in diverse environments. Biogeotextiles may provide socio-economic platforms for sustainable development and the benefits for developing countries may include poverty alleviation, engagement of local people as stakeholders, employment for disadvantaged groups, small and medium enterprise (SME) development, earning hard currency, environmental education and local community involvement in land reclamation and environmental education programmes. These benefits are achieved through:

- (i) promotion of sustainable and environmentally friendly palm-agriculture to discourage deforestation, promoting both reforestation and agroforestry,
- (ii) construction of biogeotextiles enabling development of a rural labour-intensive industry, particularly encouraging employment of socially disadvantaged groups, and
- (iii) export of biogeotextiles to industrialised countries could earn hard currency for developing economies, based on the principles of fair trade.

The BORASSUS Project offers many insights into sustainability and waste issues, especially in São Luís, Maranhão State, North-East Brazil (GUERRA, A.J.T. *et al.* 2014). This work-package assessed the effects of biological geotextiles, constructed from the palm leaves of *Mauritia flexuosa* (Buriti), in the reclamation of a large (~10 m deep) gully.

Accelerated erosion in Sacavém gully (São Luís) is enhanced by intense rains, acting in combination with vegetation clearance and the erodible sandy soil texture. Intense human action, with inappropriate soil use and irregular settlement, also plays a very important role in promoting gully erosion. The gully was stabilized using a combination of land-sculpturing, planting and the application of geotextiles. Only one month after the rehabilitation work was completed, the area was exposed to intense erosive rains (one-month total 753.7 mm, with a recurrence interval of ~60 years). Vegetation resisted erosion and the Buriti geotextiles seemed to have achieved the main aim of arresting erosion and rehabilitating the gullied area.

Integrating the results indicate positive effects of using biological geotextiles, as they offer potential for sustainable development and soil conservation. Furthermore, they can also be used for economic development, creating jobs and reducing poverty in poor urban areas. The higher-quality Buriti leaves are used for the handicraft manufacture of gift items for tourists (e.g. handbags, purses, wallets and hats). Coarse discarded leaves are used to construct the biogeotextiles. On decomposition, the leaves input nutrients into the soil, especially potassium (K), magnesium (Mg), calcium (Ca) and sulphur (S).

The leaves can also be burned and added as an ash-fertilizer to soils. The fruit is used to make fruit juice, ice cream and alcoholic beverages. The palm oil is used for skin care and may be useful for preventing skin cancer. On the death of the palm trees, the wood can be carved into boxes, statues and other trinkets for sale to tourists. Therefore, soil conservation and economic development are compatible and the Sacavém gully may well be an excellent exemplar of a zero-waste closed loop recycling system.

Long-term monitoring at Sacavém will enable thorough evaluation of the effectiveness of an integrated soil conservation programme on both erosion rates and processes and sustainable economic development. The ongoing site development can be moni-

tored via the ‘Laboratory of Environmental Geomorphology and Land Degradation’ of the Federal University of Rio de Janeiro (LAGESOLOS) web site: <http://www.lagesolos.ufrj.br> (accessed 09/11/15).

The Yuanyang Project

One of the most illuminating projects which teaches us many lessons on waste management is the study on the ‘Agro-environmental sustainability of the Yuanyang rice terraces of Yunnan Province, China’ (COLINET, G. *et al.* 2011; FULLEN, M.A. 2014). The Hani minority people of Yunnan Province (South-West China) have developed a complex and sustainable agro-environmental system of terraced rice paddy fields in Yuanyang (22°49′–23°19′N, 102°27′–103°13′E). The Hani people have maintained this intricate and elaborate system for over 1,300 years, with some 3,000 terraces covering about 11,000 hectares. Hence, during the Ming Dynasty (1368–1644), an Emperor awarded the Hani people the title of “*Magic Mountain Sculptors*” for “*building their ladders to Heaven*.” However, geographic isolation and proximity to the, until recently, politically-sensitive border with Vietnam, has meant the Yuanyang terraces have attracted scant scientific attention. If we can understand how this system is sustained, we can learn lessons which hopefully can be applied more generally.

The sustainability of the system seems to be the result of complex interplays between cultural, agronomic and environmental factors. These include the cultural and spiritual beliefs of the Hani people, a hydrogeological system which provides ample water resources, the maintenance of genetic diversity within the dominant rice cropping agro-ecosystem and the operation of complex fertigation practises. Distilling and understanding the ‘secrets’ of the Hani people and their terraces should enable broader application and dissemination of the principles of sustainability. Currently a joint Chinese-European team are working towards a greater understanding of

these lessons. The research team postulate that these lessons will have some global applicability for agro-environmental sustainability. Identified lessons relate to resource optimization, landscape multi-functionality and cultural attitudes.

Landuse within Yuanyang is zoned on the basis of ecological principles. Upland grassland progresses downslope into forest and then in a downslope sequence into tea plantations, bamboo woodland and rice terraces. Grasslands are used for the grazing of water buffalo, while wooded areas provide timber (deciduous, pine and bamboo) and food (mushrooms, wild vegetables and honey). The local Yunnan pine (*Pinus yunnanensis*) provides an excellent source of timber. Furthermore, the forest is very effective in conserving soil and water and releases high quality water from the upper to lower slopes. Besides providing rice, the perennially wet paddy fields provide food for domestic consumption (carp, eels, mudfish, ducks, frogs and snails) and weeds for pig-feed (*Photo 1*). Thus, there is multifunctional use of each ecological zone, which ensures optimum use of resources, effective recycling of materials and minimal waste. Often, the net waste from these subsystems is virtually zero.

The Hani people have a unique cultural system that reveres the land. The Hani religion embraces polytheism and the worship of nature. They pay particular devotion to the ‘forest god,’ which is perceived as the source of life-giving water. Deforestation is considered a religious violation and the Hani people actively teach their children to respect the forest.

This concept significantly contributes to forest conservation and ecosystem stability. In general, we can learn much from these positive environmental attitudes, in terms of improving public understanding and appreciation of land resources (land literacy) and agro-environmental education at multiple levels (school, college and university). The ancient ballads (poetic songs) of the Hani people are highly instructional in terms of maintaining the sustainability of agro-environmental systems.



Photo 1. The rice terraces of Yuanyang, Yunnan Province, P.R. China (Photo by FULLEN, M.A. on 23 Oct. 2009)

The Cradle to Cradle BIZZ Project

Critical analysis of the concept of ‘waste’ is integral to ‘Cradle to Cradle’ (C2C) technology, which is an innovative approach that promotes and develops closed loop recycling. At the end of a useful life time, C2C items are disassembled and reassembled for other uses. The aim is that materials are not downgraded, but rather at least retain the same grade with the objective of upgrading materials. C2C was developed by Michael BRAUNGART and William McDONOUGH in the 1980s and has progressively gained increased attention and interest (BRAUNGART, M. and McDONOUGH, W. 2009). There are three guiding principles:

1. ‘*Waste equals food.*’ In nature there is no concept of waste; when any material has served its purpose, it is used by something else.

2. ‘*Use solar income.*’ Solar energy is effectively infinite and if we can successfully harness it, then we have an infinite energy source. Solar energy indirectly powers the wind, by

creating air pressure differences which generate wind. Solar energy from the geological past is stored underground. Thus, solar energy, wind power and geothermal energy systems are interpreted as ‘solar income.’

3. ‘*Celebrate diversity.*’ Ecological systems (flora and fauna) adapt to the complexity of their environment to survive and thrive. Therefore, if we mimic diverse ecological systems, we can strengthen our social, economic and environmental sustainability.

Our global resources are running out. We all know that something has to change, in order to keep our planet habitable. The C2C philosophy aims for a beneficial future footprint by continuing material flows, using renewable energy and creating ecological, social and economic diversity.

The University of Wolverhampton (UoW) is a partner in the ‘C2C BIZZ’ Project. The Project involves 11 partners from six EU countries (Belgium, France, Germany, Luxembourg, The Netherlands and the UK).

The partners include public bodies, research institutes, private companies and universities. The Project is funded by the 'INTERREG IVB North West Europe Programme of the European Union.' UoW is collaborating in the C2C BIZZ Project, which has the objective to enhance the implementation of C2C technology on new and existing business sites in North West Europe. The aim is to mix functionalities, to promote co-operation and collaboration of on-site companies and develop an attractive environment, by using resources in different and innovative ways.

By its very nature C2C is multidisciplinary and so multidisciplinary teams can effectively work together, including engineers, scientists, environmentalists, economists, ecologists etc. In November 2014, the team published its main output; that is the 'Guide to Cradle to Cradle Business Sites.' The Guide is freely available on the C2C web site: <http://www.c2cbizz.com/> (accessed 09/11/15).

An important concept implicit in C2C technology and philosophy is that, in reality, there is no such thing as 'waste.' 'Waste' from one process or material becomes a resource for other process(es) or material(s). Perhaps we should view 'waste' as 'resources.' There are several excellent examples of this changed philosophy. One is 'AirCarbon,' where atmospheric carbon in the form of methane (CH₄) is used to produce plastics, especially plastic mobile telephone covers: <http://newlight.com/air-carbon/> (accessed 09/11/15). Another is the use of sewage sludge solids to make light-weight building aggregates (D. Newport, University of East London, pers. comm. 2013).

Conclusions

It is timely that we progress to imitate 'nature' and recognize there is really no such thing as waste. We can develop effective 'closed-loop recycling systems' which minimize waste or may even generate zero waste. Indeed, as we advance to 'cradle to cradle' systems, we can recognize output from one system as a resource for another and that waste can become a resource.

Acknowledgement: Thanks to Dr S. SURESH for preparing Figure 1.

REFERENCES

- BRAUNGART, M. and McDONOUGH, W. 2009. *Cradle to Cradle: Remaking the Way We Make Things*. London, Vintage Books.
- COLINET, G., KOULOS, K., WU BOZHI, LI YONGMEI, LACROIX, D., SU YOUNG, CHAPPELLE, J., FULLEN, M.A., HOCKING, T. and BOCK, L. 2011. Agro-pedological assessment of the traditional Yuanyang rice terraces of Yunnan Province, China. *Journal of Resources and Ecology* 2. (3): 289–299.
- FULLEN, M.A. 2004. The development of sustainable cropping systems on red soils in the highlands of South China. In *The Red Soils of China: Their Nature, Management and Utilization*. Eds.: WILSON, M.J., LI, ZHENLI and XIAOE, YANG. Dordrecht, Springer, 261–274. (on behalf of SHASEA).
- FULLEN, M.A. 2014. Agro-environmental sustainability of the Yuanyang rice terraces of Yunnan Province, China. *Espaço Aberto, PPGG–UFRJ* 4. (1): 35–42.
- FULLEN, M.A., SUBEDI, M., BOOTH, C.A., SARBY, R.W., DAVIES, K., BHATTACHARYA, R., KUGAN, R., LUCKHURST, D.A., CHAN, K., BLACK, A.W., TOWNROW, D., JAMES, T., POESEN, J., SMETS, T., KERTÉSZ, Á., TÓTH, A., SZALAI, Z., JAKAB, G., JANKAUSKAS, B., JANNAUSKIENE, G., BÜCHMANN, C., PATERSON, G., MULIBANA, E., NELL, J.P., VAN DER MERWE, G.M.E., GUERRA, A.J.T., MENDONÇA, J.K.S., GUERRA, T.T., SATHLER, R., BEZERRA, J.F.R., PERES, S.M., ZHENG YI, LI YONGMEI, TANG LI, PANOMTARACHICHIGUL, M., PEUKRAL, S., DAO CHAU THU, TRAN HUU CUONG, TRUONG THI TOAN, JONSYN-ELLIS, F., SYLVA, J.Z., COLE, A., MULHOLLAND, B., DEARLOVE, M., CORKILL, C. and TOMLINSON, P. 2011. Utilizing biological geotextiles: introduction to the BORASSUS Project and Global perspectives. *Land Degradation and Development* 22. 453–462.
- GUERRA, A.J.T., BEZERRA, J.F.R., FULLEN, M.A., MENDONÇA, J.K.S. and JORGE, M.C.O. 2014. The effects of biological geotextiles on gully stabilization in São Luís, Brazil. *Natural Hazards*. DOI 10.1007/s11069-014-1449-0
- SUBEDI, M., HOCKING, T.J., FULLEN, M.A., MCCREA, A.R. and MILNE, E. 2009. Lessons from participatory evaluation of cropping practices in Yunnan Province, China: overview of the effectiveness of technologies and issues related to technology adoption. *Sustainability* 1. 628–661. Open on-line access at: (accessed 09/11/15).
- WANG SHUHUI 2003. *Cultivation practices, maize and soybean productivity and soil properties on fragile slopes in Yunnan Province, China*. Ph.D. thesis, The University of Wolverhampton (UK).

Strategy or disaster: New-style river regulation as an issue of national security

FERENC SCHWEITZER¹

Abstract

Protection against floods along the Tisza, Danube and their major tributaries have become an issue of state security significance since nearly 2.5 million lives are affected. The floods of 1999 and 2000 on the Tisza and the 2013 flood on the Danube demonstrated that the 150-year-old system was corrected at the expense of outstanding financial investment and human effort although it is clear that the flood-protection structures built observing contemporary prescriptions are not able to provide the necessary protection. With the rising flood levels and other reasons (including climate change, tectonic movements, changes in river mechanism and others), their protection potential will be further reduced in the future. The warning signs are getting more and more frequent. Since 1864 there have been almost 30 disastrous floods on the Tisza alone. Over the past quarter of a century there happened ten high floods, during which the flood-control system could not ensure the safe conveyance of flood waves. The changes on the Danube were also very remarkable in spite of the major water engineering interventions along the Hungarian section of the river.

Keywords: river regulation, national security, floods, Tisza, Danube

Introduction

About one-fourth of the territory of Hungary is floodplain area, protected by 4,220 km of flood-control dykes. The streams are divided between the systems of two major rivers, the Tisza and the Danube. In the areas endangered by floods 2.5 million people live on almost 700 settlements. This geomorphological surface accommodates almost 32% of railways, 15% of public roads and more than 2,000 industrial plants. Such structures are located encircled by 19,000 to 20,000 km² of valuable agricultural land. The large-scale flood regulation works following the formation of the Tisza Valley Flood Regulation Association in 1846, primarily the construction of dykes along the Danube, the Tisza and their major tributaries, changes of the alignment of main channels, the creation of side-branches and main defence lines confining floodways, the establishment of artificial channel sections,

the cut-off of bends, the drainage of swamps, the improvement of navigation conditions, the prevention of ice-jam and ice-free floods and investments observing water management and land utilization aspects were the most comprehensive activity of nature transformation in Europe of that time and also the largest-scale regional development programme in Hungary to date.

After 150 years it became clear that the concept was not correct in all aspects due to political and economic decision making, for instance, setting navigation goals allowing too narrow active floodplains, draining swamps on the lower floodplain levels, prioritizing the interests of large-scale agricultural cultivation, deficient design and implementation of main canals (IHRIG, D. 1952). We are aware that since then the stability of embankments has been reduced, the transport capacity of large rivers has increased after regulation, current velocities have increased, low-water

¹DSc, research professor emeritus. Geographical Institute, Research Centre for Astronomy and Earth Sciences HAS, H-1112 Budapest, Budaörsi út 43. E-mail: schweitzer.ferenc@csfk.mta.hu

beds have incised deeply and deeper channels have led to the sinking of the groundwater table, which – according to PÁLFAI, I. (2004) – increased susceptibility to drought. We also know that the narrowing of the low floodplain level within dykes results in rapid sedimentation on the active floodplain, the surface of which rises and, thus, the levels and durations of floods of equal height are increased.

The Trianon Peace Treaty dissected the unified flood-control system of historical Hungary. As a consequence, Hungary became defenceless as far as water management is concerned and exposed to floods. River regimes in the catchments encircled by the Eastern Alps and the Carpathians could not be influenced.

Before 1976 the primary measure of flood security was the difference between the highest flood level observed to date and the height of embankment crown. Since 1976 this value is only registered for some river sections. The desirable difference was raised from 70 cm in 1852 to 100–150 cm in 1934, when the dimensions of the minimum dyke cross-sections were also specified. The average difference for the Tisza River was 100–120 m in 1956 and its minimum was above 70 cm along the whole length of the river. Today the average is below 40 cm and over more than a hundred kilometres long section it is below 20 cm. As a consequence, during the 2000 flood a temporary dyke had to be built along a 155-km-long section of the Middle Tisza and the existing dykes had to be raised (SCHWEITZER, F. and NAGY, I. 2011).

Since 1960 the afforestation of active floodplains began, summer dykes and resorts appeared, arable and grazing lands were abandoned and invasive plants (like false indigo, *Amorpha fruticosa*) started to spread. All these contributed to the rapid rise of flood levels and increased floodplain sedimentation.

Discussion

The water management investments in dyke construction have a lasting impact, for decades or even centuries. Replacements are slow and

costly to accomplish. For instance, the active floodplain of the Körös Rivers was designed to have only 50–70 m width in the late 19th century. Beyond the Hungarian-Romanian border, however, floodplain width is 150–200 m. Therefore, water is funnelled into the narrow sections, flood waves pile up and result in dam breaching, boil activity and excess water inundations. To mitigate this hazard the active floodplain in Hungary should be broadened through the backward placement of flood-control dykes (SCHWEITZER, F. 2001).

Engineering interventions are not able to fully eliminate problems. Regional development and landscape rehabilitation are outstanding tasks. In order to prevent disasters political decisions are indispensable. It is to be noted that in dry periods the awareness of flood risk is greatly reduced in the general public and among most of the political leaders. However, when floods occur again, like in November 1998, when 17 dry years were followed by flood and led to catastrophic situation on the Upper Tisza, opinions and attitudes have to be rethought, even by those who refute the existence of flood hazard.

On the catchments of rivers in Hungary – with special regard to natural and economic processes in the active floodplains – flood levels can rise significantly. The reduction of flood conductivity of the floodway amounted to 3 cm per year for the period 1970–2010 (SCHWEITZER, F. and NAGY, I. 2011).

In the drainage basin of the Tisza River, e.g. on the upper section in the Carpathian foreland, there were 19 destructive floods after 1947 (VÁGÁS, I. 1982, 1984). Researchers see the cause of this in unmerciful deforestation, mining activities and, as a consequence, common landslides and soil erosion inducing enhanced sediment transport. Although the significance of deforestation is debated by some, I. SZIKURA (personal communication, 2001), a professor of botanic at the Uzhgorod National University emphasizes that the forest foliage intercepts up to half of rainfall, reduces snowmelt to half and increases the amount of infiltration and storage of water in the soil. The fact is also important to note that in the North-Eastern Carpathians the upper timber line has moved 200–300 m lower.

The sediment transport capacity of rivers in the Carpathian Basin has ever been large. Even the settlement on the isolated higher floodplain levels rising above the low floodplain level were occasionally inundated by floods because on the low levels around them silts accumulated. Along the present-day Tisza River, the divide surface of NE to SW alignment, built up of loess and loess-like deposits, was dissected by high flood discharges, e.g. at the breach of the Mirhó Stream. These locations could have been sites of channel changes of the Tisza during floods. Between them the paleochannels of the Tisza can be detected (Figure 1) showing huge meanders filled continuously with excess water (Figure 2).

Very rapid urbanization in the drainage basin further enhanced the natural rate of sediment transport over the 150 years of flood defence and sedimentation accelerated on certain sections, manifested in the accu-

mulation of point-bars and natural levees. The consequence was that the heights of the dykes had to be raised time after time, since 1850 on 5–6 occasions (Figures 3 and 4).

If nothing changes, they have to be raised further (SCHWEITZER, F. 2001). In the active floodplain of the Tisza River the accumulation of sediment has reached 200–240 cm south of Szolnok and 400 cm on the Vajdaság (Vojvodina) section in Serbia, while along the Körös rivers accumulation amounted to 140–160 cm. The rapid growth in the rate of sedimentation in the active floodplain is indicated by the distribution of ^{137}Cs in the cross-section at Szolnok (BRAUN, M. *et al.* 2001) (Photo 1). Since the Chernobyl nuclear accident (1986) sedimentation estimated from the concentration of ^{137}Cs activity is 30–35 cm until 2000. In author's opinion this rapid sedimentation affects the water levels of lakes in Hungary, including Lake Balaton.

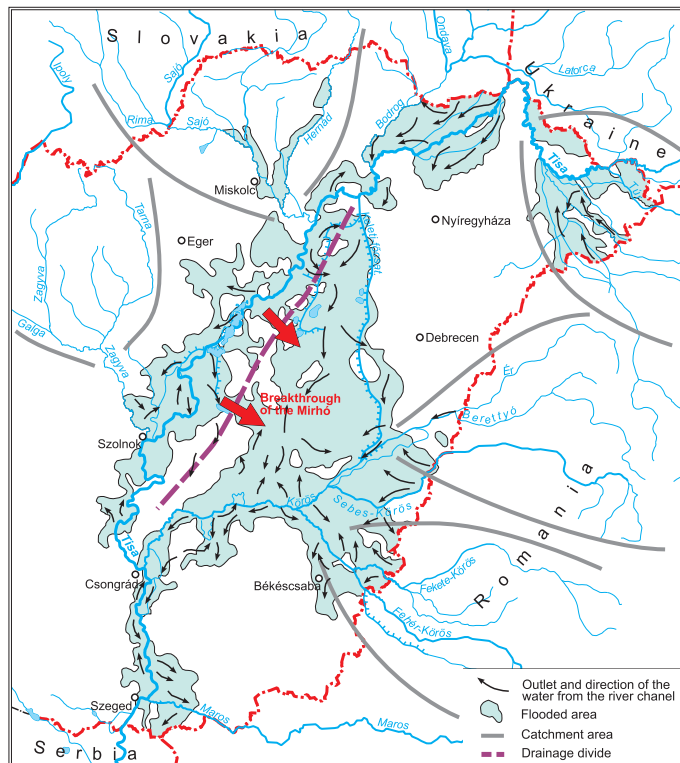


Fig. 1. Waterlogged areas in the Tisza valley prior to water regulation (edited by SCHWEITZER, F. 2000)

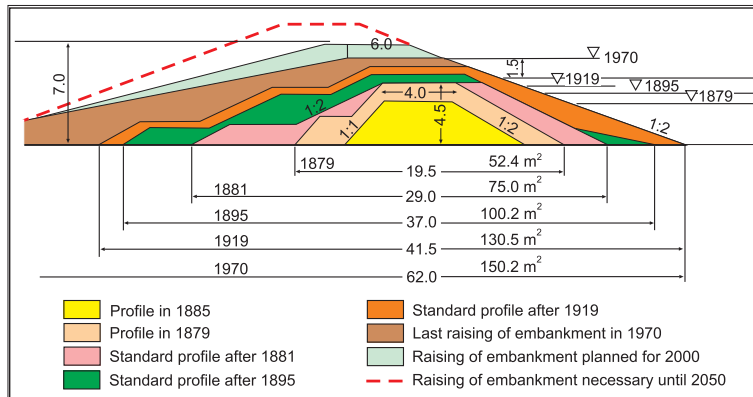


Fig. 4. Rise of the embankments (edited by SCHWEITZER, F. after VÁGÁS, I. 1982)

In the active floodplains of rivers huge amounts of sediment arriving from the catchments are deposited. Evidenced by the history of dykes along the Tisza (raised on 6–7 occasions), the further heightening of flood-control embankments is no long-term solution (SCHWEITZER, F. 2009).

