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The hot spring deposits near Magyarkút and their paleobotanical analysis (Börzsöny Mountains, Hungary)

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Abstract

The clarification of the location and origin of the siliceous-calcareous deposits north of Magyarkút can lead to noteworthy conclusions in connection with the geological evolution in the environment of the Szokolya Basin.

Utilizing the already available bibliography, this research separated the discussed deposits from the other types of sediments detectable in their environment. The presence of the siliceous-calcareous deposits on the south-eastern edge of the Börzsöny, near the settlement of Magyarkút was already partly known. Nevertheless, the lately found terrestrial plant fossils provided novel knowledge.

According to the researches based on geomorphological and paleobotanical methods, the study assumes that a hot spring activity of postvolcanic origin took place in a time interval during the Middle to Late Miocene, in a subtropical environment. Besides the already known calcareous spring deposits embedded into the diatomaceous environment, in the side of the Szalamandrás Hill rocks of presumably terrestrial origin were also recognised and described based on the flora present in them. Completing the former knowledge, the study can claim, that among the hot spring deposits of Magyarkút, the terrestrial deposits of Szalamandrás Hill can definitely be separated from the rock complex of limnic origin – the latter being similar to the spring deposits of the Szokolya Basin. The flora remnants prove or specify the chronological results of earlier researches regarding the Middle to Late Miocene age of the deposits.

Keywords: siliceous-calcareous deposits, geyserite, paleobotanical evidence, *Podocarpium podocarpum*

Introduction

The investigation of sediments on the south-eastern margin of the Börzsöny Mountains dates back to more than one hundred years. Former studies fre-

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quently mentioned the sediments covering volcanites near the settlement Magyarkút, even though their names and their proposed origin often proved to be highly different and contradictory. The most recent references define them as a sediment complex produced both by volcanic and non-volcanic processes (Karátson, D. 2002, 2007). However, the sedimentary complex still lacks an adequate description.

From the really varied deposits near Magyarkút sequences of calcareous-siliceous deposits were selected for more detailed analysis, which are significantly different from all other sequences of the area. Composition and morphology of their bedrock outcrops refer to postvolcanic activity. The fossilized plant remnants found here are of exceptional importance for dating.

This study aims at the structural description of the rocks, the identification of the plant remnants found in the calcareous spring deposits, finally dating and reconstruction of the conditions of their formation.

The calcareous spring-deposits at Magyarkút are referred to in several instances in literature. The earliest reference is written by Böckh, H. (1899), who mentioned the formations only peripherally:

„Let me refer to those travertine and siliceous deposits, which can be found around Verőcze (near Magyarkút) and in the Puncz Trench (Szokolya Basin). They are the most closely connected to the underlying andesite breccia and tuffs. Superimposing the lignite seams the tuff breccia layers change into extremely fine tuffs, in some places the transition into sandy, marly, siliceous and calcareous layers is almost undetectable.…"

Böckh was the first to realize the importance of calcareous and siliceous deposits, and unambiguously associated them with the neighbouring volcanic products.

In his geological study about the Börzsöny Mountains, Ferenczi, I. (1935) mentioned the deposits of the small stream extending upwards the western slope of Borbély Hill (located south-east of Magyarkút). He describes a so-called "*andesite agglomerate*", the grain size of which gradually decreases from the bottom of the stream upwards, and is covered by rounded andesite gravel and finally by "*travertine, geyserite and opaline spring-products"* in the higher regions. These spring-products are to be found in the line of the gully on Borbély Hill. They represent the southernmost, mainly fragmented section of the occurrences near Magyarkút, and are identical with the samples taken from the bedrock. According to Ferenczi's description, in this section the sediment covers agglomerate with a thickness of 50–60 metres. The sediment was identified as *„a fresh-water sediment group composed of diatomaceous shale, geyserite, chalcedony, and produced by postvolcanic activities".*

Báldi, T.–Kókai, J. (1970) mentioned the area of Magyarkút in relation to the dating of the andesite-volcanic activity in the Börzsöny. Their study highlighted the role of limnic/marine calcareous cover deposits filling the

Szokolya Basin, and briefly mentioned the sporadically present travertines in the diatomaceous succession at Magyarkút, primarily on Borbély Hill. Authors supposed that the limnic formations at Magyarkút can be correlated with those of the Szokolya Basin, which were considered to be Lower Badenian.

Based on morphological characteristics and the records of airborne magnetic surveys and in accordance with the findings of Jámbor, Á.–Moldvay, L.–Rónai, A. (1982), a geological map was constructed. Its explanatory text claims that "*based on their outcrop the presence of diatomite, geyserite and travertine at Magyarkút can be classified as part of the Tortonian (Badenian)*", i.e. the Rákos Limestone Formation.

There is Ól Hill on the northern side of Szokolya Basin (*Figure 1*). Nagy, B. (1983) found here siliceous sediments containing limonite. In his opinion, these are hot spring deposits.

In conclusion, the calcareous spring deposits near Magyarkút were found at the turn of the 19th and 20th centuries and referred to as *„geyserite"* and *„travertine"* up until the 1980's. Many studies connected them to the deposits of the Szokolya Basin. More detailed analyses were not carried out in the last two decades of the last century; moreover, the deposits neither were considered during the mapping of the area (Korpás, L.–Csillag-Teplánszky, E. 1999), nor for the reconstruction of the geological evolution of the Börzsöny Mountains (Korpás, L. ed. 1998).

Description of the study area

The hot spring deposits, as earlier described, can be found near the settlement Magyarkút (*Figure 1*).

The settlement of Magyarkút is located on the south-eastern margin of the Börzsöny Mts., on a widening of a valley bottom, where the Keskeny-Bükk Stream flows into the Les Stream (*Figure 2*). The eastern and southern margins of the area of 8 km^2 represented on the terrain model is marked by the curved crest of the Keskeny-Bükk–Csapás Hill–Magas Hill–Borbély Hill ridge, while the northern margin is indicated by the andesitic Kis-Kő Hill and by the Nagyhársas formed by Oligocene deposits.

The most significant occurrences in the area are undeniably represented by the rocks found in the hillside of the Szalamandrás Hill. These rocks enclosed paleobotanical rests, with the help of which a dating of good accuracy can be carried out. During a field trip 35 samples were taken from the rocks near Szalamandrás Hill, out of which 27 contained flora residues. The paleobotanical analysis was carried out by Hably, L. in the Department of Botany, Hungarian Natural History Museum.