The floodways are less and less suitable to conduct floods of both the Danube and the Tisza. In 2000, when the largest ever flood passed down on the Tisza, the flood discharge was only slightly higher than in 1970.

Maximum flood level, however, was at 1,041 cm at Szolnok, 1.5 m higher than before. The only explanation lies in the deterioration of flood conductivity caused by sedimentation in the active floodplain (Table 1).

Unfortunately, this process has been neglected in flood hazard research. Disregarding sedimentation, dyke heights had to be raised in every 20–25 years over the last 150 years (SCHWEITZER, F. 2000; NAGY, I. *et al.* 2001). If this deterioration continues, the high flood waves of the last decades will return within



Photo 1. Section South from Szolnok with intense floodplain sedimentation. – 1 = alluvial meadow soil formed prior to flood control; 2 = 200–230 cm thick siltation; 3 = 30–40 cm thick sediments deposited between 1986 and 2000. (Photo by SCHWEITZER, F. 2001)

Table 1. Maximum flood levels at river gauges of the Middle Tisza region in 1999 and 2000

Gauge	1999 maximum in cm	1999 maximum related to design flood level, cm	2000 maximum, cm	1999 maximum related to design flood level, cm	Growth of maximum flood levels compared to pre-1999 period, cm
Tiszafüred	835	+21	881	+67	93
Kisköre	978	+47	1,030	+99	122
Tiszaroff	1,033	+39	1,088	+94	130
Tiszabó	1,023	+19	1,080	+76	131
Szolnok	974	+13	1,041	+80	132
Martfű	926	+3	1,003	+80	115
Tiszaug	844	-36	932	+52	89
Csongrád	891	-80	994	+23	59

Source: NAGY, I., KÖTIVIZIG, 2001.

15–20 years. This can only be prevented by governmental interference.

Sedimentation in active floodplains is considerable and will lead higher and higher flood levels in the future, as it can be seen on the example of the Tisza, Danube or Körös rivers. A new flood-control concept is also necessary for the Danube which would employ new approaches to flood-level reduction (e.g. floodway reconstruction, water diversion, storage and others) and the raising of the design height of dykes only where the previous techniques remained unsuccessful. In many places of the floodways of large rivers it is visible that the zones where floods are conveyed unhindered are significantly reduced through groynes, higher summer dykes (levees), forestation or housing development (Figure 5).

Dense vegetation in the floodway and next to the channel promotes the settling out of sediment load. Therefore, if this geomorphic process is neglected, higher flood levels are to be expected in the future. Within a reasonable time there is no real chance for a new flood channel to form and the opportunity for raising dykes and building reservoirs in the low floodplain level is restricted or even excluded by both engineering and financial considerations. In addition to these three options, a fourth one has to be mentioned: the preparation of society for a new-style river regulation, establishment of new channels.

Since the beginning of river regulation efforts 150 years elapsed. Since then the active

floodplains have filled up, narrowed and higher and higher floods of increasing frequency and duration are predicted, primarily as a consequence of sedimentation in active



Fig 5. Shrinkage of active floodplain of Tisza in Serbia due to the construction of levees (eds: NAGY, I. and SCHWEITZER, F. 2011 by using Google Earth images)

floodplains and developments in the embayments of low floodplain levels, along the Danube at Pilismarót, Pomáz, Békásmegyer, Káposztásmegyer (Budapest) and Adony and along the Tisza in the environs of Szeged and Hódmezővásárhely. The plans and decisions of new river regulation have to be made soon. The Department of Geomorphology, Geographical Research Institute, Hungarian Academy of Sciences, and the author of the present paper have prepared, based on geomorphological and hydrogeographical investigations such plans for flood control along the Danube at Budapest, Paks and Komárom, for the Tisza at Szeged or for Lake Balaton.

Intensive urbanization in the Balaton catchment, the refilling of the karst reservoir in the wake of closing bauxite mines since the 1990s and the re-emergence of karst springs will increase the amount of water stored in Lake Balaton. A turning point in the development of the region was the construction of the southern railway. Its planners designed the track at 107.7 m elevation, higher than maximum lake water level. In the winter of 1860 raised water level and ice accumulation destroyed the railway track. As a reaction, the Balaton shore was enforced, some sections – particularly on the southern shore – were filled up, reclaimed areas protected by stone revetments were allotted for development. Datings by ^{137}Cs show that the lake bottom was affected by sedimentation of almost 20 cm since the beginning of nuclear experiments (1953) and another almost 10 cm since the Chernobyl event (1986). Therefore, in the future the Siófok Sluice, already existing in Roman times, and the Sió canal is to be supplemented with a new outlet, gravitationally conducting water into the Mura River during floods (SCHWEITZER, F. 2014).

Conclusions

The study of flood levels shows that the rise has considerably accelerated and the height of flood waves surpassed the crown of the embankment along more than 200 km length

of the Tisza (NAGY, I. *et al.* 2001). As a result of the deteriorated conductivity of flood channels, for instance, the growth of flood waves on the Tisza between 1970 and 2013 reached 2–3 cm per year. This can be observed on the Danube, where average increase amounted to 1.40 cm per year between Vác and Budapest over the same period, on the Körös, where it was 1.60 cm per year at Békésszentandrás since 1890 and in case of the Ipoly. In practice it means that if the 2000 Tisza flood were repeated today, the flood channel would not be able to convey that flood wave and only the emergency reservoirs could give some hope to avoid disaster. The marked rise of flood levels could be interpreted as warning for the Danube too as 20–25 cm sedimentation is expected in the active Danube floodplain in the Danube Bend, north of Budapest, in the next 10 years (Figure 6).

The key to flood control in Budapest, a city of 1.8 million, inhabited from Roman times, is river regulation. The main channel of the Danube crosses the city in 31 km length. Together with the banks of tributaries the length of flood-control dykes amounts to 83.6 km. As attested by written documents available since 1112, flood hazard has ever belonged to city life. The greatest disaster was the ice-jam flood of 1838 (Figure 7).

After the flood plans for not only the Danube section of Pest-Buda, but for all major rivers in Hungary were prepared and submitted to the government. Naturally, lack of financing in times of the revolution and war of independence prevented the implementa-

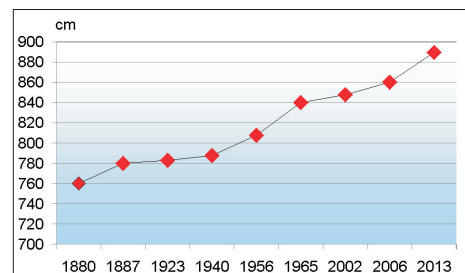


Fig. 6. Rising of peaks of largest ice-free flood levels on the Danube section at Budapest between 1880 and 2013 (completed after DÉGEN, I.)

REFERENCES

- BRAUN, M., DEZSŐ, Z. and HADADY, Gy. 2001. *A Tisza balpart, Szolnok övzátóny fejlődésének rekonstrukciójáról* (On the reconstruction of the natural levee at Szolnok, left bank of the Tisza River). Debrecen, Manuscript.
- IHRIG, D. 1952. *A magyar vízszabályozás története* (History of river regulation in Hungary), Budapest, VITUKI.
- KÁROLYI, Z. 1960. A hordalékmozgás jellegzetességei folyók medrében (Characteristics of sediment movements in river channel). *Hungarian Geographical Bulletin / Földrajzi Értesítő* 9. (1): 90–96.
- NAGY, I., LIGETVÁRI, F. and SCHWEITZER, F. 2010. Tisza river valley: future prospects. *Hungarian Geographical Bulletin* 59. (4): 361–370.
- NAGY, I., SCHWEITZER, F. and ALFÖLDI, L. 2001. A hullámtéri hordalék-lerakódás (övezátóny) (Sedimentation on active floodplain, natural levee formation). *Vízügyi Közlemények* 83. (4): 539–564.
- PÁLFAI, I. 2004. *Belvizek és aszályok Magyarországon* (Excess water and drought periods in Hungary). Budapest, KVM.
- SCHWEITZER, F. 2000. A magyarországi folyószabályozások geomorfológiai vonatkozásai (Geomorphological aspects of river regulation in Hungary). *Hungarian Geographical Bulletin / Földrajzi Értesítő* 50. (1–4): 63–72.
- SCHWEITZER, F. 2009. Strategy or disaster: flood prevention related to issues and actions in the Tisza River Basin. *Hungarian Geographical Bulletin* 58. (1): 3–17.
- SCHWEITZER, F. and NAGY, I. 2011. Döntési kényszer a hazai árvízvédelemben (Force to make decisions in the flood protection of Hungary). In *Katasztrófák tanulságai*. Ed.: SCHWEITZER, F. Budapest, MTA CSFK Földrajztudományi Intézet, 13–68.
- TAKÁCS, K. 2009. Ha a jég az úr: jeges árvizek a Dunán. (When the ice is the lord: icy floods on the Danube). *A Földgömb* 2. 60–69.
- VÁGÁS, I. 1982. *A Tisza árvozei* (Floods of the Tisza river). Budapest, VÍZDOK.
- VÁGÁS, I. 1984. A folyók vízhozamának és vízállásának kapcsolatai (Water discharge and water stage on rivers). *Hidrologiai Közlemények* 64. (3): 142–147.

ADDITIONAL SOURCES

- LÓCZY, D., FÁBIÁN, Sz.Á. and SCHWEITZER, F. 2008. River action and landslides in Hungary. In *Issues in geomorphology and environment*. Eds.: BASU, S.R. and DE, S.K. Kolkata, ACB, 1–15.
- MOSONYI, E. 1999. A mértékadó árvíz. (The design flood stage). *Vízügyi Közlemények* 81. (2): 201–220.
- SCHWEITZER, F., BALOGH, J. and KIS, É. 2008. Hullámterek vizsgálata a Dél-Alföldön. (Studies on flood plains in southern areas of the Hungarian Lowland). *Hungarian Geographical Bulletin / Földrajzi Értesítő* 57. (1–2): 111–123.
- SOMLYÓDY, L. (ed.) 2000. *A hazai vízgazdálkodás stratégiai kérdései*. (Strategical questions in water management in Hungary). Budapest, MTA Vízgazdálkodási Tudományos Kutatócsoport.
- VARGA, M. and VÁRADI, J. 2010. *Vízvisszatartás - tározás - vidékfejlesztés: javaslatok a vízgazdálkodás hosszú távú fejlődési irányjaihoz*. (Water-retention – storage – rural development: recommendations to long-term development directions of water management). Budapest, MTA Történettudományi Intézet.

Ukraine in Maps

Edited by: **KOC SIS, K., RUDENKO, L. and SCHWEITZER, F.**

*Institute of Geography National Academy of Sciences of Ukraine
Geographical Research Institute Hungarian Academy of Sciences.
Kyiv–Budapest, 2008, 148 p.*

Since the disintegration of the USSR, the Western world has shown an ever-growing interest in Ukraine, its people and its economy. As the second-largest country in Europe, Ukraine has a strategic geographical position at the crossroads between Europe and Asia. It is a key country for the transit of energy resources from Russia and Central Asia to the European Union, which is one reason why Ukraine has become a priority partner in the neighbourhood policy of the EU. Ukraine has pursued a path towards the democratic consolidation of statehood, which encompasses vigorous economic changes, the development of institutions and integration into European and global political and economic structures. In a complex and controversial world, Ukraine is building collaboration with other countries upon the principles of mutual understanding and trust, and is establishing initiatives aimed at the creation of a system that bestows international security.

This recognition has prompted the Institute of Geography of the National Academy of Sciences of Ukraine (Kyiv) and the Geographical Research Institute of the Hungarian Academy of Sciences (Budapest) to initiate cooperation, and the volume entitled “Ukraine in Maps” is the outcome of their joint effort. The intention of this publication is to make available the results of research conducted by Ukrainian and Hungarian geographers, to the English-speaking

public. This atlas follows in the footsteps of previous publications from the Geographical Research Institute of the Hungarian Academy of Sciences. Similar to the work entitled South Eastern Europe in Maps (2005, 2007), it includes 64 maps, dozens of figures and tables accompanied by an explanatory text, written in a popular, scientific manner. The book is an attempt to outline the geographical setting and geopolitical context of Ukraine, as well as its history, natural environment, population, settlements and economy. The authors greatly hope that this joint venture will bring Ukraine closer to the reader and make this neighbouring country to the European Union more familiar, and consequently, more appealing.

Ukraine in Maps



Price: EUR 35.00

Order: Geographical Institute RCAES HAS Library
H-1112 Budapest, Budaörsi út 45.

E-mail: magyar.arpad@csfk.mta.hu

Changing nature of Pleistocene interglacials – is it recorded by paleosoils in Hungary (Central Europe)?

GYÖRGY VARGA¹

Abstract

Based on stable isotope analyses of worldwide reference curves, it has long been apparent that duration, intensity and climatic conditions of Pleistocene interglacial periods were significantly diverse. As a consequence of negligible fresh, detrital material admixture during interglacials, the soil formation intensity and maturity of various kinds of past soils have been holding vital information on the environmental conditions at the time the soils formed. This, in turn, means that several physicochemical properties of soils allow us to reconstruct past climatic regimes. Loess-paleosol sequences in Hungary (Central Europe) provide insight into the cyclic nature of glacial-interglacial variations of the last 1 million years. The paleosoils have been recognized as the product of warmer and moister interglacials, when the (glacial) loess material was altered by chemical weathering and pedogenic processes. The gradual change from oldest red Mediterranean soils via forest and forest-steppe soils to steppe soils represents well the continuous decrease of chemical alteration of interglacial paleosoils determined by environmental factors and duration of soil formation. Pedogene units from MIS-21 to MIS-5 strata were analysed in the course of this study. Major element analyses were carried out to get a proper picture on the paleoenvironmental conditions. Geochemical transfer functions have been applied to derive mean annual precipitation and mean annual temperature. These kinds of quantitative data on past climate and the stratigraphic data allow us to fit our pedostratigraphic units into a global context. The present paper is aimed at providing new information on the various climatic and environmental characteristics of Pleistocene interglacial periods and soil forming processes.

Keywords: Pleistocene, interglacial, paleosoils, Hungary

Introduction

Recognition of past climatic changes plays a crucial role in deeper understanding of natural variability of Earth system processes. This is especially true nowadays when we would like to know more about the nature and dynamics of present climate change and about the anthropogenic influence on these variations.

Pleistocene glacial-interglacial variability represents two major opposite states of long-term climatic regimes with short transitional periods. Based on stable isotope analyses of worldwide reference curves from deep sea, ice core and speleothem records, it has long

been apparent that duration, intensity and climatic conditions of different interglacial periods were significantly diverse. By the identification of driving forces leading to warm-humid periods and reconstruction of paleoenvironmental conditions of these interglacials could provide analogues to Holocene interglacial period and natural climate change dynamics.

Alternating loess and paleosol strata of aeolian dust deposits in the Carpathian Basin are regarded as one of the most important terrestrial archives of climatic changes of the last 1 million years in Europe (MARKOVIĆ, S.B. *et al.* 2011, 2015; ÚJVÁRI, G. *et al.* 2014). During cold-dry glacial periods characterised by

¹ Geographical Institute, Research Centre for Astronomy and Earth Sciences, Hungarian Academy of Sciences, Budaörsi út 45, H-1112 Budapest, Hungary E-mail: varga.gyorgy@csfk.mta.hu

high dust fluxes, the deposited mineral dust particles accumulated in large quantities and formed into loess deposits. Warm and moist interstadials and interglacials favoured to weathering processes and soil formation. As a consequence of negligible fresh, detrital material admixture during these intervals, the soil formation intensity and maturity of various kinds of past soils have been holding vital information on the environmental conditions that prevailed at the time of their formation. This, in turn, means that several physical and chemical properties of soils allow us to reconstruct past climatic regimes.

The detailed differentiation and climatic characterisation of past soil forming periods is limited by various kinds of problems, discussed in detail e.g. by CATY, J.A. (1988). The precise dating of soil forming periods; the detachment of climatic factors from those related to parent material or relief; the mathematical relations between soil features and climate and several other questions make these estimations difficult and tough. In case of buried paleosoils in well-dated loess sequences, however, most of these difficulties can be arranged. Paleo-geomorphological conditions of soil formation and geochemical properties of parent material are very similar in case of some long loess-paleosol series, while the duration of pedogenesis can be obtained from the proper age-depth model of the sequence. Mathematical relations between climatic factors and geochemical composition of soils have been widely investigated, and the emergence of new paleoclimate transfer functions from geochemical data provide the opportunity to quantify environmental conditions of soil formation; and so, to distinguish various kinds of warm-moist phases of the Pleistocene period (SHELDON, N.D. and TABOR, N.J. 2009). Weathering indices, major element ratios and paleoclimate transfer functions provide information on past environments (KOVÁCS, J. *et al.* 2011, 2013). According to SCHATZ, A.-K. *et al.* (2015), glacial loess samples allow also us to quantify environmental conditions that prevailed at the time of their formation, because

loess deposits can be regarded as moderately pedogenised (loessified) aeolian dust deposits (PÉCSI, M. 1990; SMALLEY, I. *et al.* 2011).

As in the course of previous studies, mainly the glacial wind-blown loess deposits have been extensively investigated, the aim of this paper is to provide new information on the various climatic and environmental characteristics of Pleistocene interglacial periods and soil forming processes.

Materials and methods

Time-frame

Pleistocene main climatic fluctuations have been controlled by the forcing of 100, 41 and 19-23 ka orbital cycles (HAYS, J.D. *et al.* 1976). The superimposition of several harmonic cycles with different wavelength and amplitude creates non-harmonic cycles, clearly visible on reconstructed summer insolation curves. The dominant orbital driver of the various long-term climatic regimes was different from time to time. In the Pliocene, the 19–23 kyr precessional cycles were the dominant, at about the onset of the Northern Hemisphere glaciation (~2.6–2.8 Ma) the obliquity-related 41 kyr cycles can be identified as the main factor, and until about 1 Ma the 100 kyr cycles became the prominent (RAYMO, M.E. *et al.* 1997; DEMENOCAL, P.B. 2004; LISIECKI, L.E. and RAYMO, M.E. 2005, 2007). The physical mechanisms driving to the change from a 41 kyr to a 100 kyr world, the so-called “Middle Pleistocene Revolution” (similarly to the Early/Middle Pleistocene transition from 19–23 kyr to 41 kyr cycles) are not well understood. However, the typical, ~100 kyr glacial-interglacial variations of the last 1 million years cannot be characterised by homogeneous and equivalent cold and warm fluctuations. Differences in the duration of interglacials have long been apparent in paleoclimate records of the Late and Middle Pleistocene.

The LR04 curve from 57 globally distributed benthic $\delta^{18}\text{O}$ records have been used as primary reference curve (LISIECKI, L.E. and

RAYMO, M.E. 2005). Odd and even marine isotope stage boundaries have been distinguished based on this database. The proxies of climatic changes of the last 800 thousand years were also archived in ice cores. The EPICA DOME C (EDC) δD record has been applied to get another independent archive of Middle and Late Pleistocene environmental variations (EPICA Community Members 2004). The climatic fluctuations of the last glacial-interglacial period can be observed more properly from the archives of Greenland ice cores. The synthetic Greenland (GL_T -syn) record, constructed from the EDC δD record, based on the bipolar-seesaw model was the third investigated reference curve to get a proper global time frame on the global climatic changes (BARKER, S. *et al.* 2011).

The three reference curves unevenly spaced in time (intervals between sampling times are different and not constant) were rescaled to equal with millennial time intervals. The amplitude of the curves was also fairly different because of the different applied paleotemperature proxies (benthic $\delta^{18}O$ vs. ice δD). Standardized values of amplitudinal scores were used to define warm (sub-)stages (interglacials and interstadials). Warm periods were determined as periods with above average mean temperature. The interglacial (interstadial) intensities were calculated from the multiplied values of duration and standardized mean values between the onset and the end of an identified warm period.

Geological setting and samples

Samples from Hungarian key-sites were collected (Dunaföldvár, Dunaszekcső, Paks, Tamási). Loess deposits in Central Europe provide insight into the cyclic nature of the last 1 million years. The intercalated paleosoils have been recognized as the product of warmer and moister periods, when the loess material was altered by chemical weathering and pedogenic processes. Wind-blown loess and loess-like deposits are widely distributed in the Carpathian Basin, covering more than

half of the area. The Upper and partly, the Middle Pleistocene loess deposits are intercalated by steppe, forest-steppe and brown forest soils, while the older pedogene horizons are different kinds; these are red, Mediterranean-type soils. Traditionally, based on its lithology, five main units have been distinguished; the Dunajváros–Tápiósüly series and the Mende–Basaharc series belong to the young loess sediments, the Paks I. and Paks II. series belong to the old loess sediments, while the oldest strata of the sequence is part of the Dunaföldvár series. This last section consists of thin loess horizons between red (Mediterranean-type) paleosols, reddish clays and loess-like deposits, underlain by aeolian red clay.

Geochemical transfer function

Soil properties are products of several different factors: climate, time, parent material, relief and organisms (JENNY, H. 1941). Degree of chemical weathering is dependent on climatic conditions, on parent material and on post depositional addition of fresh mineral dust to the weathering profile. The geochemical characteristics of Hungarian loess deposits are fairly homogeneous (ÚJVÁRI, G. *et al.* 2008) and the interglacial dust addition could have played only a minor role in the interglacial soil formation in the case of most Hungarian paleosoils. In the case of paleosoil samples from the well-dated and documented Paks loess-paleosoil series, parent material and relief conditions can be regarded similar along the whole sequence.

Thus, climate-related paleoweathering conditions have been reflected in the major elemental geochemical composition of paleosoil samples, and geochemical transfer functions can be applied to derive mean annual precipitation (MAP) and mean annual temperature (MAT) estimates. The quantitative assessment of climatic indicators relies on the selective removal of soluble and mobile elements from the soils compared to the relative enrichment of non-soluble elements. The

relationship between the XRF-based data and the climatic parameters has been obtained from precipitation, temperature and major-element data of modern soils from North America. Major element data were used as input of the paleoenvironment indicator geochemical transfer functions to quantify mean annual precipitation and temperature (for further details of the method see SHELDON, N.D. *et al.* 2002; and NORTD, L.C. and DRIESE, S.G. 2010 and the references therein).

The following functions were applied:

- MAP-1 = $-259.3 \ln(\sum \text{bases}/\text{Al}) + 759$ (SHELDON, N.D. *et al.* 2002),
- MAP-2 = $-130.9 \ln(\text{Ca}/\text{Al}) + 467$ (SHELDON, N.D. *et al.* 2002),
- MAP-3 = $221.1e^{0.0179 \times (\text{CIA}-\text{K})}$, where $\text{CIA}-\text{K} = \text{Al}/(\text{Al}+\text{Na}+\text{Ca}) \times 100$ (SHELDON, N.D. *et al.* 2002),
- MAT-1 = $46.9 (\text{Al}/\text{Si}) + 4$ (SHELDON, N.D. 2006),
- MAT-2 = $-18.5 (\text{K}+\text{Na})/\text{Al} + 17.3$ (SHELDON, N.D. *et al.* 2002),
- MAT-3 = $-2.74 \ln(\text{PWI}) + 21.39$, where $\text{PWI} = (4.2\text{Na} + 1.66\text{Mg} + 5.54\text{K} + 2.05\text{Ca}) \times 100$ (GALLAGHER, T.M. and SHELDON, N.D. 2013).

Results and discussion

The global time frame

Based on the calculations, we could estimate the exact duration of warm, soil forming periods and define warm, average and cold interglacials. According to the findings, the MIS-5e (duration: 18–20 kyr), MIS-9e (duration: 16–18 kyr), MIS-11c (duration: 26–34 kyr) and MIS-15c (duration: 14–20 kyr, but not so intense) periods provided the most suitable paleoenvironmental conditions for intense soil formation in a global context, from a theoretical viewpoint. Analyses of loess-paleosol sequences of Hungary have shown a fairly good agreement with these assumptions, but some uncertainties still exist, and most of these obscurities are connected to the older stratigraphic units (*Figure 1, Table 1*).

(Paleo)climate of the studied area

Present day climate of the region is determined by three competing climatic regimes: (1) Atlantic; (2) continental and (3) Mediterranean. The mean annual temperature is ~10.5 °C, while the mean annual precipitation is between 600 and 700 mm. To get a proper picture on past climate conditions, paleoclimate transfer functions were used, while the stratigraphic position of the paleosoils were determined based on previously published studies (PÉCSI, M. and SCHWEITZER, F. 1995; GÁBRIS, G. 2007, ÚJVÁRI, G. *et al.* 2014).

The MIS-5 pedocomplex (MF2 unit) consist of three parts at several Hungarian sites, however the pedogene units cannot be correlated unequivocally with the three MIS-5 warmer substages, due to the scarce absolute age data. The MIS-7 (BD1 and BD2) and MIS-9 (BA) stages are represented by three forest steppe soils. The MIS-11 pedocomplex (MB) and the lowermost rubefied soils MIS-19 (PD1), MIS-21 (PD2) and MIS-23 (PDK) units are thick and well-developed forest soils, formed under a more humid climate compared to the younger pedogene strata. The chronological subdivision of old paleosoils is based on the controversial position of Matuyama-Brunhes Boundary (MIS-19), the only reference point, which was placed at the last time in the uppermost part of the PD2 soil (SARTORI, M. *et al.* 1999). However, MIS-17 was a relatively cold interglacial as it was recorded by global reference curves. From a pedostratigraphic point of view, the discussed soils are well-developed, rubefied forest soils representing a warmer phase, a more intense interglacial period. The calculations resulted a mean annual temperature of 10.6–10.7 °C for these soils, while the precipitation values were ranged from 830 to 850 mm/year, suggesting that the PD1 soil cannot be formed during the cold MIS-17 stage. According to the studies of BASARIN, B. *et al.* (2014) and BUGGLE, B. *et al.* (2014) MIS-17 is represented the by V-S6 fossil Cambisol and its iron mineralogical proxies indicate lower temperature and/or more summer precipi-

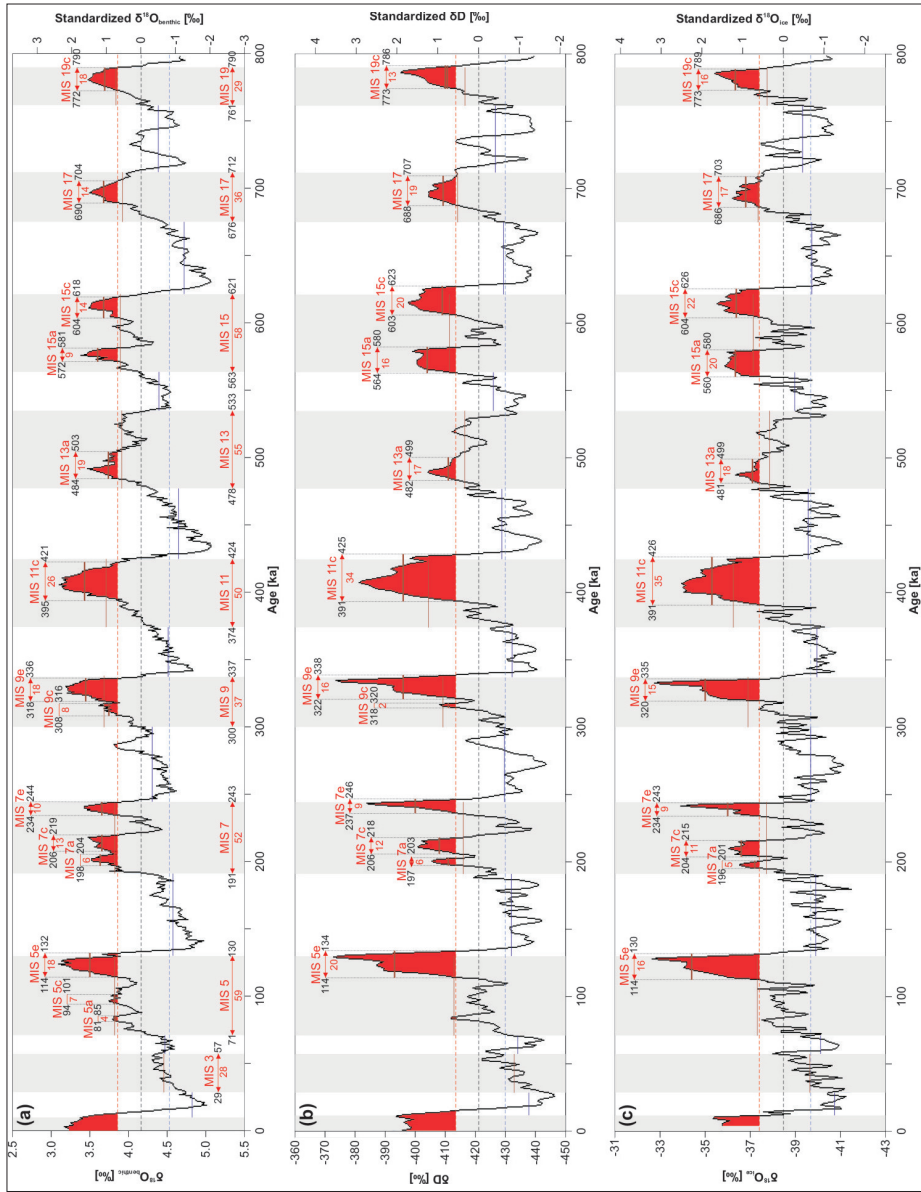


Fig. 1. Glacial-interglacial records of the last 800 kyr. Data series of the following reference curves have been used in our calculations: LR04 benthic stack; it is an average of 57 globally distributed benthic $\delta^{18}O$ records (Lisiecki, L.E. and Raymo, M.E. 2005); EDC: EPICA DOME C ice core record [δD] (EPICA Community Members 2004); GLT_syn: synthetic Greenland $\delta^{18}O$ record, constructed from the EDC record based on the bipolar-seesaw model (BARKER, S. *et al.* 2011).

Table 1. Quantified intensities and differences of Middle and Late Pleistocene interglacials based on global reference curves*

LR04 benthic $\delta^{18}\text{O}$ stack						
Age	End	Start	Duration	Mean	St_mean	Intensity
MIS 5a	81	85	4	3.84	0.70	2.80
MIS 5c	94	101	7	3.83	0.74	5.20
MIS 5e	114	132	18	3.50	1.48	26.59
MIS 7a	198	204	6	3.64	1.16	6.95
MIS 7c	206	219	13	3.65	1.13	14.73
MIS 7e	234	244	10	3.65	1.14	11.39
MIS 9c	308	316	8	3.75	0.91	7.24
MIS 9e	318	336	18	3.45	1.57	28.27
MIS 11c	395	421	26	3.41	1.66	43.26
MIS 13a	484	503	19	3.73	0.95	18.08
MIS 15a	572	581	9	3.61	1.23	11.08
MIS 15c	604	618	14	3.67	1.08	15.16
MIS 17	690	704	14	3.67	1.09	15.20
MIS 19c	772	790	18	3.69	1.04	18.63
		Mean	13.14	3.65	1.13	16.04
		St. dev. (σ)	6.19	0.13	0.28	10.79
		-1 σ	6.96	3.52	0.85	5.25
		+1 σ	19.33	3.78	1.42	26.84
		-1/2 σ	10.05	3.59	0.99	10.65
		+1/2 σ	16.24	3.71	1.28	21.44
EPICA DOME C ice core record [δD]						
MIS 5a	–	–	–	–	–	–
MIS 5c	–	–	–	–	–	–
MIS 5e	114	134	20	-393.13	2.08	41.53
MIS 7a	197	203	6	-410.88	0.76	4.54
MIS 7c	206	218	12	-407.86	0.98	11.78
MIS 7e	237	246	9	-400.19	1.55	13.96
MIS 9c	318	320	2	-410.04	0.82	1.64
MIS 9e	322	338	16	-396.04	1.86	29.76
MIS 11c	391	425	34	-396.23	1.85	62.75
MIS 13a	482	499	17	-411.16	0.74	12.52
MIS 15a	564	580	16	-404.78	1.21	19.37
MIS 15c	603	623	20	-409.30	0.87	17.49
MIS 17	688	707	19	-409.34	0.87	16.56
MIS 19c	773	786	13	-410.20	0.81	10.50
		Mean	15.33	-404.93	1.20	20.20
		St. dev. (σ)	8.15	6.69	0.50	17.14
		-1 σ	7.18	-411.62	0.70	3.06
		+1 σ	23.48	-398.24	1.70	37.34
		-1/2 σ	11.26	-408.27	0.95	11.63
		+1/2 σ	19.41	-401.59	1.45	28.77

Table 1. (continued)

GLT_syn: synthetic Greenland $\delta^{18}\text{O}$ record						
Age	End	Start	Duration	Mean	St_mean	Intensity
MIS 5a	–	–	0	–	–	–
MIS 5c	–	–	0	–	–	–
MIS 5e	114	130	16	-34.53	2.15	34.35
MIS 7a	196	201	5	-37.28	0.65	3.25
MIS 7c	204	215	11	-36.62	1.01	11.12
MIS 7e	234	243	9	-35.99	1.35	12.16
MIS 9c	–	–	0	–	–	–
MIS 9e	320	335	15	-35.04	1.87	28.07
MIS 11c	391	426	35	-35.27	1.75	61.08
MIS 13a	481	499	18	-37.08	0.76	13.60
MIS 15a	560	580	20	-36.35	1.16	23.16
MIS 15c	604	626	22	-36.37	1.15	25.21
MIS 17	686	703	17	-36.77	0.93	15.76
MIS 19c	773	789	16	-36.37	1.15	18.35
		Mean	16.73	-36.15	1.26	22.37
		St. dev. (σ)	7.80	0.87	0.47	15.54
		-1 σ	8.93	-37.02	0.79	6.83
		+1 σ	24.53	-35.28	1.74	37.92
		-1/2 σ	12.83	-36.59	1.03	14.60
		+1/2 σ	20.63	-35.72	1.50	30.15

*Colours indicate the deviation by ± 0.5 and 1σ from the mean values; abbreviations: st_mean: standardized mean; st. dev: standard deviation).

tation, an unsuitable condition for rubefied brown forest soil formation.

Contrary to the global loess-paleosoil sequences, the MIS-13 and MIS-15 soils are not so dominant in the Hungarian series. The two brown forest soils and two pseudogley soils could be located only in the Paks loess section, but their geochemical data suggest an intense weathering history. According to the calculations, the older paleosoils were formed under a warmer and moister climate compared to the younger pedogene units. The reconstructed paleoprecipitation and paleotemperature values are showing a general trend of weathering intensity decrease (Figure 2).

Conclusions

Geochemical proxies demonstrate a general decreasing chemical weathering trend over the last 800 kyr in the Carpathian Basin. This

decreasing trend could be caused by (1) less humid and mild interglacials and/or by (2) enhanced erosion of the dust source areas which has resulted an enhanced input of relatively unweathered material. It is worth noting that, the applied proxies are not capable to distinguish pre- and post-depositional weathering. The younger soils were formed completely from the underlying loess deposits of the preceding glacial periods, and there was no interglacial dust deposition or it could be neglected, while according to previous granulometric studies (e.g. VARGA, Gy. 2011), the different grain size characteristics of the older soils reflect a largely different depositional system. Interglacial dust deposition played a more dominant role during the formation of the red paleosoils; similarly to certain types of red clays.

The possibility of significant interglacial aeolian dust deposition is leading to several other questions. According to the classical

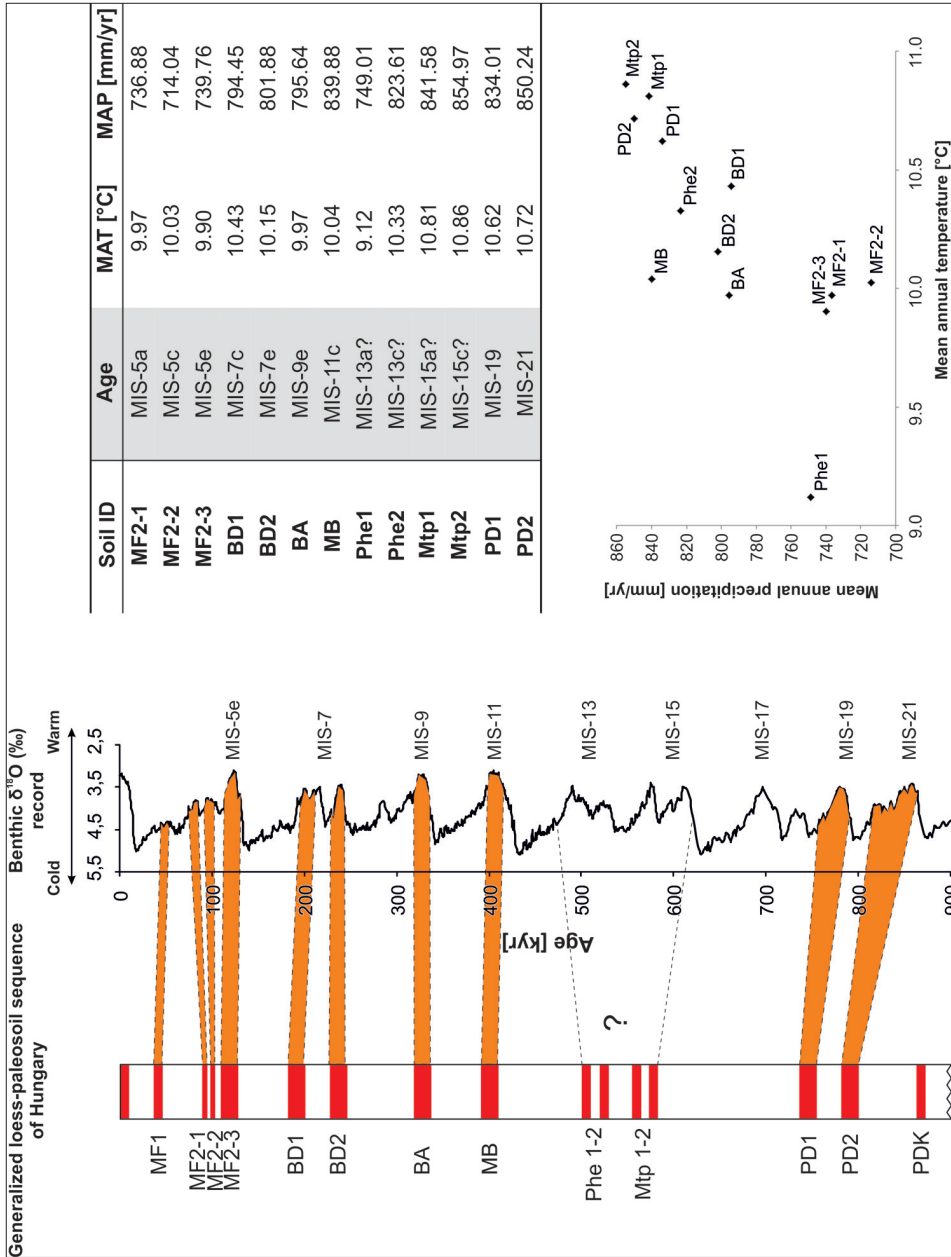


Fig. 2. Generalized loess-paleosol sequence of Hungary and its possible correlation with benthic $\delta^{18}\text{O}$ records of deep sea sediments, and the results of paleo-climate reconstructions

assumption, the loess deposits have been formed from the depositing dust material, while the paleosols developed from the underlying loess deposits by weak weathering processes. However, intensive interglacial dust accumulation claims a different kind of stratigraphic interpretation. In the first case, when the soils were formed from the underlying deposits, the last period of loess formation could not have been identified as loess layer in the sequence. In the second case, the soils form syngenetically from the falling dust, and all of the changes are represented in the stratigraphic column. From a paleoclimatic viewpoint, these glacial-interglacial shifts and abrupt warmings of glacial climax periods are one of the most interesting research topics.

The paleoprecipitation and paleotemperature data of the widely used geochemical climofunctions deserve also further reconsideration. The fine-grained populations of deposits are consisting of detrital and secondary particles; only the secondary ones provide relevant information on the environmental properties of the soil formation. By the assessment of the amount of detrital, windblown clay-minerals the result of these reconstructions could be refined significantly.

Acknowledgement: Support of the Hungarian Research Fund OTKA under contract PD108708 is gratefully acknowledged. It was additionally supported by the Bolyai János Research Scholarship of the Hungarian Academy of Sciences.