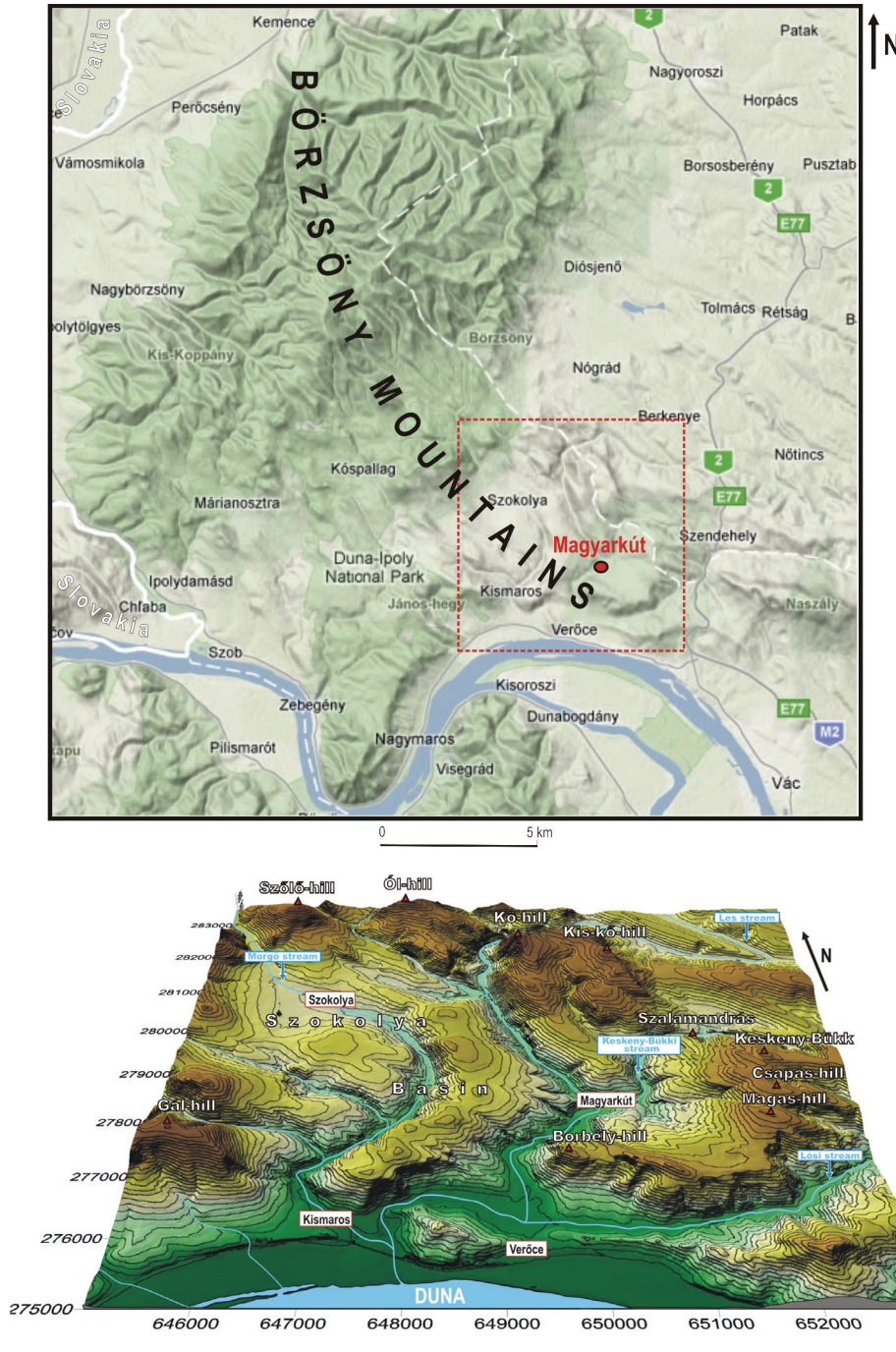


Fig. 1. Magyarkút and environs

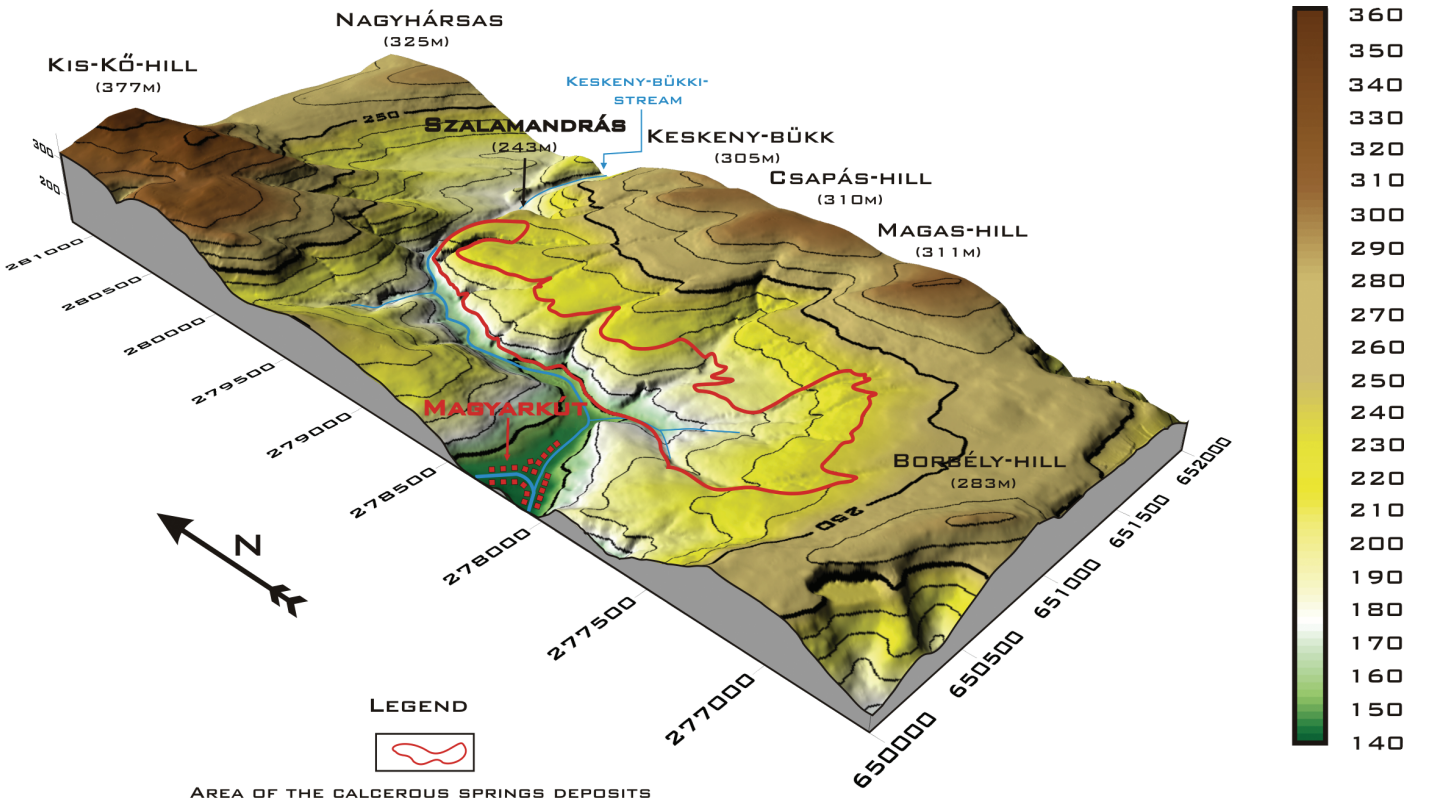


Fig. 2. Surrounding of Magyarkút on the Digital Elevation Model

Although previous researchers (Böckh, H. 1899; Ferenczi, I. 1935; Báldi, T.–Kókai, J. 1970) described several occurrences in the inner side of the crest of the Keskeny-Bükk-Borbély Hill, the present study discusses the deposits on the side of the Szalamandrás Hill exclusively. This is the very place where the paleobotanical rarities to be introduced later on were revealed.

This locality represents by all means a novelty, since there were no other findings of similar quality and condition detected nearby.

The Szalamandrás Hill (243 m) is one of the elevations prepared by weathering of the slope gently descending towards the stream valley flanked by the Keskeny-Bükk–Borbély Hill's ridge (*Figure 2*). From the north and the west, it is bordered by the Keskeny-Bükk Stream, while its southern and eastern borders are marked by the line of steep gullies. In the southern and western side of the Szalamandrás Hill a significant amount of hot spring deposits can be detected (*Figure 3*).

These calcareous spring deposits directly superimpose the andesite weathering products of gravel-sand size. The bedrock outcrops on the surface can be primarily related to the terrain at 210–230 m above sea level, where several, clearly isolated, porous, hollow limestone blocks are present (*Figure 3 (1); photos 2–3*), presumably marking the sites where water of springs issued. Stratified calcareous spring deposits can be found at several places near the bedrock blocks (*Figure 3 (2); photos 4–5*). The two rock types frequently occur together, developing from each other.

Thus the porous calcareous spring deposits undoubtedly emerge from a stratified environment of rocks. One can assume that the once operating springs could develop the whole formation. Stratified calcareous material precipitated from stagnant water or from water pouring down along the sides of the cones and accumulating in the area between them.

Description of the rocks

The samples taken from the surface outcrops appear in their natural occurrence as moss-grown, greyish-white or dark-grey, hard, resistant rocks. The colour of their fresh fracture is generally beige-, greyish-, yellowish-white. As the effect of hammering, they give a siliceous scent frequently accompanied by sparks, which is due to silicification of the limestone.

In many cases quartz and calcite also occur as inclusions. Regarding their structure massive, porous and stratified rocks can be distinguished.

The weathered surface is greyish-white *(1)*, at some places having traces referring to corrosion (*Photo 1*). The fresh fracture features a mixture of light-brown to beige and darker brown patches *(2)*. The irregularly-shaped, in some cases angular cavities are filled out by white calcite crystals *(3)*.