REFERENCES

- BARKER, S., KNORR, G., EDWARDS, R.L., PARRENIN, F., PUTNAM, A., SKINNER, L.C., WOLFF, E. and ZIEGLER, M. 2011. 800,000 years of abrupt climate variability. *Science* 21. 347–351.
- BASARIN, B., BUGGLE, B., HAMBACH, U., MARKOVIĆ, S.B., O'HARA DHAND, K., KOVAČEVIĆ, A., STEVENS, T., GUO, Z. and LUKIĆ, T. 2014. Time-scale and astronomical forcing of Serbian loess–paleosol sequences. *Global and Planetary Change* 122. 89–106.
- BUGGLE, B., HAMBACH, U., MÜLLER, K., ZÖLLER, L., MARKOVIĆ, S.B. and GLASER, B. 2014. Iron mineralogical proxies and Quaternary climate change in SE-European loess–paleosol sequences. *Catena* 117. 4–22.
- CATT, J.A. 1988. Soils of the Plio-Pleistocene: do they distinguish types of interglacial? *Philosophical Transactions of the Royal Society of London. Series B* 318. 539–557.
- DEMENOCAL, P.B. 2004. African climate change and faunal evolution during the Pliocene-Pleistocene. *Earth and Planetary Science Letters (Frontiers)* 220. 3–24.
- EPICA Community Members 2004. Eight glacial cycles from an Antarctic ice core. *Nature* 429. 623–628.
- GÁBRIS, G. 2007. The relation between the time scale of the Quaternary surface processes and oxygen isotope stratigraphy – according to the loess-paleosol sequences and river terraces in Hungary. *Földtani Közlemény* 137. 515–540.
- GALLAGHER, T.M. and SHELDON, N.D. 2013. A new paleothermometer for forest paleosols and its implications for Cenozoic climate. *Geology* 41. 647–650.
- HAYS, J.D., IMBRIE, J. and SHACKLETON, N.J. 1976. Variations in the earth's orbit: pacemaker of the ice ages. *Science* 194. 1121–1132.
- JENNY, H. 1941. *Factors of Soil Formation – A System of Quantitative Pedology*. New York, Dover Publications, 281 p.
- KOVÁCS, J., FÁBIÁN, S.T., VARGA, G., ÚJVÁRI, G., VARGA, G. and DEZSŐ, J. 2011. Plio-Pleistocene red clay deposits in the Pannonian basin: A review. *Quaternary International* 240. 35–43.
- KOVÁCS, J., RAUCSIK, B., VARGA, A., ÚJVÁRI, G., VARGA, G. and OTTNER, F. 2013. Clay mineralogy of red clay deposits from the Central Carpathian Basin (Hungary): Implications for Plio/Pleistocene chemical weathering and paleoclimate. *Turkish Journal of Earth Sciences* 22. 414–426.
- LISIECKI, L.E. and RAYMO, M.E. 2005. A Plio-Pleistocene stack of 57 globally distributed benthic $d^{18}O$ records. *Paleoceanography* 20. PA1003
- LISIECKI, L.E. and RAYMO, M.E. 2007. Plio-Pleistocene climate evolution: trends in obliquity and precession responses. *Quaternary Science Reviews* 26. 56–69.
- MARKOVIĆ, S.B., HAMBACH, U., STEVENS, T., KUKLA, G.J., HELLER, F., MCCOY, W.D., OCHES, E.A., BUGGLE, B. and ZÖLLER, L. 2011. The last million years recorded at the Stari Slankamen (Northern Serbia) loess-paleosol sequence: revised chronostratigraphy and long-term environmental trends. *Quaternary Science Reviews* 30. 1142–1154.
- MARKOVIĆ, S.B., STEVENS, T., KUKLA, G.J., HAMBACH, U., FITZSIMMONS, K.E., GIBBARD, P., BUGGLE, B., ZECH, M., GUO, Z., HAO, Q., WU, H., O'HARA DHAND, K., SMALLEY, I.J., ÚJVÁRI, G., SÜMEGI, P., TIMAR-GABOR, A., VERES, D., SIROCKO, F., VASILJEVIĆ, D.A., JARY, Z., SVENSSON, A., JOVIĆ, V., LEHMKUHL, F., KOVÁCS, J. and SVIRČEV, Z. 2015. Danube loess stratigraphy – Towards a pan-European loess stratigraphic model. *Earth-Science Reviews* 148. 228–258.
- NORDT, L.C. and DRIESE, S.G. 2010. A modern soil characterization approach to reconstructing

- physical and chemical properties of paleo-vertisols. *American Journal of Science* 310. 37–64.
- PÉCSI, M. 1990. Loess is not just the accumulation of dust. *Quaternary International* 7–8. 1–21.
- PÉCSI, M. and SCHWEITZER, F. 1995. The lithostratigraphical, chronostratigraphical sequence of Hungarian loess profiles and their geomorphological position. In *Concept of loess, loess-paleosol stratigraphy*. Loess InForm 3. Eds.: PÉCSI, M. and SCHWEITZER, F. Budapest, Geographical Research Institute HAS, 31–61.
- RAYMO, M.E., OPPO, D.W. and CURRY, W. 1997. The mid-Pleistocene climate transition: a deep sea carbon isotope perspective. *Paleoceanography* 12. 546–559.
- SARTORI, M., HELLER, F., FORSTER, T., BORKOVEC, M., HAMMANN, J. and VINCENT, E. 1999. Magnetic properties of loess grain size fractions from the section at Paks (Hungary). *Physics of the Earth and Planetary Interiors* 116. 53–64.
- SCHATZ, A.-K., SCHOLTEN, T. and KÜHN, P. 2015. Paleoclimate and weathering of the Tokaj (Hungary) loess–paleosol sequence. *Palaeogeography, Palaeoclimatology, Palaeoecology* 426. 170–182.
- SHELDON, N.D. 2006. Quaternary glacial-interglacial climate cycles in Hawaii. *Journal of Geology* 114. 367–376.
- SHELDON, N.D. and TABOR, N.J. 2009. Quantitative paleoenvironmental and paleoclimatic reconstruction using paleosols. *Earth-Science Reviews* 95. 1–52.
- SHELDON, N.D., RETALLACK, G.J. and TANAKA, S. 2002. Geochemical climofunctions from North American soils and application to paleosols across the Eocene-Oligocene boundary in Oregon. *Journal of Geology* 110. 687–696.
- SMALLEY, I., MARKOVIĆ, S.B. and SVIRČEV, Z. 2011. Loess is (almost totally formed by) the accumulation of dust. *Quaternary International* 24. 4–11.
- ÚJVÁRI, G., VARGA, A. and BALOGH-BRUNSTAD, Z. 2008. Origin, weathering, and geochemical composition of loess in southwestern Hungary. *Quaternary Research* 69. 421–437.
- ÚJVÁRI, G., VARGA, A., RAUCSIK, B. and KOVÁCS, J. 2014. The Paks loess-paleosol sequence: A record of chemical weathering and provenance for the last 800 ka in the mid-Carpathian Basin. *Quaternary International* 319. 22–37.
- VARGA, G. 2011. Similarities among the Plio-Pleistocene terrestrial aeolian dust deposits in the world and in Hungary. *Quaternary International* 234. 98–108.

Analysis of socio-economic indicators in the context of the regional development of Eastern Croatia

JELENA LONČAR¹ and VENI MARINKOVIĆ²

Abstract

The main goal of this paper is to analyse socio-demographic processes in Eastern Croatia. We focus especially on the structure of particular economic activities as well as population, which should be the basis of regional development. We have used several demographic and economic indicators to determine the changes that have taken place in the region. Trends in population change in the last decades, the share of industrial and agricultural workers in legal entities, the share of employed and unemployed persons in cities and municipalities, as well as the inactive population in five Eastern Croatian counties are examined. Also, agricultural indicators have been analysed, as this is one of the most important economic activities in this area. Thereby, an overview of the main trends in regional development of this area has been given, although some of the data were unavailable at the local level. Altogether, the authors have analysed 126 local units (22 cities and 104 municipalities) within five counties of the Eastern Croatian region.

Keywords: population change, regional development, economic indicators, Eastern Croatia

Introduction

The region of Eastern Croatia belongs to the underdeveloped group of regions according to the index of development (Ministarsvo regionalnog ... 2010). For this reason, the implementation of regional development policies has great significance.

Regional development is a broad term but it can also be seen as a general effort to reduce regional disparities by supporting employment and wealth-generating economic activities in such regions. In the past, regional development policy tended to try to achieve these objectives by means of large-scale infrastructural development and attracting inward investment. However, previous policies have failed to reduce regional disparities significantly and have not been able to help individual lagging regions to catch up, despite the allocation of significant public funding.

The result has been under-used economic potential and a weakened social cohesion, which is noticeable in the area today (www.oecd.org).

According to HANSEN, HIGGINS and SAVOIE (1990) regional development policy usually implies all deliberate activities that the government implements with the goal of changing spatial distribution of economic and social phenomena like population, income, government incomes, manufacturing of different goods and services, transportation infrastructure, social infrastructure and political power (HANSEN, N. *et al.* 1990).

Also, it can be said that regional economic development can be seen as both a product and a process. It is a product of economic development as well as a process, for example in the case of industry support, infrastructure, the labour force and market development (STIMSON, R.J. *et al.* 2006). Hence,

¹ Department of Geography, Faculty of Science, University of Zagreb, CR-10 000 Zagreb, Phone: +00 385 1 4895 426. E-mail: jloncar@geog.pmf.hr

² Project assistant. University of Zagreb. E-mail: marinkovic.veni@yahoo.com

cities, towns, counties and all local entities in the global economy have the challenge and opportunity of crafting their own economic destinies (BLAKELY, E. and LEIGH, N.G. 2009).

In the Republic of Croatia, the process of establishment of a regional development concept can be traced back to its occurrence in Yugoslavia after World War II, through the changes of fundamental principles and approaches to regional development policy that took place in the period of Croatian independence and at the beginning of the European integration process. Based on the characteristics of regional development policies during each period, major deficiencies and consequences for today's structural problems can be identified.

Also, the comparison of Eastern Croatian indicators (consisting of the Slavonian and Baranja regions) with indicators from some other neighboring regions, such as northeastern Bosnia and Herzegovina or Voivodina, would be interesting because they have similar characteristics, but such an analysis would be very difficult to achieve.

In the first place, since Bosnia and Herzegovina has complex administrative divisions it is impossible to attain the data that would be comparable with those in other countries. One possibility is to take the data for the whole Republika Srpska (the northeastern part of Republika Srpska borders with Slavonia and Baranja) and for the District of Brčko, and compare it with Eastern Croatian cities and municipalities. But in this case, the area does not have similar characteristics and would not be comparable. Also, the land utilisation data in the region of Voivodina (Serbia) are not from the same year as those used in this paper, which means that they are incomparable with the data for Eastern Croatia.

Theoretical and methodological framework

The problems of regional development and regional policy are two of the most impor-

tant issues in Croatia today. They are part of governmental strategies for economic growth and recovery, but they are also the focus of scientists of different affiliations. Policy makers should be able to view economic and social realities through the lens of the correct geographic scale to identify appropriate policy packages (OECD 2014).

The authors will try to emphasise the importance of strategies and development plans in the context of regional development as identifying and promoting connections between economic, environmental and social goals, which should be beyond administrative boundaries (OECD 2014). Also, as data for Croatia as a whole is usually analysed in most scientific papers, authors consider that detailed analysis at the level of regions, and especially at the level of cities and municipalities, is necessary to fully understand the economic-geographic processes that characterise this area. Accordingly, we try to analyse demographic and economic problems at the local level, as they are more obvious than those at the county or state level.

In an attempt to establish to what extent changes in population and economic-geographic conditions have influenced the region of Eastern Croatia, we have established three hypotheses:

1. The contemporary characteristics of demographic structures and trends are considered as one of the most important limiting factors of regional development in the region of Eastern Croatia.

2. There are significant demographic and economic structural differences between the local administrative units of Eastern Croatia, among which larger cities stand out especially as the cores, and smaller, demographically and economically weaker municipalities represent the rural periphery of this region.

3. The advantages of Eastern Croatia for stronger regional development have not been fully utilised. This especially refers to agriculture as one of the most important traditional and contemporary activities, primarily due to the favourable natural conditions in this area.

Analysing official data from the Croatian Bureau of Statistics, we try to gain insights into the main features of demographic and economic trends in the area of Eastern Croatia through:

- The characteristics of Eastern Croatian population dynamics and structures, analysed through general population trend from 1953 to 2011 on the regional level, the index of population changes in the period of 1953–2011 at the local level and the index of ageing in 2011, in order to indicate the main demographic trends in this area.
- The number and share of employed persons in industry in legal entities at the local level.
- The percentage of (un)employed persons at the local level.
- The inactive population in the counties.

Regional development policies in Croatia

The attempt to establish a regional development policy at the beginning of Croatian independence was based on determining the areas with a preferred position within the state. In the 1990s, Croatia did not have a coherent regional developmental strategy, concept or policy. The territory of 20 counties, 268 cities and municipalities (49% of the total number of local units) was specified by 4 acts of parliament as areas of special state care. These acts were: the law on special areas under government protection (NN 44/96), the law on hilly-mountainous areas (NN 12/02), the law on islands (NN 34/99) and the law on the reconstruction and development of the City of Vukovar (NN 44/01) (STARČ, N. and RAŠIĆ, V. 2003). However, the effects of the above laws were not at the expected level, as it has been indicated by the contemporary economic and social trends. The first significant document on the issue of regional development in Croatia was *The concept of the regional economic development of Croatia*, published by the Economic Institute on the initiative of the Ministry of Economy in 1999 (ČAVRAK, V. 2002).

The awareness of the importance of regional development in overall Croatian development was increasingly strengthened at the beginning of the European integration process in 2001. Croatia has further increased activities in the field of regional development by adopting new legislature and strategic documents and also by establishing new institutions. Accepting the concept of European regional policy, which enabled the use of pre-accession funds intended for regional development projects, a special institution was established in 2008 that should participate in achieving a more balanced regional development. It was based on the sustainable management of natural resources. Also, the Agency for Regional Development was established in the same year to implement regional development programs and projects.

Although in terms of regional development, Croatia has been conceptually and institutionally moved away from its initial phase, the expected impact is still lacking. Many analyses indicate contemporary divergent trends in the concentration of population and the economy, which is the case in the Eastern Croatian region as well.

Means of regional development

Main means of regional development include the adopted legal acts and the development strategic documents that prescribe and define the objectives and measures of regional development policy. The basis of regional development policy is defined by the Regional Development Law (NN 153/09)³. It determines the goals and principles of regional development management in Croatia. It prescribes necessary planning documents, appoints competent state entities and classifies the development stages of different spatial units. Also, the law prescribes the adoption of regional planning documents at the national level (Regional Development Strategy of the

³At the end of 2013, a draft of the Regional Development Law was introduced to the public as an update to the former Regional Development Law enacted in 2009.

Republic of Croatia, 2011–2013) and regional level (county development strategies). It is also in line with practice and requirements that derive from Croatian pre-accession obligations towards the EU. This law poses a few very important facts:

1. Induct the practice of partnership as the main method of working to shape regional development policy and as the basic institutional structure that will enable participatory work methods such as this.

2. Introduce a unique model of evaluation and classification of regional and local units according to degrees of development and a unique system of criteria for the selection of areas with developmental difficulties.

3. Define the main planning documentation that programmes regional development through conciliating and unifying development in the entire Croatian development policy.

4. It clearly defines the role and responsibility of regional development policy host at the state level.

5. It clearly defines the role and responsibility of regional development policy host in conception and leadership.

6. It institutionalises the principles and management of regional development policy and introduces unique terminology.

7. For more efficient planning and monitoring of the functionality of regional policy, it identifies the central electronic base of development projects.

In the Strategy of Regional Development (2010), regional development policy is defined as the *entirely adjusted agglomerate of goals, priorities, measures and activities aimed at strengthening the competition of regional and local units according to principles of sustainable development and decreasing regional inequalities according to the degree of development*. The Regional Development Policy in Croatia is defined by specific laws and it is mostly focused on the local level.

Also, part of the non-specific assistance is included in the law on government support for agriculture and fishery (Law on Government support for Agriculture and

Rural Development); the law on the promotion of investment; and the law on the promotion of development for small entrepreneurship. These three laws are not only for areas facing difficulties in development, but also for the Republic of Croatia in general.

An important tool for classifying the heterogeneity and regional differences of spatial units in Croatia is the development index. It classifies administrative units in comparison with the national average using income per capita, the unemployment rate, citizens' source income in different counties and/or municipalities, population trends and educational levels as relevant criteria. However, new tools are needed to understand what influences the places where people live and work (OECD 2014).

Croatian NUTS II classification as EU regional development instrument

The Bureau of Statistics determined Croatia's NUTS classification in 2002 with EUROSTAT's help and recommendations. All of Croatia is classified as one NUTS I region, while NUTS III regions are counties and NUTS V entities are cities or municipalities. However, problems occurred during the determination of NUTS II regions, because the county level (NUTS III) was too small and the level of Croatia as a whole (NUTS I) was considered to be too big. On the other hand, most European regions are monitored and analysed at the NUTS II level. Regional development and the use of the EU structural funds are expected at this level. It is also a basic framework for the implementation of regional policy and the standard level of data availability.

Through a new statistical classification in 2012 by the Ministry of Regional Development and EU funding bodies, Croatia was divided into two NUTS II regions: Continental and Adriatic Croatia. Continental Croatia consists of 13 counties (Zagreb, Međimurje, Varaždin, Krapina-Zagorje, Bjelovar-Bilogora, Koprivnica-Križevci, Virovitica-Podravina,

Osijek-Baranja, Požega-Slavonija, Slavonski Brod-Posavina, Vukovar-Sirmium, Karlovac, and Sisak-Moslavina counties) and the City of Zagreb. It has 64.1 percent of the 27 EU countries' GDP. Adriatic Croatia consists of 7 counties (Lika-Senj, Primorje-Gorski Kotar, Istria, Zadar, Šibenik-Knin, Split-Dalmatia and Dubrovnik-Neretva counties), and has 62.1 percent of the 27 EU countries' GDP.

This kind of statistical division enables the use of resources from the Structural Funds with the highest benefits to all Croatian regions. Also, it facilitates the implementation of development projects following the same rules in the entire territory of the Republic of Croatia (Ministry of Regional Development and EU funds). Observed in terms of European NUTS II classification according to the division from 2012, Eastern Croatia belongs to the statistical region of Continental Croatia, which has about 62 percent of the 27 EU countries' GDP. However, it is generally known that Eastern Croatian counties have a significantly lower average GDP because other, more developed counties of Central Croatia also belong to this NUTS II region (City of Zagreb, Zagreb County etc.), which raise the average.

Demographic characteristics as a factor of economic development

As population is the most important factor of regional development planning, it is necessary to consider recent demographic processes and structures in terms of identifying the main problems and to evaluate population resources in the Eastern Croatian region. Large differences between particular parts of Eastern Croatia are expressed in terms of population, especially between urban and rural areas, mostly as a result of 'de-agriculturalisation', ruralisation and industrialisation after World War II.

Today, according to the 2011 Census, there are about 806,000 people living in the five counties in the Eastern Croatian region. The Eastern Croatian region's population trend

since World War II has indicated two different stages of population development. The first is characterised by the increase in the total population of Eastern Croatia until 1991 and the Homeland War. Since then a period of depopulation has taken place. However, the stagnation or decline in population was recorded in some counties in the 1981 Census (Virovitica Podravina and Požega-Slavonia counties), indicating that the process of shrinkage had already started.

The entire region of Eastern Croatia, as well as all its counties, has recorded a significant loss of population in the last three decades, the most intensive periods being the intercensal periods of 1991–2001 and 2001–2011, during which the region of Eastern Croatia lost about 170,000 people. In the last intercensal period the population decline of Eastern Croatia were about 85,000 people in total, which is about 9.6 percent of the total population of Eastern Croatia in 2001. At the same time, natural decline, together with the increased emigration of working and reproductive age groups, has led to a noticeable deterioration in the age-sex population structure of Eastern Croatia (WERTHEIMER, A. and ŽIVIC, D. 2003 (*Figure 1*).

Negative changes in the population in the last three decades has resulted in a decline of

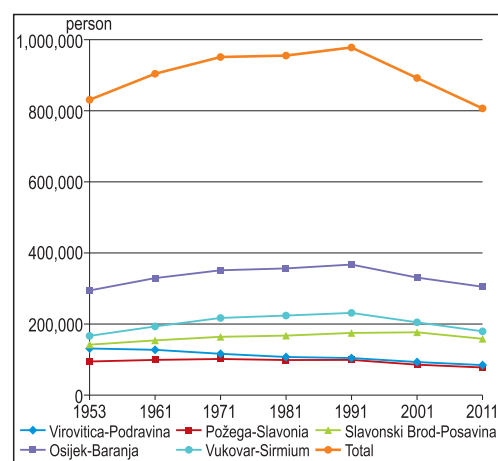


Fig. 1. Population of Eastern Croatia 1953–2011, by counties. Source: 1857–2001 Censuses, 2011 Census, www.dzs.hr

more than 170,000 inhabitants in the region of Eastern Croatia (in the 2011 Census only Dragalić in Slavonski Brod-Posavina county had minimal population growth in relation to the 2001 Census). The main causes of such an unfavourable state are the consequences of the decline in birth rates, increased mortality rates, emigration, adverse economic conditions and the consequences of war in the region of Eastern Croatia. Peripheral rural areas have suffered especially as the process of “village senilisation” has been emphasised with the emigration of younger age groups (ČIČIĆ, I. 2003). In this way, the development potential of Eastern Croatia has been significantly reduced.

The demographic changes of the Eastern Croatian local units are presented by the index of changes in the number of residents in the period of 1953–2011 in order to show the intensity and spatial distribution of depopulated areas, as well as the areas of population increase within the local units. The index values of less than 100 indicate depopulated areas in the period of 1953–2011 (*Figure 2*). Mainly, these are rural municipalities that are more distant from the urban centres in Eastern Croatia, mostly in the western and northern parts of Slavonia, especially in Podravina, Posavina and the Western Slavonian micro-regions.

The process of depopulation has been the most intensive in these areas, which reduces the possibilities of local and regional development. It is especially important to emphasise that 72 percent of all local government units in this macro-region have recorded a population decline over this period. Among them, more than one-third has recorded a decrease of 50 percent or more. For example, in 2011 the municipality of Čađavica in the micro-region of Podravina had only 27 percent of its 1953 population. On the other hand, index values over 100 represent areas with population increases in the period of 1953–2011.

Their spatial distribution indicates the population increase bigger urban areas or macro-regional and regional centres, such as the City

of Osijek (163.5%); Slavonski Brod (255.8%); Virovitica (140.7%); Požega (169.9%); Đakovo (150.9%); and Vinkovci (169.5%). Also, areas and municipalities in their surroundings recorded a population increase, for example, in the Slavonski Brod region there were increases in the municipalities of Sibiňj (114.8%) and Brodski Stupnik (110.1%); in the Osijek region in the municipalities of Darda (152.7%), Čepin (155.5%) and Antunovac (106.8%); and in the Vinkovci region in the municipalities of Ivankovo (129.6%), Nuštar (140.6%) and Andrijaševci (130.9%).

These data indicate the process of population concentration in urban centres, mostly in the large macro-region (Osijek) and other regional and county centres (Slavonski Brod, Požega, Vukovar, Vinkovci and Virovitica) in relation to the remaining rural areas of the region. Only 35 of all local units recorded a population increase in this period and among those three had a doubling of the number of residents while others had less significant increases. The macro-region of Osijek recorded an overall increase of 60 percent compared to 1953, which does not belong to the largest increase compared to other urban areas, due to the advanced suburbanisation process.

Another indicator of demographic characteristics and the region's potential is the index of ageing. It represents the ratio of the age group of 0–19 (youth) and over 60-year-olds (senior) (*Figure 3*).

Generally, a population is considered to be elderly if the index of ageing is over 40 (NEJAŠMIĆ, I. 2006). The ageing index indicates that the population of Eastern Croatia is in general very old. It is an especially remarkable phenomenon if considered at the local level. First of all, it is important to emphasise that no one of the Eastern Croatian local units had an index of ageing less than 40 in 2011. The lowest values or the most favourable ratio of youth to elderly was found in urban areas and the municipalities in their surroundings (with an index of ageing less than 80). At the same time, the oldest population was to be found in rural municipalities. In particular, the municipalities and one city

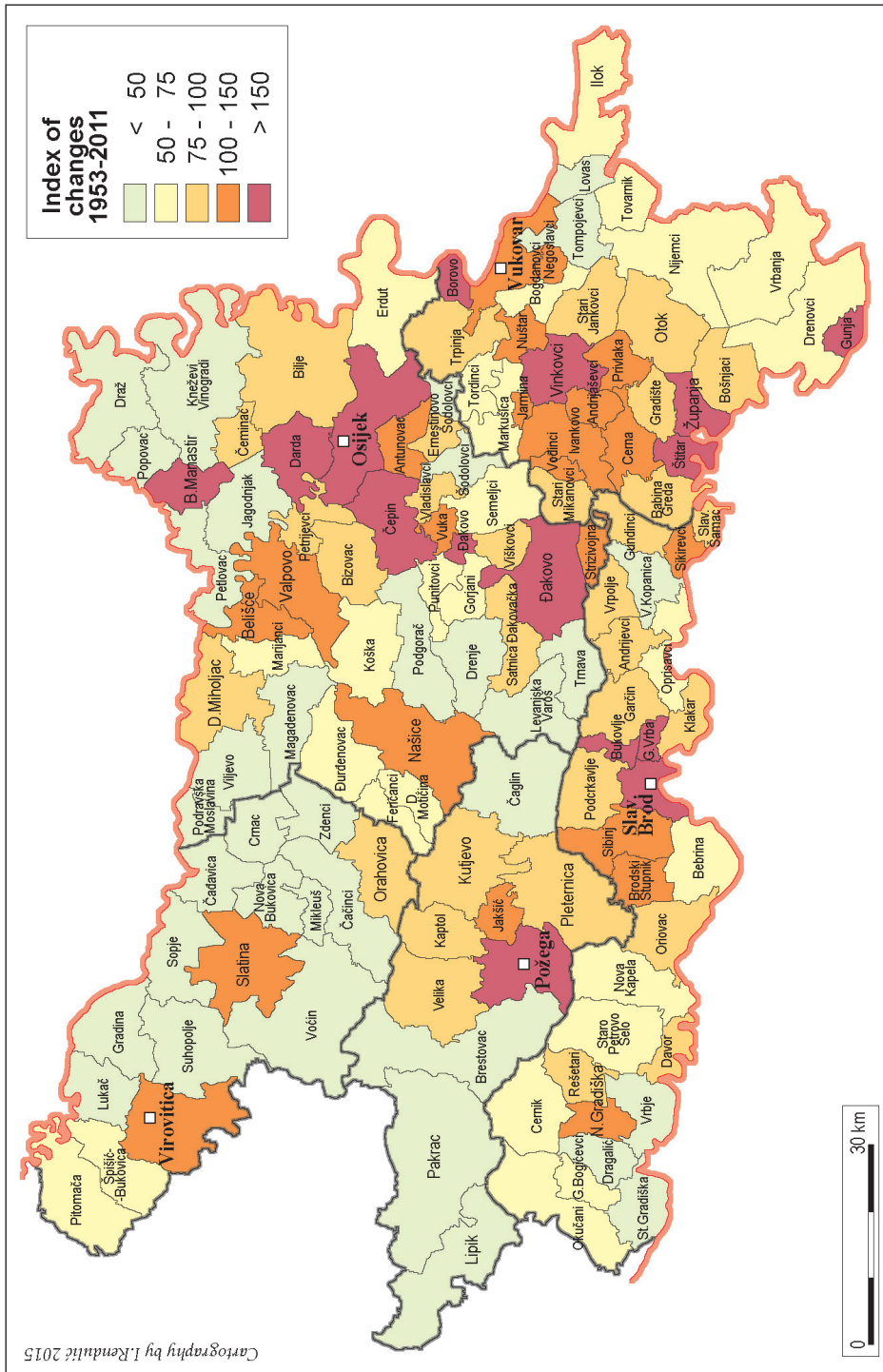


Fig. 2. The index of population change 1953–2011. Source: 1953 Census and 2011 Census, www.dzs.hr

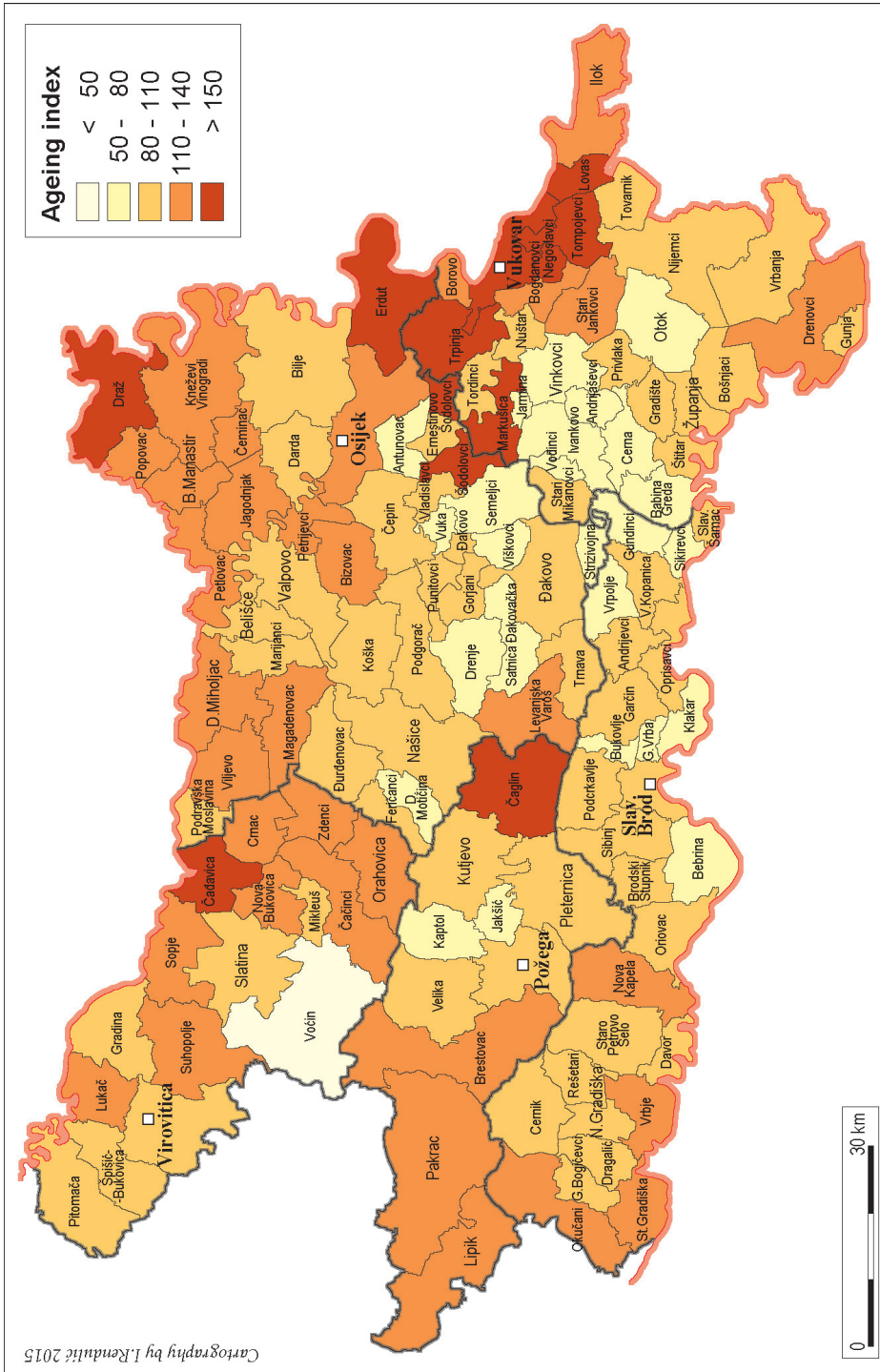


Fig. 3. The ageing index of the Eastern Croatian population in 2011. Source: Population contingents by towns/municipalities, 2011 Census, www.dzs.hr

in Eastern Slavonia (Vukovar, Erdut, Ilok, Lovas, Negoslavci, etc.) had the highest values in the index of ageing, which is a consequence of the war and youth emigration.

These indicators show the Eastern Croatian region's demographic potential and problems. The most important demographic indicators reflect the processes of depopulation, regional population concentration and the unfavourable age structure of the population. At the same time, the spatial distribution of these unfavourable processes indicates that bigger urban centres and the municipalities in their surroundings record better demographic profile and structures in comparison with remote rural municipalities.

Migration is considered to be an important key in solving the puzzle of providing a healthy foundation for future economic growth. For those areas that are increasingly

was held in Croatia in 2003, 27 percent of all Croatian agricultural households were in the region of Eastern Croatia, as well as 43 percent of all business entities. Unfortunately, the current situation in the agricultural sector of Eastern Croatia is characterised by small farms, an aging workforce and a small and uncertain market.

The involvement in the global agricultural market is still too much to expect at this level of agricultural development in Eastern Croatia. In most of the counties in Croatia, including the counties of Eastern Croatia, most of the utilised agricultural land is up to 5 ha (in some counties up to 50 percent of all utilised land). The strategy for enlargement of the parcels should be re-parcelling and land management. In this way, the agricultural sector should be able to grow and have bigger production and export (Table 1).

Table 1. Basic agricultural indicators of utilised agricultural land in Eastern Croatia by counties, 2003

County	Number of		Utilised agricultural land, hectares		
	households	business entities	total	in agricultural households	in land business entities
Virovitica-Podravina	19,062	78	83,752	58,862	24,890
Požega-Slavonia	13,521	37	42,548	31,675	10,873
Slavonski Brod-Posavina	20,704	109	62,316	47,377	14,939
Osijek-Baranja	41,103	235	184,094	95,987	88,107
Vukovar-Sirmium	26,316	130	121,078	84,821	36,257

Source: Agricultural Census, 2003 (www.dzs.hr)

confronted with population aging, attracting the flow of young people represents the only alternative in the short and medium term (MAZILESCU, R. 2012). The biggest problem in this region is the emigration of skilled labour because productive workers move to urban areas that pay higher real wages while the sending/source region becomes less specialised and less productive (EDWARDS, M. 2007).

Economic-geographic indicators of development

As agriculture and industry, especially the food industry, are two traditional economic activities in Eastern Croatia, they will be analysed in the next section of this paper. In the period of the last agricultural census that

If the agricultural structure of Eastern Croatian households and business entities are analysed, it is obvious that the number of agricultural households is much larger than the number of business entities. The same applies in the case of utilised agricultural land that is in the hands of households. Data show that utilised agricultural land that is used by agricultural households is almost twice as big as the utilised agricultural land used by business entities. This shows that an attempt to make bigger businesses in the agriculture sector in Croatia is still economically risky. Croatian farms are among the smallest in the EU.

Besides that, our data show that the number of agricultural workers in most cities and municipalities is below 10 percent, while only municipalities farther from bigger

cities or regional centres have a population made up of over 30 per cent of agricultural workers. Some of them (Vrbanja, for example) are more focused on the forestry sector (Figure 4). This result is significant if we take into account that traditionally this is an agricultural area with all the preconditions for the further development of the agricultural sector (ecological cultivation, for example). However, years of neglect and lack of investment that would have improved knowledge in agricultural business, as well as a lack of investment in new technologies and the lack of local communities' capacity to get more resources from EU funds, have had the result that Croatia imports a significant part of its food products from abroad

As Croatia became member of the EU there have been many opportunities for Eastern Croatia's agricultural sector using EU funds. "The agricultural sector of rural development satisfies an economic way of reasoning which turns out to be insufficient to enable rural areas to apprehend the new issues of territorial cohesion. In order to contribute to the Lisbon and Gothenburg objectives, rural development strategies should focus on innovation and the transfer of knowledge and good practices" (ZORZOLIU, R. 2012).

In general, rural areas should play a more significant part in regional and economic development if the further concentration of population and economic activities in Eastern Croatia are wanted to be avoided. The contemporary understanding of rural development involves a comprehensive development with the participation of the community itself, or the process by which institutions and people from the community are mobilised in order to create, strengthen and stabilise activities using the resources of the area in the best possible way to achieve stable economic and social development (GREFFE, X. 2005).

The modern local development policy is based on the OECD approaches and principles of: qualitative development, a differentiated and unique approach to each local area and the involvement of local stakeholders in the creation and implementation of

their own development. The main characteristic of recent rural development policy is an effort to stop the developmental delay of rural areas by efficient use of all local resources. Directing rural development strives to increase the competitiveness of agriculture and forestry, improve the environment, landscape, and quality of life in rural areas and diversify the rural economy. The contemporary rural developmental policy is based on the LEADER approach, which means, "links between the actions in development of the European rural areas", which is also the method used to mobilise the potential of rural communities. This also includes:

1. Sustainable rural development based on the conservation and balancing of environmental, social and economic capital;

2. Approach based on local characteristics, potential, uniqueness and distinctiveness;

3. Bottom-up approach, which means that local stakeholders are involved in taking decisions;

4. Establishment of local partnerships (local action groups) composed of public, civil and economic sectors that seek to identify and implement local development strategy;

5. Innovations to represent traditional values in a new and competitive manner;

6. Integrated, multi-sectoral approach involves horizontal, cross-sectorial as well as vertical connectivity, linking local, regional and national institutions in order to achieve sustainable rural development;

7. Networking and connectivity, learning from best practices, exchange of knowledge and experience;

8. Cooperation representing a further step of networking towards the development and implementation of individual projects of two or more LAGs within a country or region.

Rural development and the LEADER approach are relatively new concepts in Croatia, dating back to the early implementation of the European model of rural development and the pre-accession IPARD programme in which it was a key instrument. In accordance with it, in 2008 the Strategy of Rural Development 2008–2012 was adopted in Croatia, with the main objectives

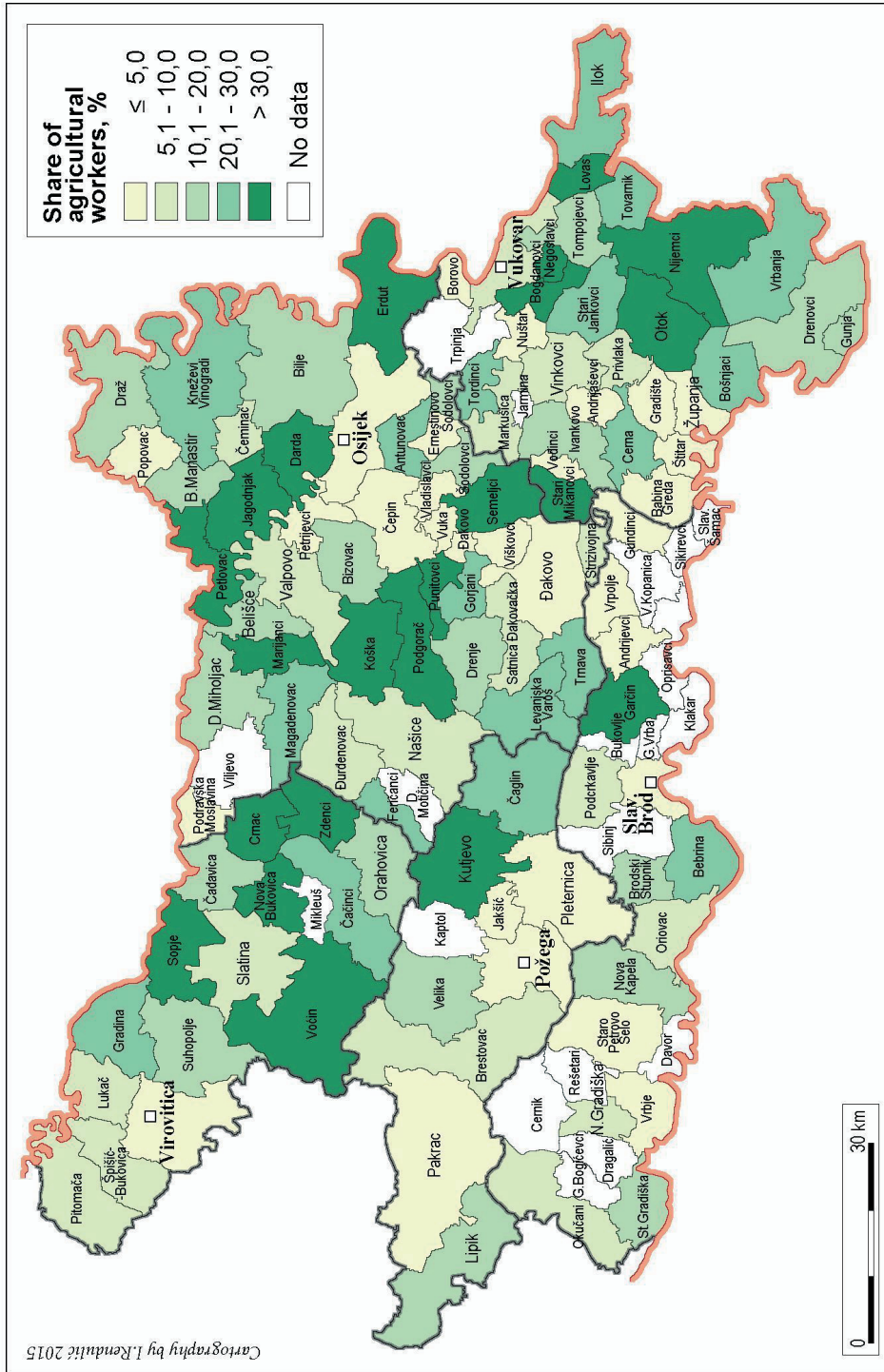


Fig. 4. The share of agricultural workers in total employment (in all activities), 2011. Source: Employment and Wages, Statistical Reports, 2011, calculated by authors

and measures of developing agriculture and rural areas. Through the EU accession, Croatia opened up the possibility of using the European Agricultural Fund for Rural Development (EARDF), financed by the Common Agricultural Policy (CAP), which contributes to achieving the objectives of the Europe 2020 strategy promoting sustainable rural development throughout the European Union.

Nowadays, Croatia is implementing the Rural Development Programme 2014–2020 with defined measures that outline the effective usage of resources from the fund.

When analysing industry, it is necessary to say that in this region it has traditionally been based largely on agricultural production, but “unfortunately”, the percentage of agricultural products that are finalised in this region is not known. However, empirically it may be concluded that the insufficient degree of completion, which affects the levels of employment in the region, affects the low level of new investment and economic growth” (BABAN, L.J. and IVIC, K. 2003).

The most severe decline of industry in this area happened after 1990 when the war caused big damages and the destruction of factories that then stopped operating and were closed. Also, badly managed privatisation and the new rules that capitalism brought found Croatian industry unprepared. Under these conditions, the loss of old markets and the lack of new ones almost caused the collapse of industry in Eastern Croatia. In the Republic of Croatia, the number of employed persons in industry decreased after the transition and privatisation almost threefold. New jobs in industry in the meantime (reindustrialisation) have not materialised.

From the data available, it is obvious that in Eastern Croatia only 5 cities/ municipalities have industrial employment of over 60 percent and their economy is mostly connected to the paper and petroleum industries (a refinery in Slavonski Brod). A slightly better situation can be found in the area of Western Slavonia with the city of Požega as its centre, while in Eastern Slavonia and Baranja,

mostly in cities like Donji Miholjac, Valpovo, Beli Manastir and Županja, industrial employment is above average (more than 30 percent). Eastern Croatia in general has an average industrial employment rate of around 22 percent. Today, industry is still the most significant economic activity in this area if the number of employees in industry and other economic sectors are compared (*Table 2*).

The main characteristic of the business life in Croatia is the decline of the working population, which is a result of negative demographic development, emigration and an ageing of workforce. The necessary policies that should be implemented should take into consideration the following goals: an increase of the active population, an increase of the employment rate, as well as an increase of workforce mobility, because the labour market is a major factor in determining the economic growth of an area (EDWARDS, M. 2007). This is why communities must continuously invest in assuring a highly skilled workforce (BLAKELY, E. and LEIGH, N.G. 2009) (*Figure 5*).

Analysing the statistics for Croatia as a whole, the number of registered business entities increased by 9.56 percent during the period of 2008–2012, from 263,760 registered business entities to 288,972. The increase occurred in all sectors except for public defence, compulsory social security, wholesale and retail trade. The largest number of new businesses during the period 2008 to 2012 have been registered in wholesale and retail trade, followed by construction, manufacturing and professional, scientific and technical activities. Unlike the 9.56 percent increase in the number of registered legal entities, the number of active legal entities in the observed period increased only by 1.69 percent, or by 2,224 legal entities (Industrial Strategy for Republic Croatia, 2014).

Also, for Croatia as a whole, the long-term unemployment rate of 18.9 percent (in 2012) has been an unsolvable problem for several years. The main problems that the government also tries to cope with are: the low share of active population, structural inconsistency of supply and demand in professional occupa-

Table 2. Number of employed persons in legal entities in some economic activities in Eastern Croatia by counties, 2011

County	Agriculture, forestry and fishing	Manufacturing	Wholesale and retail trade	Transportation and storage	Public administration and defence	Education	Human health and social work
Virovitica-Podravina	1,153	3,415	1,951	624	1,517	1,756	1,216
Požega-Slavonia	970	3,933	1,631	598	1,520	1,627	1,650
Slavonski Brod-Posavina	940	6,573	2,721	1,118	2,378	2,982	2,406
Osijek-Baranja	4,108	13,183	10,217	3,324	6,832	7,645	5,683
Vukovar-Sirmium	3,100	4,847	3,686	1,600	4,570	3,988	2,672
<i>Total</i>	<i>10,271</i>	<i>31,951</i>	<i>20,206</i>	<i>7,264</i>	<i>16,817</i>	<i>17,998</i>	<i>13,627</i>

Source: Employment and wages, Statistical Reports, 2011, www.dzs.hr

tions, the low number of flexible and adaptable companies and the low utilisation of human potential and resources (Industrial Strategy for Republic Croatia, 2014) (Figure 6).

The problem of unemployment persists because the number of unemployed is almost permanently higher than the demand. Therefore, employers behave as if staff were always available, as reflected in the very low level of investment in employee education. However, the existence of a structural mismatch has been confirmed by Croatian Employment Service and research results also indicate a lack of specific personnel, the existence of occupations and the lack of certain skills among those who apply for the job. The clustering of the most capable, highly educated people in the field of services could be a limiting factor for reindustrialisation based on new materials and technologies in terms of increased competition.

The planning of necessary resources by using stimulation to select the required interests, determining quotas and adapting educational program needs with adequate financial support can lead to improvements in the structure of knowledge and skills that are necessary for development (Industrial Strategy Republic of Croatia, 2014) (Figure 7).