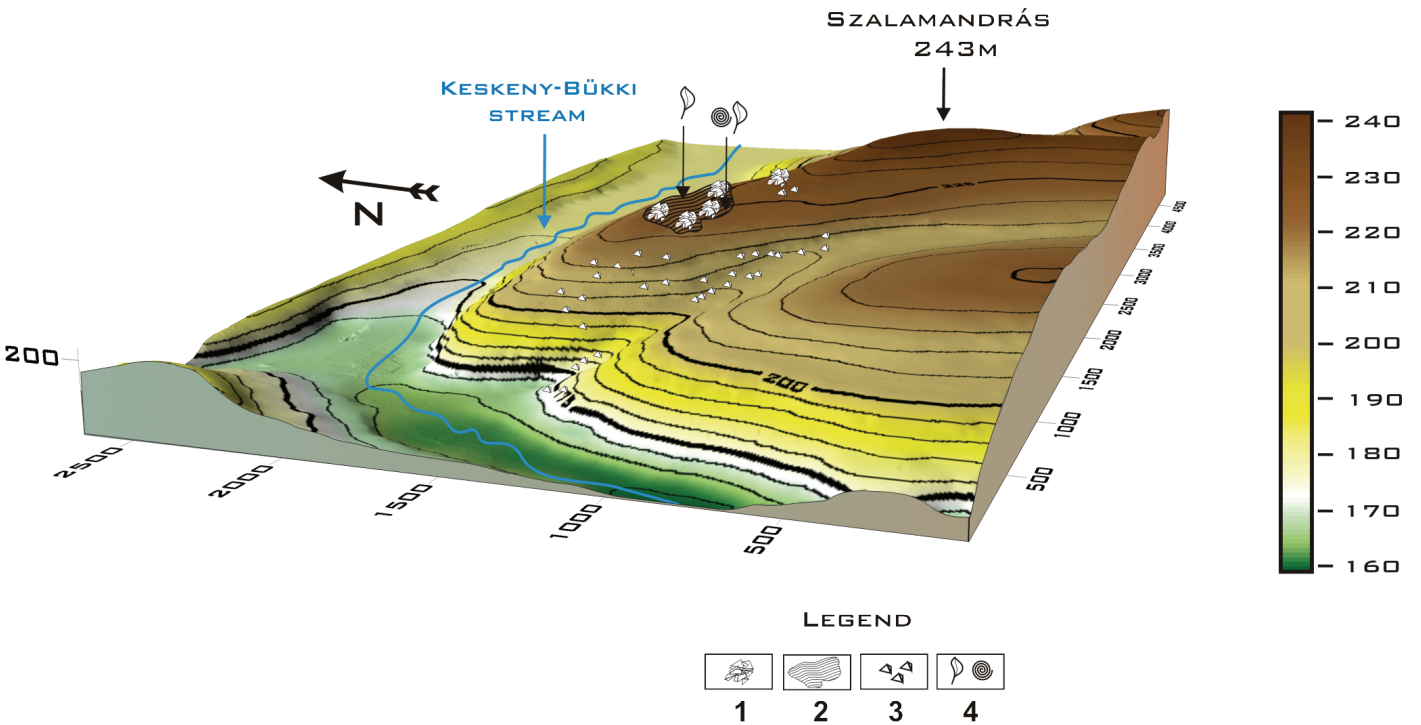


Fig. 3. Calcareous spring deposits on the Szalamandrás Hill. – 1= Porous spring deposit rocks; 2= stratified rocks; 3= debris; 4= locality of flora and fauna

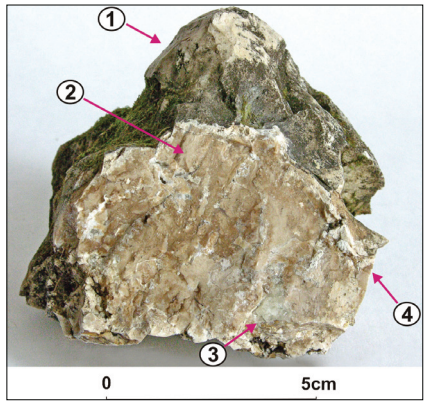


Photo 1. Massive calcareous spring deposit. – 1 = surface; 2 = fresh fracture; 3 = calcite crystal; 4 = sharp rims

Photo 2. In situ occurrence of a 3 m high, porous spring deposit on the slope of the Szalamandrás Hill

There are 0.5 mm wide, 2–5 mm long, curved, narrow holes filled out by white calcite crystals. The rock often contains quartz as inclusion, and is chipping with sharp rims *(4)*. Porous-structured rocks can be recognised in the hillside of the Szalamandrás Hill (*photos 2*, *3a* and *3b*). Their weathered surface is greyish-white, the fresh fracture is white or beige-white. The layers of the rocks are built up from 0.5 mm thin sheets (*Photo 3b, (1)*), and construct a complex structure, in which the components of irregularly twisting layers look similar to a „crumpled wet sheet of paper".

The thickness of the layers varies between 1 and 5 mm. There are smaller and larger cavities within the rocks, ranging also between 1 and 5 mm in size (*Photo 3a, (1)*), the inner side of which is sometimes covered by calcite crystals. The rock is chipping, and breaks along angular rims.

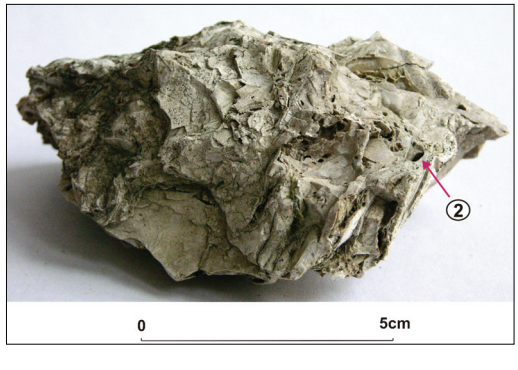


Photo 3a. Porous spring deposits. – 1 = cavities in the rock

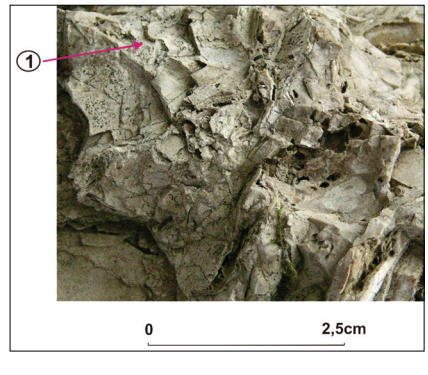


Photo 3b. Enlarged picture of porous spring deposits. – 1 = 0.5 mm thin sheets

In the case of stratified rocks, various kinds of occurrences are possible, and are to be found in the side of Szalamandrás Hill, north of the gully of Medve-kút and of Hosszú gully. They are detectable always near the massive or porous rocks, in some cases they alternate with the latter. Their decomposition surface is white, sometimes with a yellowish-greyish tint.

A special variety of it can be characterized by wispy layers thinner than 0.5 mm (*Photo 4*). Generally grey and white layers alternate. There are at every 4–5 mm regularly repeating, very thin, rusty brown layers *(1)* which probably refer to the periodical activity of the hot spring. The rock does not break up along the layers, the latter cannot be separated from each other by a chisel (*Photo 4a*).

The illustrated rocks of alternating layers are continuously developing on the surface of the porous-structured rocks. Based on the outlook of the stratified deposit, it could be the precipitation from some kind of water running down on an uneven surface (*Photo 4b*); here the rock can be split along the layers by a chisel. The layers are wavy, rough surfaces *(2)*.

The other variety of stratified rocks involves much more rougher, even 0.5–1 cm thick layers (*Photo 5*). Though the paper-thin, uneven surface of strati-

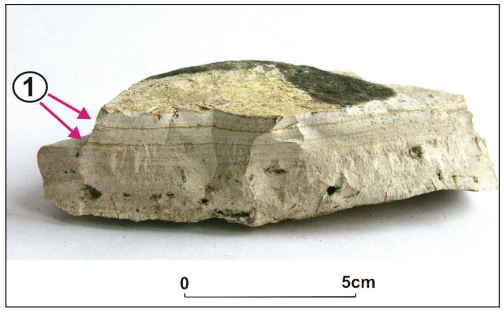


Photo 4a. Microstratified spring deposit, continuously developing on the surface of the porous rock, on the side of the Szalamandrás Hill (243 m). – 1= rusty brown layers

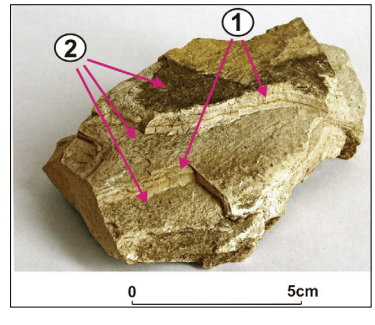


Photo 4b. Microstratified spring deposit. – 1= rusty brown layers; 2= wavy, rough surfaces of the layers

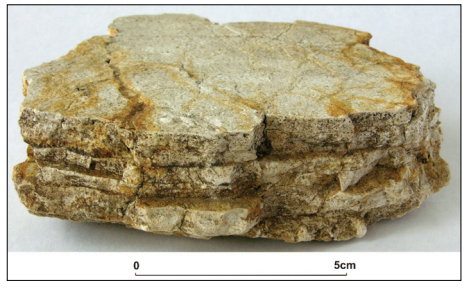


Photo 5. Macrostratified spring deposit

fication frequently occurs in this case as well, it can be definitely separated from the above described version, since the rocks can easily be taken apart. Often plant remnants, sometimes even calcareous snails can be found among the layers (*pictures 6, 7*). Regarding the number and preservation of the finds, the plant remnants have a greater significance in this case. The fossils include mainly silicified stems or carbonized remnants of leaves (*Photo 6*).

The veins are visible even to the naked eye, in some cases the material of the leaves was preserved as well. The material of such conserved leaves is always extremely crumbling and poorly preserved. These remnants could be found exclusively in white coloured layers.

Paleobotanical description

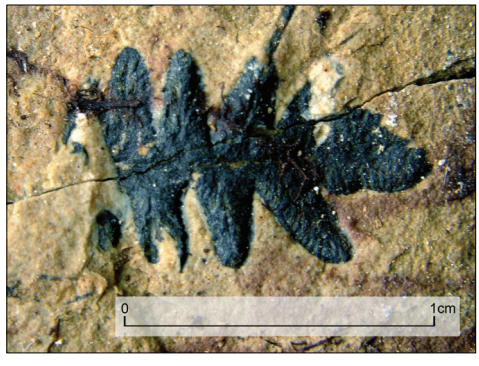


Photo 6. Fossilized fern remnant

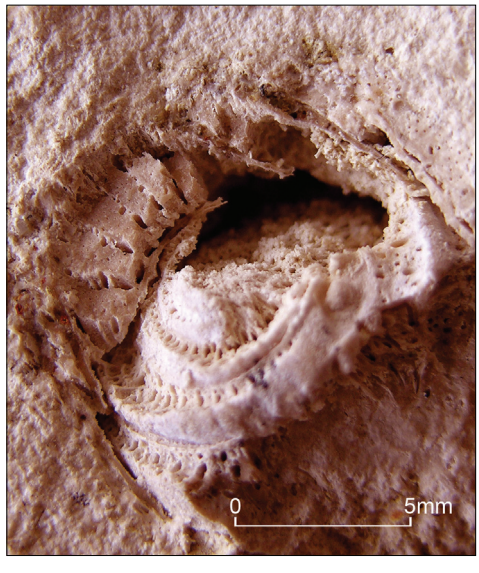


Photo 7. Silicified gastropod

Pteridophyta

„Pteris" oeningensis Unger, F. (*Photos 8, 9*).
1847 Pteris oeningensis Unger, F., Unger, F. 124 p. Pl. 37, *figures 6, 7.*
1855 Pteris oeningensis Unger, F., Heer, O. 39 p. Pl. 12, *Figure 5.* (a-i) – Öningen.
1990 Pteris oeningensis Unger, F., Kovar-Eder, J.–Krainer, B. 18 p. Pl. 1, figures 7–10, Pl. 3. *Figure 7.* – Wörth bei Kirchberg/Raab.
1998 Pteris oeningensis Unger, F., Krenn, H. 174 p. Pl. 1, *Figure 3.*
2004 Pteris oeningensis Unger, F., Kovar-Eder, J. 165 p. Pl. 1, *figures 1–3.* – Mataschen
Pteris oeningensis Unger, F., Meller, B. and Hably, L. – Gratkorn, in progress.

Description: Only 1.2–1.3 cm small fractions of the secondary wings of the leaf blade are preserved. The length of the secondary winglets varies between 0.2–0.8 cm, their width is between 0.1–0.2 cm, their size decreases towards the leaf apex section of the wings. Their location alternates on the spur. The wings grow narrow in the rounded leaf apex; their basis section broadens out, and joins the petiole as well as partly the other wings. There is a strong midrib in the middle of the blade, which has a dense vein system. The winglets have a smooth edge.

Photo 8. „Pteris" oeningensis Unger, F.; leaf apex of the secondary winglet

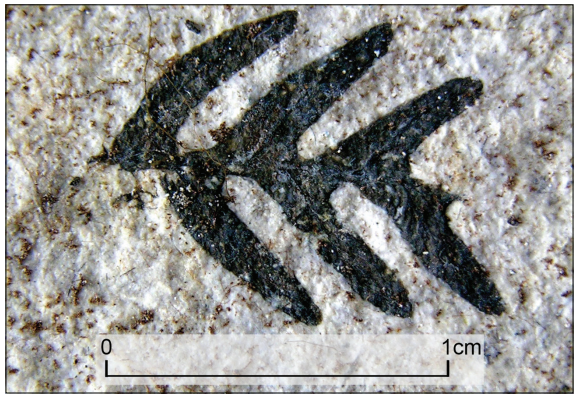
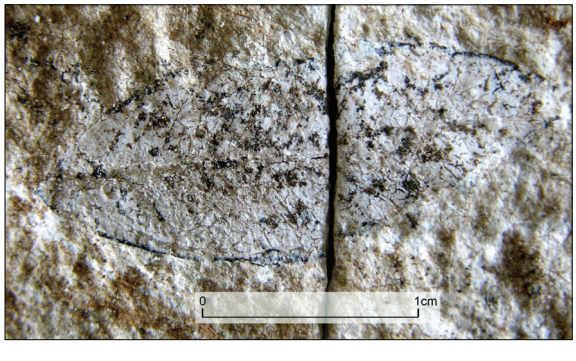


Photo 9. „Pteris" oeningensis Unger, F.; medial section of the secondary winglet



The majority of the plant remnants in the quarry belong to this species. More than 20 fractions were found, which were originally parts of the leaf apex or the middle section of the secondary winglets. In some cases, the rims of the winglets were fossilized turned up, and the leaf seems to be narrower than its actual size is. The occurrence of the species was recorded at numerous Austrian Late Miocene quarries, at several places it is accompanied by *Podocarpium podocarpum*. Its occurrence refers to autochthonous environment on the one hand, and to wet habitat on the other.