When analysing the active and inactive populations of Eastern Croatia at the county level, it becomes clear that in every county the share of inactive population is over 50 percent and in some cases close to 60 percent (Požega-Slavonia county, for example). The biggest number/share of the inactive population involves pupils and students as well as retired people. These indicators show a very small worker pool that can't be the base for economic and regional development and prosperity, especially in periods of economic stagnation or crisis, and it will also influence the decline of GDP per capita.

If GDP data for the year of 2005 on the NUTS 2 level is compared between the EU and Croatia, the regional GDP in Eastern Croatia according to purchasing power parity is only at 34.5 percent of the EU average (while, for example, the North-western region of Croatia

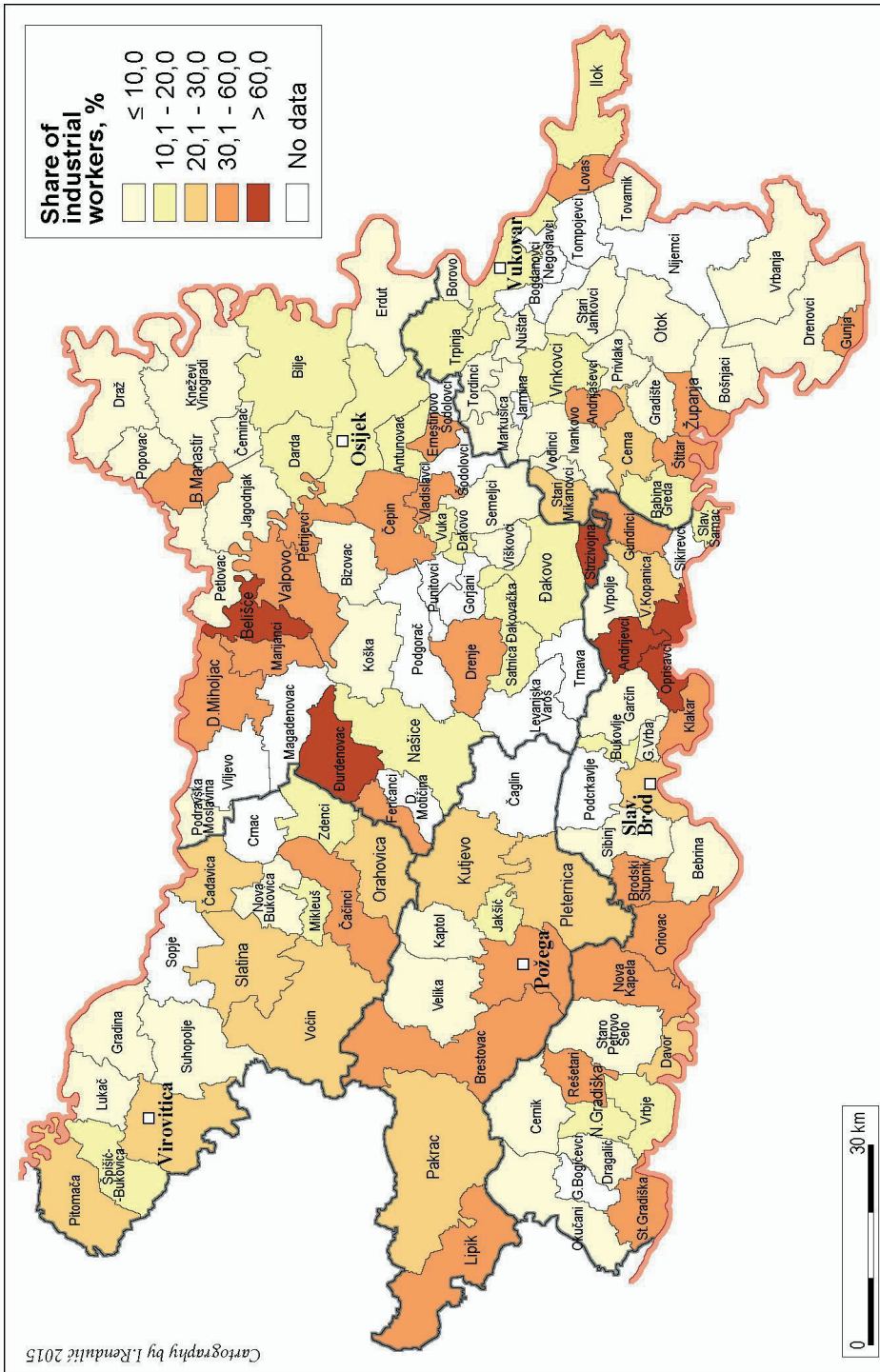
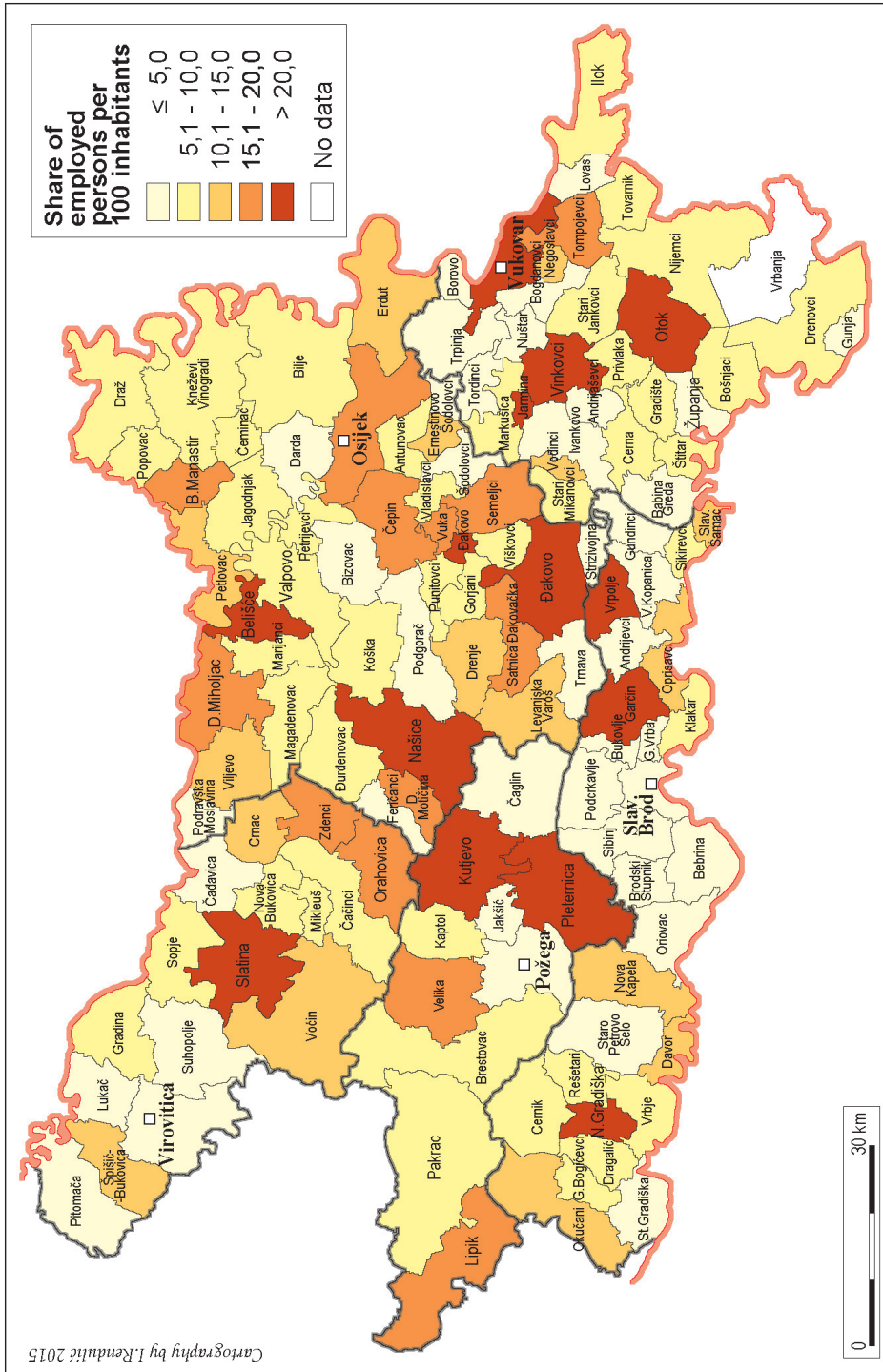


Fig. 5. The share of industrial workers in total employment (in all activities) in 2011. Source: Employment and Wages, Statistical Reports, 2011, calculated by authors



FFig. 6. Share of employed persons per 100 inhabitants in cities and municipalities in Eastern Croatia, 2011. Source: Employment and Wages, Statistical Reports, 2011, calculated by authors

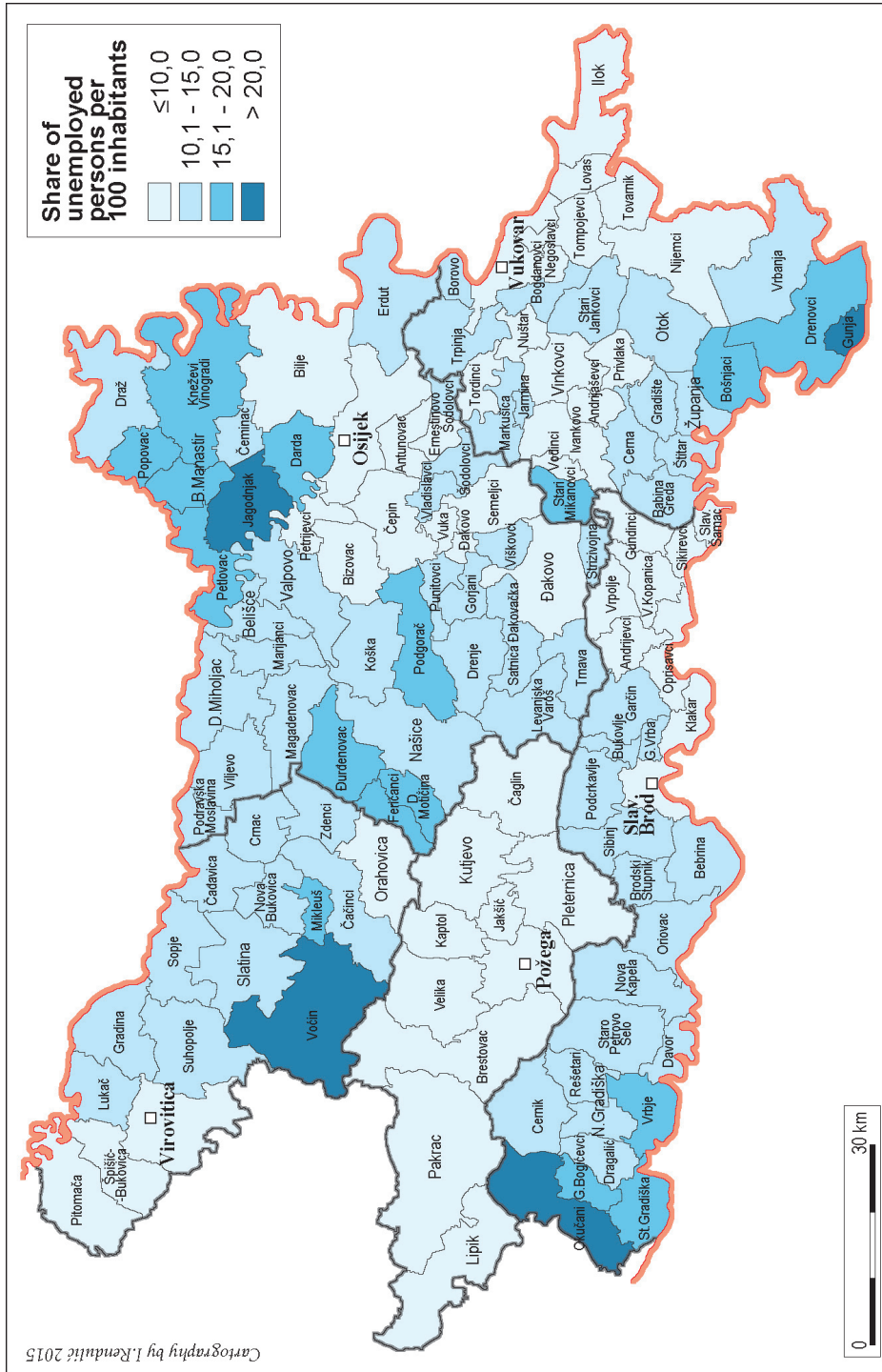


Fig. 7. Share of unemployed persons per 100 inhabitants in cities and municipalities in Eastern Croatia, 2011. Source: Croatian Bureau for Employment, www.hzz.hr, calculated by authors

is at 64.3 percent of the EU average and the Adriatic region is at 47.6 percent of the EU average). Differences in wealth between these three regions can be linked back to the main economic structure, i.e. the share of certain sectors compared to national average. Eastern Croatia is economically very homogeneous, while the other two regions have more heterogeneous economical structures. Regions with a narrow economic base are more sensitive to all economic crises and less competitive in comparison with regions that have a broader economic base (Strategy for Regional Development). If we also take into consideration demographic structures in Eastern Croatia, the number of active members in the population declines further (Table 3).

opment of these activities and investment in new technologies and research will not be possible. Both of these sectors have been in economic crisis for decades. That is why specialised geographical production systems should be developed to serve as a basis for the food industry and the agro-food sector in general. A big part of this production could be used in the tourism sector to a much greater extent than it is now.

In this context, authors can conclude that the first hypothesis is confirmed. As the population is the most important factor of regional and local planning and development, the unfavourable demographic dynamics and structural characteristics of Eastern Croatia reduce development po-

Table 3. Population of Eastern Croatia by current activity status, 2011

County	Population, person	Employed		Unemployed		Economically inactive	
		person	%	person	%	person	%
Virovitica-Podravina	71,344	24,084	33.7	6,662	9.3	40,577	56.8
Požega-Slavonia	64,892	21,948	33.8	5,727	8.8	37,194	57.3
Slavonski Brod-Posavina	131,512	41,804	31.7	15,393	11.7	74,288	56.4
Osijek-Baranja	258,226	95,300	36.9	26,363	10.2	136,505	52.8
Vukovar-Sirmium	149,070	48,894	32.7	16,426	11.0	83,693	56.1

Source: Population aged 15 and over by current activity status, age and sex, Census 2011, www.dzs.hr

Conclusions

Eastern Croatia is a region with numerous economic and development advantages in comparison to other Croatian regions. Unfortunately, there are also numerous disadvantages that have disabled the full use of resources and capacities in this area.

One of the biggest problems is depopulation and the lack of young and educated people who are usually the 'engine' of positive changes and the basis for social and economic development.

In terms of agriculture and industry, once the traditional sectors in the region of Eastern Croatia, without further financial help from the state and EU cohesion and structural funds, the further restructuring and devel-

potential in this region, especially at the local level. The second hypothesis in this paper is not confirmed fully, as indicators show that the whole of Eastern Croatia has similar population and economic-geographic problems. However, at the local level, we have demonstrated that bigger urban centres and municipalities and their surroundings have a better developmental position in comparison with remote rural municipalities. The third hypothesis is confirmed, as population and economic potentials of Eastern Croatia for regional development are not used in a way that would increase regional prosperity and the development of this area.

Eastern Croatia's unique identity might become a significant resource and could be utilised for the further development of regional economy in agriculture, tourism or other economic activities.

REFERENCES

- BABAN, L.J. and Ivić, K. 2003. Diversifikacija kao bitna strategija razvitka poljoprivrede i prehrambene industrije Istočne Hrvatske. In *Razvojne perspektive ruralnog svijeta Slavonije i Baranje*. Eds.: ŠTAMBUK, M. and ŠUNDALIĆ, A. Zagreb, Institut društvenih znanosti Ivo Pilar, 209–219.
- BLAKELY, E. and LEIGH, N.G. 2009. *Planning Local Economic Development: Theory and Practice*. Los Angeles, Sage Publications, 480 p.
- ČAVRAK, V. 2002. Strategija i politika regionalnog razvoja Hrvatske. *Ekonomija* 3. 645–661.
- ČIPIRIĆ, I. 2003. Iskustva mješovite poljoprivrede: obiteljsko gospodarstvo u tranzicijskim promjenama i novim izazovima. In *Razvojne perspektive ruralnog svijeta Slavonije i Baranje*. Eds.: ŠTAMBUK, M. and ŠUNDALIĆ, A. Zagreb, Institut društvenih znanosti Ivo Pilar, 129–143.
- EDWARDS, M. 2007. *Regional and urban economics and Economic development: Theory and Methods*. New York, Auerbach Publications, 752 p.
- GREFFE, X. 2005. *The instrument of good governance*. Local governance and the drivers of growth. Paris, OECD Publishing, 39–88.
- HANSEN, N., HIGGINS, B. and SAVOIE, D. 1990. *Regional Policy in Changing World*. New York, Springer Science and Business Media, 311 p.
- MAZILESCU, R. 2012. Patterns of demographic development. *Procedia. Economics and Finance* 3. 1075–1080.
- Ministarstvo regionalnog razvoja, šumarstva i vodnog gospodarstva 2010. *Strategija regionalnog razvoja Republike Hrvatske, 2011–2013*. (Strategy of Regional development of Republic Croatia, 2011–2013) www.mrrfeu.hr
- NEJAŠMIĆ, I. 2006. *Demogeografija. Stanovništvo u prostornim odnosima i procesima*. Zagreb, Školska knjiga, 283 p.
- OECD Regional Outlook 2014. *Regions and Cities: Where Policies and People Meet*. OECD Publishing, 291 p.
- STARČ, N. and RAŠIĆ, I. 2003. Nevolje s regionalnom politikom. *Privredna kretanja I ekonomska politika* 95. 47–86.
- STIMSON R.J., STOUGH R.R. and ROBERTS B.H. 2006. *Regional Economic Development: Analysis and Planning Strategy*. Berlin–Heidelberg–New York, Springer, 452 p.
- WERTHEIMER, A. and ŽIVIC, D. 2003. Demografske promjene u ruralnim područjima Slavonije i Baranje od 1953. do 2001. godine. In *Razvojne perspektive ruralnog svijeta Slavonije i Baranje*. Eds.: ŠTAMBUK, M. and ŠUNDALIĆ, A. Zagreb, Institut društvenih znanosti Ivo Pilar, 15–39.
- ZORZOLI, R. 2012. Regional and sustainable development in Italy, *Procedia. Social and Behavioral Sciences* 58. 514–522.
- Additional sources:
- Croatian Bureau of Statistics 2011. *Naselja i stanovništvo RH 1857–2001* (Census 1857–2001). cd, Zagreb, R. Hrvatska, www.dzs.hr
- Croatian Bureau of Statistics 2011. *Popis stanovništva 2011. Kontingenti stanovništva po gradovima i općinama* (Census 2011. Population contingents by Towns and Municipalities). Zagreb, R. Hrvatska, www.dzs.hr
- Croatian Bureau of Statistics 2012. *Robna razmjena RH s inozemstvom po županijama, gradovima i općinama* (Foreign trade in goods of the Republic of Croatia by counties, towns and municipalities). Priopćenje god. XLIX. Zagreb, R. Hrvatska, www.dzs.hr
- Croatian Bureau of Statistics 2012. *Zaposlenost i plaće* (Employment and Wages, Statistical Reports), Zaposleni u pravnim osobama po županijama gradovima i općinama. Statistička izvješća. Zagreb, R. Hrvatska. www.dzs.hr
- Croatian Bureau of Statistics. 2003. *Popis poljoprivrede* (Agricultural census). Zagreb, R. Hrvatska. www.dzs.hr
- Croatian Employment Service 2011. *Mjesečni statistički bilten* (Monthly Statistic Bulletin). www.hzz.hr
- Ministarstvo regionalnog razvoja i fondova EU. www.mrrfeu.hr
- Ministarstvo gospodarstva 2014. *Industrijska strategija Republike Hrvatske 2014–2020* (Industrial strategy of Republic Croatia, 2014–2020). Zagreb, R. Hrvatska. www.mingo.hr
- Ministarstvo gospodarstva RH. *Industrial Strategy of Republic Croatia, 2014–2020*. (www.mingo.hr)
- Nacrtni zakon o regionalnom razvoju 2013. <http://www.mrrfeu.hr/default.aspx?id=1674>
- OECD, Better policies for better lives, www.oecd.org
- www.slavonija.hr
- Zakon o regionalnom razvoju (NN 153/09)

LITERATURE

Lang, T. et al. (eds.): Understanding Geographies of Polarization and Peripheralization: Perspectives from Central and Eastern Europe and Beyond. Palgrave Macmillan, Basingstoke, 2015. 352 p.

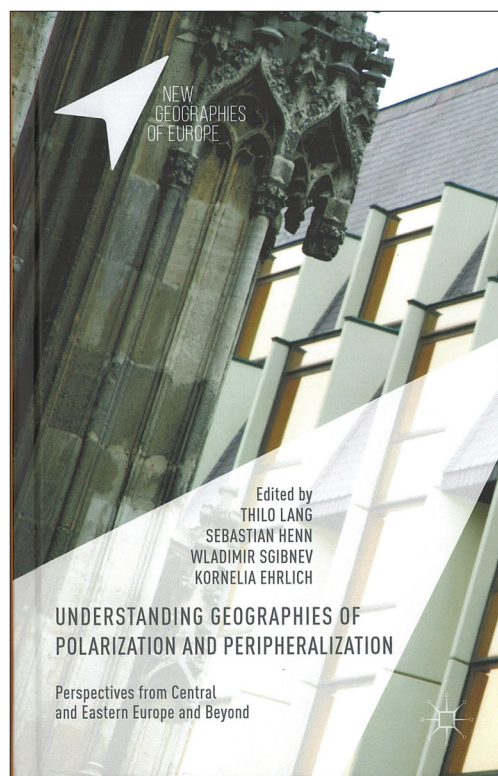
Given that increasing socio-spatial polarisation is one of the cruelest realities of our times it is surprising how few larger projects have recently been devoted to studying its mechanisms and outcomes. This is most likely related to the neoliberal hegemony of the 1990s and 2000s; however, especially since the 2008 global economic crisis a number of influential thinkers (STIGLITZ, J. 2012; KRUGMAN, P. 2012; PIKETTY, T. 2014; HARVEY, D. 2014) have taken this until then dominating regime under critical scrutiny. Yet such overarching systemic critiques need to be complemented with more on-the-ground theoretical and empirical research to grasp how polarisation unfolds in various spaces as well as more generally. The large ongoing Marie Curie project 'ITN RegPol² – Socio-economic and Political Responses to Regional Polarisation in Central and Eastern Europe' (ITN RegPol² 2015) is

undertaking such a task. Some of its first results were recently published in a theme issue of the *Hungarian Geographical Bulletin*, summarised in the introductory article by the guest editor (NAGY, E. 2015).