Leguminosae

Podocarpium podocarpum (Braun, A.) Herendeen, P.S. *(Photo 10)*
1992a Podogonium knorrii (Braun, A.) Heer, O.; Herendeen, P.S., 4 p. *figures 1–5.*
1992b Podocarpium podocarpum (Braun, A.) Herendeen, P.S. 732 p.
1995 Podogonium knorrii (Braun, A.) Heer, O., Erdei, B. 1995. 15 p. *figures 10, 11.*
2004 Podocarpium podocarpum (Braun, A.) Herendeen, P.S., Kovar-Eder, J.–Kvaček, Z.–Ströbitzer-Hermann, M. 2004. 74 p. Pl. 9. *figures 8–11.*

Description: The length of the leaflets varies between 2.2–2.4 cm, their width ranges between 0.8–1.0 cm. They are oval-shaped, the leaf base is slightly asymmetric, and the leaf apex is sharp. The vein

Photo 10. Podocarpium podocarpum (Braun, A.) Herendeen, P.S. leaflet

system is brochidodrom, camptodrom. The midrib is strong, the secondary veins are thin but dense, they run nearly parallel, and finally join each other noose-like near the rim of the leaflet. A basal vein starts from the petiole – exclusively on one side –, which can be followed till the lower third-half of the layer. The leaflet has a smooth edge.

The quarry involved three leaflets of this subtropical species of tree. It first occurred in Central Europe in the Carpathian (Magyaregregy; Hably, L. 2002; Parschlug; Kovar-Eder, J. *et al.* 2004), later became dominant in the Sarmatian, and was an important element of almost every Sarmatian quarry (Hably, L. 1992). Like many other Sarmatian components, it also disappeared from the Pannonian Basin during the Pannonian, and did not return in the Pliocene, not even to places, where other dominant Sarmatian species, e.g. the Quercus kubinyii, Zelkova zelkovifolia occurred in the Pliocene of Gérce and Pula (Hably, L.–Kvaček, Z. 1997). It became an additional component of a reasonably rich flora in the Carpathian, while it frequently accompanied the principal or characteristic species of Quercus kubinyii, Zelkova zelkovifolia, „Parrotia" pristina in the Sarmatian. It can be found as a member of a subtropical flora-complex at every of its known quarries.

Ulmaceae

cf. Ulmus sp. (*Photo 11*)

Description: The length of the leaf is 2.6 cm, its width takes about 1.5 cm. Its base, leaf apex and edge are fragmented. The vein system is craspedodrom. The secondary veins leave the strong midrib in acute angle, at some places branch out in a Y–shape.

Only a single fragmented print was found at the quarry. Based on the low amount of taxonomic characteristics, it could be a leaf of an elm tree, which was quite widespread together with the various species of the Neogene edaphic associations. It was generally located in the grove forests of the high flood area. It most frequently occurred only as an additional component, the dominant stock of the Ulmus braunii is known from the Sarmatian, and Pliocene.

Photo 11. cf. Ulmus sp.; leaf

Monocotyledonae gen. et sp. – 2 small fragments (*Photo 12*)

Description: The fragments are somewhat longer than 1 cm, their width is 0.7–0.8 cm. They have a dense system of fine veins, running parallel.

Only two small fragments are known from the quarry. According to the parallel vein system, they can be the members of this class. Their occurrence refers to autochthonous environment on the one hand, and to a neighbouring wet habitat on the other.

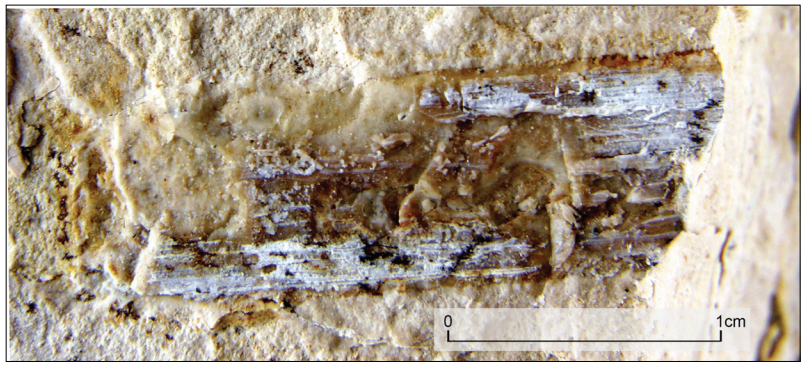


Photo 12. Monocotyledonae gen. et sp.; leaf fragment

Conclusions

Based on the quite scant flora remnants, one can assume the presence of an edaphic association strongly related to water: the monocotyledons and the ferns could be located in the direct neighbourhood of water, the elm-trees were in the high flood area, while the *Podocarpium podocarpum* forest could be found somewhat further apart, supposedly accompanied by other species, which were not fossilized. The *Podocarpium* can be detected in the Carpathian Basin from the Carpathian to the Sarmatian, therefore, the age of the quarry can be between the Middle and Late Miocene. Regarding its climatic requirements, this species provides the most amount of information as well, since its known occurrences all prove a subtropical climate.

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Dynamics of organic carbon and dissolved iron in relation to landscape diversity

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Abstract

Spatial diversity of landscapes results in spatial and temporal heterogeneity of soil physical and soil chemical parameters. These diversities of pH and E_H may cause spatial and temporal differences of dissolved macro- and microelements between ecotopes. The present paper focuses on the relationship between vegetation induced landscape patterns and the spatial and temporal diversities of soil physical and chemical parameters. We supposed that the higher plants induced soil chemical differences generate concentration gradients between ecotopes. This study primarily deals with organic carbon and iron turnover in a headwater wetland.