A good number of members of the above-mentioned project contributed to the book *Understanding geographies of polarization and peripheralization*, although the list of contributors goes far beyond. With its eighteen contributions by as many as forty-one authors, including Ray HUDSON, John PICKLES, Adrian SMITH, and Michael WOODS, this is one of the richest volumes of its kind – certainly among those focusing on Central and Eastern Europe (CEE).

The book emerged from at least two identified problems. On the one hand, empirical evidence indicates the study area has been particularly hit by growing socio-spatial polarisation (p. 1), which is definitely the case in comparison with Western Europe and some other regions. On the other hand, "[up] until recently, spatial development in CEE has mainly been researched through the lenses of post-socialist transformation and modernization" (p. 2). Whereas the latter has long been criticised (MÜLLER, K. 1992) for its structural-evolutionary assumptions, whether – or at least to what extent – the socialist and in some cases the post-Soviet heritage still represent an important legacy is also debated in this volume, for instance in the contributions on Ukraine and Russia. Further, it is an explicit argument in the book that adopting novel "approaches enables new comparative perspectives to similar phenomena in other parts of Europe and the world" (p. 2), thus escaping its validity for CEE alone (the geographic denomination does not appear in the volume's main title but in the subtitle). Relatedly, the anthology includes a respective case study on Northern Ireland, the Baltic Sea Region, as well as Central Asia.

In spite of the above, it is not the aim of the book to authoritatively come up with an "overarching framework that claims to explain it all" (pp 12–13). Instead, the editors' strategy to bring the different perspectives into conversation is a relational approach. Thus there is still a certain level of consensus reached: for several authors regional peripheralisation "is not only the simultaneity of a number of features constituting the formation of peripheries, such as distance, economic weakness and lack of political power, but is often also the dynamic formation of core and peripheral regions



overlapping at different spatial scales” (pp 1–2). Consequently, “applying these conceptual notions allows a process-based, relational understanding of up-to-date forms of spatial differentiation in CEE and offers opportunities for spatial research circumventing dichotomous ideas of urban and rural, of central and peripheral” (p. 2), and so on.

The book is structured in four parts. The first one presents a series of tools for grasping the fragmented complexity of agency and the multitude of actors related to region-building. This includes reflections on the theoretical backgrounds of peripheralities as well as methodological considerations. Some of the contributions in this part (on Thuringia, Central Asia, and Northern Ireland) form a series of ethnographically grounded accounts of social constructions of peripheralities at the level of everyday lives.

The second part of the volume sets out to examine the role of diverse socio-political agents in the production of peripheries. The authors adopt an actor-centred perspective and elaborate upon ways in which peripheralisation is being perceived, lived, and reproduced. In this regard these contributions take up the constructivist challenge of the volume’s first part and provide dense accounts of peripheralisation and polarisation processes in CEE. One example is the Hungary-focused case study by Judit TIMÁR, Erika NAGY, Gábor NAGY, and Gábor VELKEY.

For them peripheralisation appears as a process of making and entering various forms of dependencies, interwoven with weakening integrative social mechanisms. They argue that peripherality and marginality mutually support and strengthen each other through local actors’ strategies. Based on their rich fieldwork in four distinct rural regions of Hungary an excellent account of institutional practices of neoliberal capitalism at work is provided, showing that the European division of labour and a shrinking state in the aftermath of the 2008 economic crisis forced local agents to enter relationships based on dependence.

The book’s third part is devoted to studies of a fragmented and relational construction of peripheralities. Authors here provide dense quantitative analyses of peripheralisation at national or supra-national levels, and discuss tools of measuring as well as assessing divergent processes of polarisation and cohesion.

The contributions in the fourth and final part of the volume have a slightly more positive tone, discussing different modalities and relations between cores and peripheries. These authors deal with how responses to peripheralisation can be devised, implemented, and assessed. Such more optimistic accounts stem from Estonia, Slovakia, and eastern Germany.

Following the trend of recent years, also this anthology does not have a concluding summary or comparative analysis; although due to the explicit lack of ambition to come up with an overarching framework (which is understandable) such a separate chapter is

perhaps not necessary. While most contributions are equipped with tables, diagrams and maps, there are no images or photos in the book. This is of course hardly any harsh critique, but the authors’ “hope for vigorous future debates in academia and society on the causes and effects of polarization and peripheralization” (p. 16) could perhaps be easier fulfilled by having added at least a few illustrations or images of (so-called) peripheries. This not least given the character of the contributions, the majority of which tends to be qualitatively oriented.

Even the front-page image – a small detail from Budapest’s Castle District – portrays little of the severity of living conditions that much of the population in this large study area is facing. These minor criticisms do not change the overall impression of a well-researched and well-edited anthology on a still too under-researched subject. This challenging and extensive contribution, rich in novel theoretical and empirical approaches alike, is highly recommended to all, not least in CEE itself where the subject is still largely approached from classic and quantitative angles.

PÉTER BALOGH

REFERENCES

- HARVEY, D. 2014. *Seventeen contradictions and the end of capitalism*. Oxford, Oxford University Press.
- ITN REGPOL² October 26, 2015-last update. *About ITN RegPol²*. Homepage of ITN RegPol². Available: <http://www.regpol2.eu/> December 27, 2015.
- KRUGMAN, P. 2012. *End this depression now!* New York, W.W. Norton & Company.
- MÜLLER, K. 1992. ‘Modernising’ Eastern Europe: Theoretical problems and political dilemmas. *European Journal of Sociology* 33. (1): 109–150.
- NAGY, E. 2015. Discussing inequalities from the periphery. *Hungarian Geographical Bulletin* 64. (3): 167–170.
- PIKETTY, T. 2014. *Capital in the Twenty-First Century*. Cambridge, MA, Harvard University Press.
- STIGLITZ, J.E. 2012. *The Price of Inequality: How Today’s Divided Society Endangers Our Future*. New York and London, W.W. Norton & Company.

Tammaru, T. et al. (eds.): Socio-Economic Segregation in European Capital Cities. East Meets West. Routledge, London–New York, 2015. 389 p.

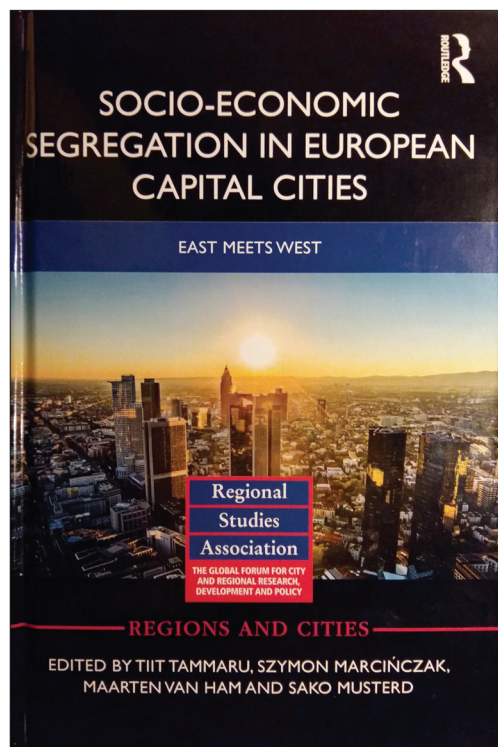
In the international urban studies mainstream, there is a programmatic call for comparative urbanism recently propagated by prominent scholars including Jennifer ROBINSON, Ananya ROY or Colin McFARLANE (earlier also articulated by Chris PICKVANCE, Anthony D. KING and others). In spite of this urge, however, relatively little emphasis has been placed on the empirical contributions to international urban comparativity to date. As an ambitious attempt to fill this gap, this book – edited by Tiit TAMMARU, Szymon MARCIŃCZAK, Maarten VAN HAM and Sako MUSTERD – systematically analyses socio-economic segregation in/across several European capital cities; Amsterdam, Athens, Budapest, London, Madrid, Oslo, Prague, Riga, Stockholm, Tallinn, Vienna, Vilnius, as well as in Milan (the only exception not being a political capital, in contrast to what the title of the volume suggests).

The introductory chapter of the book, authored by Tiit TAMMARU, Sako MUSTERD, Maarten VAN HAM and Szymon MARCIŃCZAK provides a comprehensive and undoubtedly valuable literature review, as well as a detailed overview of methodological considerations. First and most importantly, by the central no-

tion ‘socio-economic segregation’ (hereinafter SES), the editors and the authors of the book understand the ‘residential segregation of population groups based on occupation and income’ (p. 2.). Based on the literature review, four key structural factors have been identified that are assumed to shape SES: globalisation, socio-economic inequalities, welfare regimes and housing systems (along with two additional occupational ones). As the indicator of globalisation, global city status was taken into account, based on the widely used typology of Alpha, Beta and Gamma cities. The level of socio-economic inequalities was measured by the Gini index, using statistical data obtained from Eurostat. Welfare regimes were classified along Gøsta ESPING-ANDERSEN’s three main categories (i.e. social democratic, corporatist and liberal), with the South European (or Mediterranean) regime considered within the corporatist type. Housing systems were categorised into Jim KEMENY’s typology of unitary and dual housing systems, with the South European system positioned in between the two.

Finally, the two additional occupational factors were measured by the share of higher occupations (managers and professionals) on the one hand, and by the share of lower occupations (unskilled workers) on the other. Using a novel multi-factor approach based on these factors, a theoretical model was elaborated to predict and quantify the level of SES in the investigated cities. Values 1 to 3 have been attached to each of the six factors, creating the following ranking of hypothetical SES in the case study cities (from the most to the least segregated ones, with the higher scores representing higher levels of SES): London (16 out of the maximum 18 points); Riga (15); Madrid and Vilnius (14); Milan and Tallinn (13); Amsterdam (12); Athens, Budapest, Oslo and Stockholm (11); and finally Prague and Vienna (9).

Case studies are then featured in Chapters 2 to 14, allowing readers for in-depth comparisons of the hypothetical and the actual levels of segregation in each city. Importantly, and in order to move beyond the above-mentioned strict structural factors, in the case studies particular attention has been paid to the unique characteristics of the place (i.e. to the *genius loci*), creating a certain kind of sensitivity towards different geographical contexts and specific historical pathways. Following a long tradition in segregation research, the authors’ analyses are primarily based on indices of dissimilarity (D) and segregation (IS), mostly using statistical data from years 2000 and 2010 (or other census years close to these). Concerning the geographical coverage of data collection, metropolitan regions were investigated in the case of Amsterdam,



Athens, London, Madrid, Oslo, Stockholm and Tallinn, whereas in the case of Budapest, Milan, Prague, Riga, Vienna and Vilnius, analyses covered only the administrative area of the cities.

In the volume Western European cities are represented by London, Amsterdam and Vienna. As a result of the analysis of occupational segregation in London (pp. 30–54.), David MANLEY, Ron JOHNSTON, Kelvyn JONES and Dewi OWEN found that there are still sharp divisions and a growing spatial distance between the top and bottom socio-economic groups in the city. In the case of income segregation in Amsterdam (pp. 55–79.), Sako MUSTERD and Wouter VAN GENT conclude that the segregation of the top and the bottom groups decreased in the 2000s (as the only exception among all analysed cities), presumably owing to the long tradition of a fairly equal income distribution in the Netherlands. In contrast to Amsterdam, however, Vienna witnessed a significant increase in the level of SES during the 2000s which might – according to Gerhard HATZ, Josef KOHLBACHER and Ursula REEGER (pp. 80–109.) – be linked with new immigration.

After the Western European case studies, Northern European cities are represented by Stockholm and Oslo. Based on the investigation of segregation dynamics in Stockholm (pp. 110–131.); Roger ANDERSSON and Anneli KÄHRİK argue that in spite of the long tradition of elaborating public policies aimed at creating a social mix within neighbourhoods, the public sector started to cut back on housing subsidies during the 1990s, resulting in a relatively high level of segregation in the Swedish capital by the 2000s. As for Oslo, economic segregation was analysed by Terje WESSEL (pp. 132–155.) who found that the particularly generous Norwegian welfare system is an important characteristic of the capital city above and beyond the strongly market-based housing system which allows the sustaining of rather high levels of equality.

As the next group of cities, the Southern European macro-region is represented by Athens, Milan and Madrid. Concerning the patterns of socio-economic segregation in Athens (pp. 156–185.), Thomas MALOUTAS concluded that despite the otherwise high levels of social inequality not only moderate levels and stable patterns of SES can be observed in Athens but even desegregation between certain occupational groups. As for socio-economic divisions in Milan (pp. 186–213.), Petros PETSIMERIS and Stefania RIMOLDI trace back post-1990 SES to two processes; first, the self-segregation of business owners into the most exclusive areas of the city, and second, the purchase of apartments by working-class households under specific right-to-buy schemes and a later selling of these properties to more affluent social groups. In the case of the processes of social change and segregation in Madrid (pp. 214–237.), Jesús LEAL and Daniel SORANDO primarily found professionalisation and the residential entrapment of lower socio-economic

groups behind the dramatic growth in the levels of segregation in the Spanish capital.

Concerning Eastern European cities featured in the book, a distinction is made between Visegrad cities (represented by Budapest and Prague) and Baltic capitals (Riga, Vilnius and Tallinn). In the case of Budapest, being one of the most segregated capital cities in Eastern Europe, Zoltán KOVÁCS and Balázs SZABÓ (pp. 238–260.) found that it is still only moderately segregated by Western standards; nevertheless, in spite of the more even geographical distribution of higher socio-economic groups (as a result of new housing developments), lower socio-economic groups became more segregated during the 2000s. Quite similar results have been revealed in the Prague case study (pp. 261–286.); Martin OUŘEDNÍČEK, Lucie POSPÍŠILOVÁ, Petra ŠPAČKOVÁ, Zuzana KOPECKÁ and the recently passed away Jakub NOVÁK concluded that the relatively low level of SES is mainly the consequence of the location of new forms of housing, as well as the influx of higher socio-economic groups into poorer (formerly working-class) neighbourhoods, often taking place in inner city areas.

As for residential segregation in Riga (pp. 287–312.), a Baltic capital where Russian-speaking residents constitute more than half of the population, Zaiga KRISJĀNE, Māris BĒRZIŅŠ and Kalju KRATOVIŠĀ convincingly argue that the ethnic dimension is still far more important than socio-economic patterns. The analysis of social inequalities and SES in Vilnius – carried out by Vytautas VALATKA, Donatas BURNEIKA and Rūta UBAREVIČIENĖ (pp. 313–332.) – revealed that recent processes of gentrification have led to an increase of mixed neighbourhoods in the inner city, similar to what happened in Budapest and Prague. As the last case study of the book, Tiit TAMMARU, Anneli KÄHRİK, Kadi MÄGI, the late Jakub NOVÁK and Kadri LEETMAA investigated socio-economic segregation in Tallinn (pp. 333–357.). Authors concluded that although the Estonian capital was also characterised by mixed neighbourhoods in 2000, the residential relocation of higher socio-economic groups significantly increased SES during the 2000s, transforming many earlier mixed neighbourhoods into more homogenous ones. On an overall level, Tallinn witnessed the largest growth in socio-economic segregation among the case study cities in the period of the 2000s, becoming the most segregated Eastern European city within the pool of research cities.

In Chapter 15, the main conclusions of the book are drawn by Szymon MARCIŃCZAK, Sako MUSTERD, Maarten VAN HAM and Tiit TAMMARU (pp. 358–382.). In contrast to the theoretical ranking of the cities' expected levels of SES (based on the multi-factor approach elaborated in the introductory chapter of the book), the case studies revealed a markedly different ranking based on real data (again, from the most to the least segregated cities): Madrid and Milan; Tallinn; London;

Stockholm; Vienna; Athens; Amsterdam; Budapest; Riga; Vilnius; Prague; and Oslo. Finally, as the main conclusion of the book, even though European cities are still less segregated compared to those in the Americas, Africa or parts of Eastern Asia, almost all of the cities involved in the study were found to be more segregated than initially hypothesised (with the only exception of Amsterdam). The spatial gap between the poor and the rich has been widening

since the early 2000s; these changes are mostly driven by globalisation and the recent neoliberalisation of European cities, both in the case of welfare states and former socialist countries. Moreover, as an alarming signal for policy-makers, the trend of rising inequalities and residential segregation does not appear to be changing anytime soon.

MÁRTON BERKI

Meusburger, P., Gregory, D., Suarsana, L. (eds.): Geographies of Knowledge and Power. Springer, Dordrecht, 2015, 347 p.

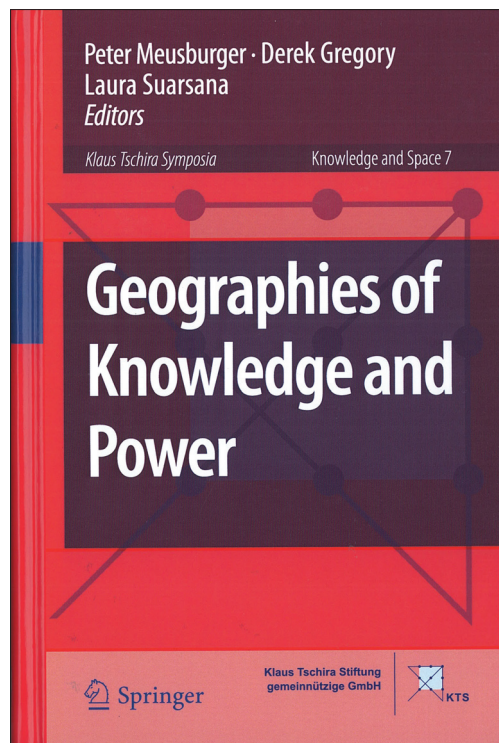
The title *Geographies of Knowledge and Power* was published by Springer in July 2015. This is the seventh volume of the series "Knowledge and Space", launched in 2008 and dedicated to topics dealing with the production, application, spatial distribution and diffusion of knowledge. Chief editor in charge of the series is Peter MEUSBURGER from Heidelberg University, whose work was this time supported by fellow editors Derek GREGORY (University of British

Columbia, Vancouver, Canada) and Laura SUARSANA (Heidelberg University). The release is an outcome of the 7th *Interdisciplinary Symposium on Knowledge and Space*, held at Heidelberg between 17 and 20 of June 2009. Both the symposium and the book were supported by the Klaus Tschira Foundation.

The book focuses on the complex relations between knowledge, power and geographic space, and involves contributions from seventeen scholars with different fields of inquiry therewith to investigate the issue at stake from multiple viewpoints. The large majority of the authors represent the field of human geography, as do all three editors, whilst others come from various fields such as anthropology, scientific theology, Assyriology and communication science.

Like many contemporary releases in human geography, the book largely builds on the theoretical findings of Michel FOUCAULT. The approach of this title is mostly based on the French philosopher's dual concept of "power-knowledge" (*pouvoir-savoir*), by which he referred to the interconnectedness and mutual dependence of political rule and scientific knowledge in reinforcing and legitimating each other. The introductory chapter (Chapter 1), in which the three editors lay the ground for the key notions of the book, is already set by a quote from FOUCAULT, suggesting that "Knowledge and power are integrated with one another, and there is no point in dreaming of a time when knowledge will cease to depend on power" (FOUCAULT, M. 1980: 52. 1.).

A basic argument of the book is that "power and knowledge depend on each other and incorporate each other; both have enabling and innovative effects. Knowledge consolidates power, and power attracts and sometimes legitimates knowledge" (3.). Though this issue has already been discussed by several authors throughout the last decades, the category of space, which is, according to FOUCAULT, "fundamental in any exercise of power" (FOUCAULT, M. 1984: 252. 4.), has remained relatively



under-examined. Thus, an explicit goal of the volume is to contribute to the discourse on the relationship between power-knowledge and space “by bringing the voices of various disciplines, different theoretical concepts, and different scales of analysis together” (6.).

As presented above, the volume indeed sought to involve authors from various fields, therefore, the sixteen chapters show a wide range of thematic focuses. Nevertheless, some key questions received distinguished attention and were put on the agenda by several authors.

The core issue of the book is framed by important theoretical foundations, aiming to contribute to a better understanding of the nature of power as such, not only in political, but also in more general terms; this is to a great extent helpful for the reader. Beyond the editors’ introduction, Chapters 2, 3, 13 and 16 are those that are dealing mainly with theoretical questions.

In Chapter 2, which is by far the longest and, thus, the most encompassing one in the entire volume, Peter MEUSBURGER offers an overview on the multiple ways in which knowledge, power and geographical space may be intertwined; moreover, he introduces some significant or at least promising concepts for the interpretation of these relations. An essential contribution of this chapter is the differentiation between factual and orientation knowledge, the first one being “regarded as widely shared, canonized knowledge that is generated by experts and taken as true on the basis of the prevailing state of the art in research” (25.), and the second one consisting of “belief systems, values, cultural traditions, worldviews, ideologies, religions, moral positions, mindsets, action-guiding norms ..., and reflection about the ethical conduct of one’s life” (27.). A detailed argumentation is also provided by the author on why both categories of knowledge are needed for the acquisition and retention of power.

In Chapter 3, Nico STEHR aims at exploring the multiple linkages between civil society, governance, and democracy; his approach attributes an important role to the spread of knowledge and the “growing knowledgeability of modern actors” (78.), through which an enhanced reflexivity and a growing influence of greater segments of society is expected in democratic regimes. In Chapter 13, Richard PEET performs a brief critical assessment on the geographical implications of speculation as well as on the logic of this process and the power centres behind. Chapter 16 by Jo REICHERTZ offers an insight into the persuasive power of words, communicative power. This special sort of power is well known from everyday life though its true nature is barely recognised. The author provides with an encompassing discussion on this mundane, yet powerful form of rule; by all means an appropriate piece for closing chapter.

The book is considerably successful in presenting distinct spatial contexts and outcomes of power-

knowledge. Several chapters focus on past or, from a European point of view, faraway cultural milieus and more precisely on how certain ideas and practices emerged and subsequently spread in these specific historical and spatial contexts. Stefan M. MAUL (Chapter 5) provides with an introduction on ancient Mesopotamia, where “kings and their counsellors did not rely exclusively on their own professional expertise” (127.), but created some kind of a space for negotiation, aiming to gain divine legitimation for their decisions by using the professional knowledge of the two most important fields of that time, extispicy and astrology. The need for gods’ (or the God’s) approval of political and social practices was also of significant importance not only for ancient cultures but also for later ones. Some of these traditions are still effective in contemporary discourses. Such cases are presented from the Muslim world by Dale F. EICKELMAN (Chapter 6), and from the United States by Robert JEWETT (Chapter 7).

In his study, EICKELMAN points to the fact that although the Islam faith and its key proponents have an important role on what knowledge is valued in Muslim countries, this has shown different forms in various historical and geographical contexts; ultimately, the author suggests, that “there is no singular Islam, but rather a multiplicity of overlapping forms of practice, discourse, and invocations based on readings of the past” (144.). In his essay, JEWETT provides with a narrative on how civic millennialism spread from New England to all thirteen colonies in the emerging United States of America during the 18th century to subsequently become a source of legitimacy for a proactive, if not offensive American foreign policy still to our days. As the author puts it, “millennialism remains evident in the peculiar orientation of America toward the future and peculiar belief in their alleged innocence and power, including their widespread conviction that they are in some sense a chosen people, destined to exercise global leadership” (148.).

This somewhat critical assessment of US’ attitude for global dominance lays the ground for a more nuanced criticism of the mutual support of colonialism and knowledge production/distribution, which makes up an important portion of the book. The comparative (economic, military, etc.) advantage of colonialist powers not only enabled them to gain dominance over foreign lands and people through direct violence, but also to invest heavily in knowledge production and distribution, therewith, to establish an ‘objective’ legitimacy base for their own superiority. For various reasons, scientists of different eras and powers all contributed to this process, either directly or indirectly.

The most striking examples in this respect are presented by Trevor J. BARNES (Chapter 9), and by two Hungarian geographers Róbert GYÓRI and Ferenc GYURIS (Chapter 10). Both chapters discuss how

scientists directly contributed to or at least laid the ground for the implementation of violent external and, in some cases, internal policies of undemocratic regimes such as Nazi Germany as well as pre- and post-WWII Hungary, respectively. BARNES takes the personality of Walter Christaller to illustrate how an ultimately violent regime managed to seduce the most prominent scholars of its time into ensuring the smooth operation of a lethal system. In a similar vein, GYÖRI and GYURIS trace the history of human geography in Hungary. Whilst a distinguished and renowned field in the interwar period, backed by the then regime in exchange for the legitimatisation of its irredentist foreign policy, human geography paid the price for this heyday by falling victim to a complete reshaping of the field by the communist regime in the aftermath of World War II. While radical changes were adapted and theoretical concepts were adjusted to new ideologies, the most prominent scholars were removed from academic positions. Following this complete uprooting of the discipline from its former context, it became suitable again for the service of the new (communist) regime.

Past and present forms of political-ideological colonisation through the spread of appropriate knowledge are also introduced and investigated in the volume. Processes such as civilisation, democratisation or internationalisation are considered as important techniques in this account. A classic case of colonisation is presented by Sarah de LEEUW (Chapter 15), who seeks to understand and theorise the “*countervailing practices and strategies levied by those whom dominant forces attempt to subordinate*” (298.) through the case of the Indigenous people of Canada. In contrast, the essays of John AGNEW (Chapter 11) and Anssi PAAASI (Chapter 12) discuss a more global issue, the worldwide dominance of a few centres and, thus, a limited number of viewpoints above entire scientific fields.

AGNEW scrutinises how a US-originated academic idea, the international relations theory, have exerted decisive influence on contemporary thinking about world politics. In his account the emergence and the subsequent spread of the theory (“the local becomes the global”; for a detailed introduction see AGNEW, J. 2007) exemplifies how “*the geography of knowledge can be conceived and related to world politics*” (236.). In a similar vein, Anssi PAAASI critically discusses the internationalisation of social sciences through the case of human geography. His criticism lies on the observation that “*the current interest in publication cultures and language has been part of a broader debate on the almost self-evident understanding that the geography practiced in the United States and United Kingdom is a product of the global core and that the same discipline practiced elsewhere is a product of the periphery*” (255.).

He considers this as threatening with the increased homogenisation of geographic knowledge in general, as “*Non-English speaking researchers ... should publish in*

top international journals, but publishing in such journals often forces them to adapt to research agendas created in the Anglophone world” (257.). This is a striking revelation from PAAASI, himself a descendant of a linguistic group of about 5 million native speakers, but otherwise a scholar with high international reputation, on how contemporary scientific thinking in human geography is in fact attempted to be uniformed from a few global power centres (publishing houses), which is also leading to new global inequalities (for more on this issue see PAAASI, A. 2005; PAAASI, A. 2013).

Beyond these main thematic focuses the volume is coloured by a handful of other papers, introducing further issues from the history of power-knowledge and space. Derek GREGORY (Chapter 4) provides an insight on how maps became “*some of the deadliest weapons in the staff officers' armoury*” (117.) at the Western Front in World War I.

A completely different story is told by Graeme WYNN (Chapter 8) on the power of books. He illuminates how two widely known books, *Man and Nature* from George P. MARSH (MARSH, G.P. 1864) and *Silent Spring* from Rachel CARSON (CARSON, R. 1962), were able to exercise meaningful influence on subsequent policy making thanks to the very specific social, economic, political, environmental, and intellectual contexts of their ages. The essay of Jürgen WILKE (Chapter 14) on the history of media control is a very insightful piece as well. Indeed, “*media control is nearly as old as media itself*” (277.), though it took different forms in different times and places. As the author reviews recent surveys of the state of press freedom, it is clearly remarkable that “*there are still discrepancies regarding media freedom on the international level*” (284.). Nevertheless, these surveys themselves, conducted exclusively from Western countries, tend to consider contemporary Western notions on media freedom as global standards. Though not explicitly insisted by the author himself, this may also give as a sort of legitimacy for global Western dominance.

All in all, the volume is an essential reading for those showing interest in the distinct spatialities of power's influence and at the same time dependence on the production, distribution and use of knowledge.

The editors earned a great honour in adjusting essays with such different viewpoints within one title. The final content of the book is not seamless; indeed, it does not need to be. Its greatest asset lies in opening up a wide range of questions of crucial importance for critical discussion, many of which are highly relevant for Central and Eastern Europe as well. They may hopefully attract scholars from the region to join these discussions.

MÁRTON PETE

REFERENCES

AGNEW, J. 2007. Know-Where: Geographies of Knowledge of World Politics. *International Political Sociology* 1. 138–148.

CARSON, R. 1962. *Silent Spring*. Boston, Houghton Mifflin.

FOUCAULT, M. 1980. *Power/knowledge: Selected interviews & other writings, 1972–1977* trans. Colin Gordon, Leo Marshal, John Mepham and Kate Sober, New York, Pantheon.

FOUCAULT, M. 1984. Space, knowledge and power. In *The Foucault reader*. Ed. RABINOW, P. Harmondsworth, UK, Penguin, 239–256.

MARSH, G. P. 1864. *Man and Nature: Or, Physical Geography as Modified by Human Action*. New York, Charles Scribner & Co.

PAASI, A. 2005. Globalisation, academic capitalism and the uneven geographies of international journal publishing spaces. *Environment and Planning A* 37. 769–789.

PAASI, A. 2013. Fennia: Positioning a ‘peripheral’ but international journal under conditions of academic capitalism. *Fennia* 191. (1): 1–13.

Magaš, D.: The Geography of Croatia. University of Zadar, Department of Geography, Meridijani Publishing House. Zadar, 2015. 597 p.

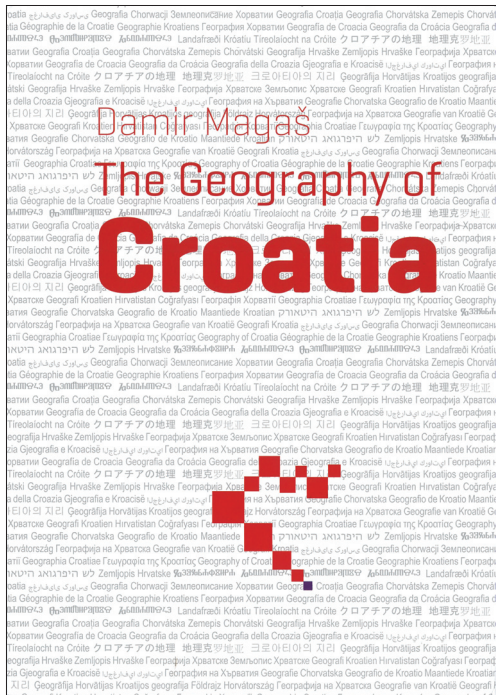
Damir MAGAŠ author of *The Geography of Croatia* volunteered to introduce and describe the physical and social geographical pattern of Croatia. The volume issued by the University of Zadar is the English translation of *Geografija Hrvatske* published in 2013. We can state that this is a seminal work that aims to set Croatia in the global context, and it also tries to familiarise the international audience with

Croatia’s natural, social and economic conditions. The language of the book and the extremely rich appendices with maps and figures are undoubtedly serving this goal.

The chapters of the book are arranged in the traditional way; first readers get to know about the absolute and relative geographical situation of Croatia, and this is where the author emphasises the fact that his country is situated in the buffer zone of East and West, of the continent and the Mediterranean, on the borderline between different cultural regions (i.e. Western Christianity, Orthodoxy and the Islam). In his view Croatia is part of the Western side, even if it means that this way Croatian nation is enlisted amongst the Central European countries.

The division of the country and the dichotomy of countless origins can be traced in various aspects; one of them could easily be the natural conditions of the country discussed in the second chapter. The well-known duality of physical geography has its effect on the climate, on geological and morphological characteristics, on hydrography or on the grounds and situation of vegetation. The northern and eastern part of Croatia belongs to the Carpathian Basin, whereas southward and westward it stretches into the Mediterranean zone facing the Mediterranean (Adriatic) Sea. The transition zone between the two major regions is provided by the steep, Karst Mountains of the Dinarides which, on the one hand, influence the climatic and hydrological features of the coastline, they form a special region of soil and vegetation, but on the other hand they also have impacts on the – later described – population distribution or circulation.

The third chapter is a register and individual representation of landscapes. The 120-page long part of the book reports shortly on all of the landscapes of



the country, along with the general overview of the relief, vegetation and climate of larger landscapes. In this rather lengthy part of the book the latter aspect should have been in focus instead of listing and describing smaller regions in catalogue-type.

In the fourth chapter of the book readers can get acquainted with the historical-geographical characteristics of Croatia. The author sets off from pre-historic times (Holocene), then comes the history of this part of the Balkans before the appearance of Croatians (Greek colonisation, Roman era), and afterwards we can read about the formation of the Croatian nation in the Middle Ages. The second greater part of the chapter deals with the Turkish, Habsburg and Yugoslav era ending up by the formation of modern Croatia. This part of the volume is especially interesting from a Hungarian point of view: it contains information about the Croatian nation's public law status, about the borders and ethnicities of the country in the Middle and Modern Ages. The history of Croatians and Hungarians intertwined throughout centuries, the personal union of the two countries, the status of Croatia (notably under the Hungarian crown, but formally as a sovereign country) had its effect on the national consciousness and history of Croatia.

It is interesting to see how the current geographical and geopolitical situation is matched with that of the Middle Ages, like mapping *Međimurje* ('Muraköz' in Hungarian) as part of Croatia, even if that area was not part of Croatia until 1920. Also, the author refers to his country as a sovereign state even in the Middle Ages, and nothing suggests its peculiar connection with the Hungarian Empire (e.g. when drawing the Croatian–Hungarian borderline). The descriptive parts of the book, of course, clarify this image.

In the fifth and sixth part of the volume the features of population and economy are described in

detail, readers can collect useful information and data about Croatia's demographic, ethnic and migration patterns, about the density of population, the characteristics of settlements, and the present situation of different economic sectors (agriculture, industry, services, including tourism, etc.).

The seventh chapter is a catalogue of Croatian counties (*županija*) likewise the landscape register in the third chapter, however, the description here is based on social geographical aspects (number of population in different settlements, economic situation, circulation, etc.). On the basis of this chapter we get a clear picture on the agglomerations of Croatia, the settlement network, and the division of labour in the area.

The eighth chapter places Croatia within the geographical framework of international communities, organisations and co-operations (EU, CEFTA, UN, NATO, AARC, etc.), whereas the last, ninth chapter deals with the history and development of Croatian geography.

Summarising my experiences, this volume – *The Geography of Croatia* – contains a vast amount of knowledge, it is a decent work, and both the author and publisher are to be praised for finding the right proportions of shared information within the book, for the high quality of layout (especially photos, charts and maps) and the prestigious content. Minor inaccuracies and the peculiar approach (that, in my opinion, reflects on the self-identification of Croatians) do not lessen the value and merit of the book that deserves attention from Hungarian and international audience.

DÁNIEL BALIZS

CHRONICLE

In memoriam Andrei Velichko (1931–2015)

Professor Andrei Alekseevich VELICHKO, Doctor of Sciences in Geography, head of the Laboratory of Evolutionary Geography of the Institute of Geography Russian Academy of Sciences (RAS, Moscow), passed away on November 11, 2015. Andrei Alekseevich received a degree in geography at the Moscow (Lomonosov) State University in 1953 and belonged to the school of K.K. MARKOV. Soon his interest turned to the complex problems of paleogeography of the late Cenozoic ranging from the stratigraphy of glacial and periglacial zones to the reconstruction of paleoclimatic events as they are reflected by the evolution of landscapes. His life work was closely associated with studies on the interaction of primitive humans with the natural environment and his first contribution was a study on the geological age of the upper Paleolithic in the central part of the Russian Plain (1961). VELICHKO's book entitled *Natural process during Pleistocene* (1973) has become a manual for generations of geographers.

During the sixty years of his professional career the impact of environmental change was increasingly observed at a global scale under an ever intensifying anthropogenic pressure. It was recognised as early as the 1960's, but it had taken time until a bilateral Soviet–American scientific program was launched under the aegis of environmental protection. As part of this collaboration national monographs were presented: on late Quaternary environments of the Soviet Union edited by A. VELICHKO was published in the USA (Minnesota, 1984) whereas another one on late Quaternary environments of the United States edited by S.C. Porter came out in Russian (Leningrad, 1986). These volumes had vital significance as they presented both research methodology and the findings of investigations.

Since its foundation (1928) the International Union for Quaternary Research (INQUA) has emphasized the research of the evolution of natural components (inland and mountain glaciology, loess, permafrost, geomorphic processes, soil cover, vegetation and fauna) in an interdisciplinary manner as of an utmost importance. The union has put an aim of encouraging joint research, discussion and publication on the problems of Quaternary. Accordingly, A. VELICHKO formed



a team of researchers at home, where he became the head of Laboratory of Paleogeography of the Institute of Geography, proceeding as Laboratory of Evolutionary Geography from the 1990's.

At the INQUA congress in 1977 he was elected as president of a newly formed Commission on the Paleogeographic Atlas of the Quaternary. Supported by the conveners of the Commission Márton PÉCSI (then president of the Commission on Loess) and Burkhardt FRENZEL (RPG on Terrestrial Paleoclimatology, FRG) a project of an atlas-monograph was launched in the mid-1980's, edited by the three professors and involving a broad circle of international experts. Eventually, it was completed by 1991 and published as *Paleoclimates and Paleoenvironments of the Northern Hemisphere (Late Pleistocene–Holocene)*. Thirty years ago a 1 °C rise in global annual mean temperature was predicted by 2100 (the scenario at Holocene climatic optimum) and 2 °C increase by 2030 (situation at the last Interglacial climatic optimum). The atlas contains various (sometimes conflicting) scenarios to reconstruct the last climatic macrocycle of the recent geological past (last Interglacial/Glacial/Holocene).

The chronostratigraphical correlation at a global scale has been a challenge to the geosciences. Considerable efforts were made to reconcile various Quaternary time scales that suggest or reflect cyclic climatic and environmental change (radiation changes by MILANKOVIĆ, ^{18/16}O ratio in deep-sea deposits, changes of magnetic susceptibility in sequences, fluctuations of CO₂ pressure in polar ice, pollen spectrum changes etc.).

Works on the atlas prompted a close cooperation between the Department of Geomorphology, Geographical Research Institute Hungarian Academy of Sciences (GRI HAS) headed by M. PÉCSI and

VELICHKO's Department of Paleogeography. It started in autumn 1986, when a scientific session was held at the HAS (Budapest) and field excursions were organized featuring key sections in Hungary (Paks, Basaharc) with the participation of German, Hungarian, Polish, Soviet (Russian, Georgian) specialists. Two years later comparative studies were performed at Basaharc (Hungary, Visegrád Gorge) and Bogolyubovo (Russia, Vladimir Oblast'). As the study of Quaternary deposits, primarily of loess-paleosol sequences provides information on the amplitude, character and speed of past climate changes, the two key localities were investigated by experts from both, Hungarian and Russian workshops by sampling for a subsequent laboratory analysis.

VELICHKO was a prolific writer producing more than one hundred scientific contributions, and edited numerous books. Volumes of studies published in Hungary contain several articles written by him.

The International Geosphere-Biosphere Programme was initiated by ICSU in 1986 to coordinate international research on global- and regional-scale interrelationship between Earth's biological, chemical and physical processes and their interactions with human systems. Later its core project Past Global Change (PAGES) emerged with a special reference to investigations into paleoclimatic cycles in the geological past. Professor VELICHKO was very active participant in this project and his last visit to Budapest was associated with a session here in 2008.

In 2014 a project was launched under Professor VELICHKO's professional guidance. Commemorating

the 120th anniversary of the expedition led by Vladimir OBRUCHEV, Russian and Chinese Quaternary researchers carried out large-scale sampling of loess deposits from key exposures of Eurasia to deepen knowledge on the terrestrial paleoclimates and past landscapes of this huge area of the Earth.

In April 2014 A. VELICHKO was decorated with the Grand Gold Medal of the Russian Geographical Society (RGS) awarded for scientific proceedings. The preamble reads: 'For the development of geography, for creation of atlases and monographs on the landscapes and climate and for active participation in the International Geographical Union and Russian Geographical Society'. A recent volume of studies under his editorship deals with the initial human settlement in the Arctic under conditions of pervasive environmental change.

Fine arts were very familiar to him. VELICHKO had a gift in drawing, and illustrations such as geological profiles drawn by him have already been incorporated in geomorphological contributions. He belonged to *Geografiya-Geozhivopis* (Geo-graphics-Geo-painting), a civil society founded under the aegis of RGS in 2005 that organised exhibitions and published albums over the past decade.

At least three generations of geographers keep the memory of Andrei Alekseevich VELICHKO, a prominent scholar of international renown, close friend of Hungarian colleagues, a global citizen with amiable personality.

LÁSZLÓ BASSA

GUIDELINES FOR AUTHORS

Hungarian Geographical Bulletin (formerly Földrajzi Értesítő) is a double-blind peer-reviewed English-language quarterly journal publishing open access **original scientific works** in the field of physical and human geography, methodology and analyses in geography, GIS, environmental assessment, regional studies, geographical research in Hungary and Central Europe. In the regular and special issues also discussion papers, chronicles and book reviews can be published.

Manuscript requirements

We accept most word processing formats, but MSWord files are preferred. Submissions should be single spaced and use 12pt font, and any track changes must be removed. The paper completed with abstract, keywords, text, figures, tables and references should not exceed **6000 words**.

The Cover Page of the article should only include the following information: title; author names; a footnote with the affiliations, postal and e-mail addresses of the authors in the correct order; a list of 4 to 8 keywords; any acknowledgements.

An abstract of up to **300 words** must be included in the submitted manuscript. It should state briefly and clearly the purpose and setting of the research, methodological backgrounds, the principal findings and major conclusions.

Figures and tables

Submit each illustration as a separate file. Figures and tables should be referred in the text. Numbering of figures and tables should be consecutively in accordance with their appearance in the text. Lettering and sizing of original artwork should be uniform. Convert the images to TIF or JPEG with an appropriate resolution: for colour or grayscale photographs or vector drawings (min. 300 dpi); bitmapped line drawings (min.1000 dpi); combinations bitmapped line/photographs (min. 500 dpi). Please do not supply files that are optimized for screen use (e.g., GIF, BMP, PICT, WPG). Size the illustrations close to the desired dimensions of the printed version. Be sparing in the use of tables and ensure that the data presented in tables do not duplicate results described elsewhere in the article.

REFERENCES

Please ensure that every reference cited in the text is also present in the reference list (and vice versa).

Reference style

Text: In the text refer to the author's name (small capitals with initials) and year of publication. References should be arranged first chronologically and then further sorted alphabetically if necessary. More than one reference from the same author(s) in the same year must be identified by the letters 'a', 'b', placed after the year of publication.

Examples: (RIDGEWELL, A.J. 2002; MAHER, B.A. *et al.* 2010) or RIDGEWELL, A.J. (2002); MAHER, B.A. *et al.* (2010)

Journal papers:

AAGAARD, T., ORFORD, J. and MURRAY, A.S. 2007. Environmental controls on coastal dune formation; Skallingen Spit, Denmark. *Geomorphology* 83. (1): 29–47.

Books:

PYE, K. 1987. *Aeolian Dust and Dust Deposits*. Academic Press, London, 334 p.

Book chapters:

KOVÁCS, J. and VARGA, Gy. 2013. Loess. In: BOBROWSKY, P. (Ed.) *Encyclopedia of Natural Hazards*. Springer, Frankfurt, 637–638.

Submission

Submission to this journal occurs online. Please submit your article via geobull@mtafki.hu.

All correspondence, including notification of the Editor's decision and requests for revision, takes place by e-mail.