The study area is divided into six distinct patches (ecotopes). Measurements have been taken in the core parts of ecotopes (patches) and along their boundaries. There have been measured individual seasonal dynamics of pH and of E_H. The increasing physiological activity of higher plants caused specific E_H. It leads to higher spatial differences of redox conditions between April and August. The most reductive conditions were measured in sedgy patches, while higher E_H prevail in horsetail and nettle dominated ecotopes. DOC concentrations have also shown similar pattern as the E_H. More reductive conditions have been correlated with higher DOC content. Under E_H<25 mV there is a direct correlation between the amount of dissolved iron and the redox conditions. The differences of E_H may induce concentration gradients between ecotopes and a potential for horizontal DOC and dissolved iron turnover. Quantification of these turnovers by diffusion is nearly beyond possibility due to the labyrinth effect. Although we could not determine the extent of diffusion, thus to estimate the intensity of elements movement along concentration gradients between two spatial units, we introduced a new indicator called "boundary permanence index (BI)". Results of 300 days long measurement suggest that the intensity of horizontal turnover mainly depends on the shape of the spatial units (length of boundaries) and on the dissimilarities between dominant herbaceous plants.

Keywords: landscape diversity, wetland, iron, dissolved organic carbon, redox conditions, ecotope

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Introduction

Comprehensive knowledge about global macro-element cycles have been published since late 60's on the basis of ecosystem studies (Whitakker, R.H. 1975; Odum, E. *et al.* 2004). These publications have essential influence on the scope and the methodology of emerging geo-ecology. The field-scale studies on nutrient cycling became one of the most important sub-discipline of geo-ecology (Leser, H. 1976). These disciplines have been active in Hungary until recently (Szalai, Z. 1998; Szabó, M.–Molnár, E. 2001; Farsang, A–M. Tóth, T, 2003; Barta, K. *et al.* 2006, Anton, A. *et al.* 2008, Szabó, Gy. *et al.* 2008, Szabó, Sz. *et al.* 2008). Other sub-discipline of geo- or landscape ecology rather focused on analysis of landscape structure (Forman R.T.T. 1995, Lóczy D. 2003, Csorba P. *et al.* 2004, Szabó, M *et al.* 2008, Kertész, Á. 2009). This wing mostly deals with the relationship between landscape diversity and landscape stability (Keveiné Bárány, I. 2003; Csontos, P.–Tamás, J. 2007; Kertész, Á. 2008). The diversity of ecotopes has an influence on the heterogeneity of soil physical and soil chemical parameters too (Moismann, Th. 1984; Szalai, Z. 2008).

The most important soil chemical factors for the solubility are the chemical reaction and the redox conditions (Impelliteritteri, C.A. 2005; Genin R. J-M. 2006; Szabó, Sz.–Szabó, Gy. 2006). The pH mostly enhances solubility in acidic range: solubility of Al(III) increases below pH 5.5, solubility of Fe(III) increases below pH 3.5 and solubility of Ti(II) increases below pH 3.0. The solubility of some minerals also may increase towards higher pH, as e.g. quartz (Bohn, H. *et al.* 1979).

Oscillation of redox conditions can be even more important factor for solubility. Reductive conditions increase solubility of several major and trace elements, such as iron, aluminium, arsenic, copper, etc. Callie, N. *et al.* 2003). Redox potential in wetland soils is affected by saturation (Ponnamperuma, F.N. 1972), by quality of higher plants (Wiessner, A. *et al.* 2005; Dusek J. *et al.* 2008; Szalai, Z. 2008), by activity of microorganisms (Eggleton, J.–Thomas, K.V. 2004; Nikolausz M. *et al.* 2008) and by presence of electronacceptors (Ponnamperuma, F.N. 1972).

The status of saturation correlates with the abundance/absence of O_2 and with E_H. The published threshold E_H values for activity of denitrifying bacteria vary between +400 mV (Rowell, D.L. 1981) and +231 mV (Rivett, M.O. *et al.* 2008).The published threshold E_H for Fe(III) reduction is also alter in wide range between +100 mV (Dusek, J. *et al.* 2008) and -130 mV (Guo, T. *et al.* 1997; Rivett, M.O. *et al.* 2008).

The major and trace metal reduction is strongly affected by microbial activity (Gambrell, R.P. 1994; Komlos, J. *et al.* 2007; Ascar, L. 2008; Nebauer S.C. et. al. 2008). Weiss *et al.* (2005) reported that Fe(III) plaques are more rapidly reduced in rhizosphere than in non-rhizosphere. They found that

the iron oxidation and reduction is primarily driven by Fe(II)-oxidizing and Fe(III)-reducing bacteria.

The soil aeration status also depends on the dominant species of higher plants, due to the oxygen release trough their aerenchyma. The range of oxic habitat around the rhizolplan depends on the physiological status of plants (Lambers, H. *et al.* 1998), and the activity of microbial communities, while the aeration status of the whole soil also depends on the structure and density of roots. The various lab-scale and field scale studies applied by different higher plants have reported distinct dynamics of E_H (Nagai T. *et al.* 2007; Batty, L.C.–Younger, P.L. 2008; Dusek, J. *et al.* 2008, Nikolausz, M. *et al.* 2008).

Since field scale and batch scale studies reported various redox dynamics in relation with different kinds of environmental conditions (e.g. dominant higher plants, microbial communities), they may appear as spatial and temporal heterogeneities of dissolved organic carbon and dissolved iron as well.

The present paper focuses on (a) the spatial pattern and seasonal dynamics of redox potential dissolved organic carbon and dissolved iron in the upper 15 cm of soils, on (b) the origin of these differences and on (c) the relationship between landscape heterogeneity and the amount of concentration gradients of DOC and of dissolved iron.

Materials and methods

Site description

The study area is situated in Völgység region (Tolna County, Hungary), in a headwater valley extending in north to south direction *(Figure 1).* The total area of headwater wetland is less than 3,000 m^2. The wetland is a functional unit. Six vegetation induced individual spatial units were defined *(Figure 2).* Five of studied patches are dominated by only one herbaceous plant species: sedge (*Carex remota*, *Carex vulpine(?)* and *Carex riparia* – three individual patches), horsetail (*Equisetum arvense*), common nettle under common maple (*Urtica dioica* and *Acer campestre*). The sixth wetland ecotope does not have dominant herbaceous plant. Most of the landscape forming factors (meso-climate, soil, soil moisture) are homogeneous *(Table 1).* The studied wetland is bordered by mesophilous meadow and oak forest and it does not have outflow in most of the year. 3–10 points were used for soil sampling and for control measurements (depending on the area) and 3–5 points were used for sampling at boundaries of patches. The samples were collected from and field measurements carried out in the upper 10–15 cm horizon. All the wetland ecotopes were characterized as *mollic gleysol siltic calcaric*. The topsoil is densely penetrated by roots. The root density drastically decreases with depth and becomes negligible at 35–50 cm.

One point was monitored continuously in each wetland ecotope and in each boundary. Temporary control measurements were carried out at the sampling points using handy TESTO230 pH and E_H meter. Each point of measurement included 3 measuring holes (d = 0.9 cm, depth = 15 cm) for the E_H and pH probes and for sampling. The permanent holes for sampling were closed by plastic sticks. The measured parameters were recorded by data collectors. The parameters were measured each day between February 15 and December 12, 2005. Since pH, E_H, and PAR units are highly variable, means of three observations per day (12:50; 13:00, 13:10) were used. Soil solution samples were transferred into falcon type PE tubes. Soil solution samples for iron measurement were conserved using cc. nitric acid. Testo Type 04 pH electrodes (with thermometer) were applied for pH measurement. The pH calibration was carried out before installation, and it was repeated at the end of the year. Applied probes were tested in laboratory using pH 7.00 and pH 10.00 buffer solutions at 25 °C. 20 pcs of Type 04 probes have recorded 24.9 °C and 2 pcs of probes measured 24.8 °C in comparison with the reference thermometer (TESTO 01: 25.0°C). Before calibrations Type 04 probes recorded pH 6.92–7.01 at pH 7.00 and pH 9.87–10.05 at pH 10.00, whereas after calibration the range of measured values were pH 6.98–7.04 and pH 9.98–10.03 for pH 7 and pH 10 buffer solutions respectively. The applied pH probes allowed continuous thermal correction.

Fig. 1. The study area

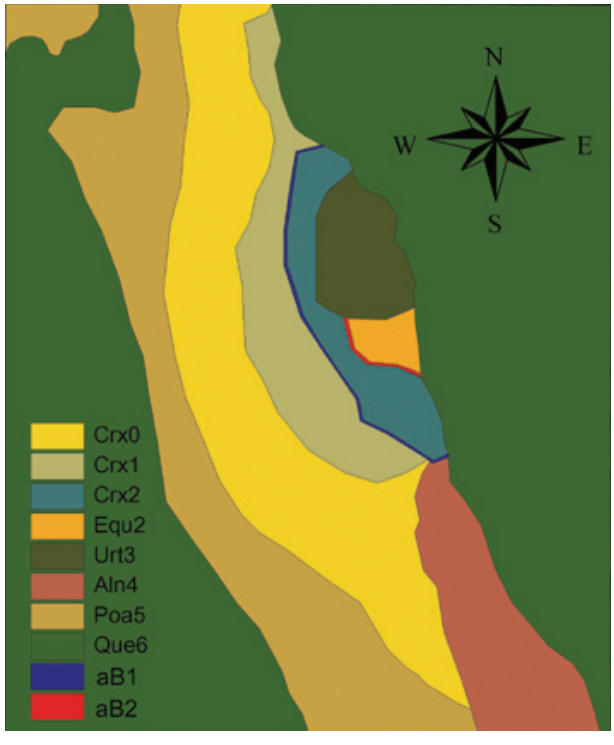


Fig. 2. Distribution of the studied ecotopes

E_H conditions were recorded by Testo Type 06 calomel electrodes. Since the E_H is one of the most variable parameter the mean of three measurements (12:50, 13:00, 13:10) were used. The recorded data were corrected relative to the normal hydrogen electrode by adding E_{Hcor} value, which depends on temperature (E_{Hcor} = -1.3903×T+585.29; R^2 = 0.9985; T = temperature (K); on the basis of the manufacturer's correction data). Redox probes were tested before installation in laboratory using Ag/AgCl redox standard solution (+358 mV) at 25°C. Applied probes recorded values in a range of +352–+365 mV. To characterize redox status of the soils three threshold values were used. E_H values below +300 mV, +230 mV and +100 mV indicate activity of denitrifying bacteria, reduction of Mn^{4+} ions and reduction of Fe^{3+} ions, respectively.

Photo-synthetically active radiation (PAR, λ = 400–700 nm) was determined by Skye 200 quantum interceptor. PAR measurements in the open ecotopes were carried out upon the ground surface and on the surface of vegetation, and they were performed upon the ground surface and on the surface of herbaceous vegetation in the shaded (woody) ecotopes.

Lab measurement

Soil pH (pH_{dw}, pH_{KCl}) was also measured in laboratory following the "International A method" (Buzás, I. 1988) using Jenway 3510 pH meter. Soil organic carbon (TOC) and dissolved organic carbon (DOC) were measured by NDIR-chemiluminescent analyser (Tekmar Dohrmann Apollo 9000N). Textural properties of soils were determined with laser diffraction analyser (Fritsch

Table 1. Spatial distribution of main landscape forming factors

	Crx0	Crx1	Crx2	Equ2	Urt3	Aln4	aB1	aB2
Area (sqm)	1360	525	276	69	242	484	27	8
Perimeter (m)	271	177	122	37	63	112	125	34
Length (m)	–	–	–	–	–	–	62	16
Dominant herbaceous species	Sedge *C. remota*	Sedge *C. vulpina* (?)	Sedge *C. riparia*	Horsetail *E. arvense*	Nettle *U. dioica*	none	Sedge	Sedge /horsetail
Dominant tree species	none	none	none	none	*Acer campestre*	*Alnus glutinosa*	none	none
Number of sampling points and of the control measurements	10	7	7	3	5	5	5	3

Crx0, Crx1, Crx2, Equ2, Urt3, Aln4 = studied ecotopes; aB1 = boundary between Cxr1 and Crx2 ecotopes; aB2 = boundary between Crx2 and Equ2 ecotopes

Analysette Microtech A22). Mineralogical properties of soils were determined by X-Ray diffraction analyser (Philips PW1710). Total iron content of soils was measured by X-Ray Fluorescense Spectrometer (Atomika Extra IIA and Philips PW1410).

Total bounded iron was determined on the basis of HNO_3-H_2O_2 digestion method: 1g soil was digested in 3 ml 2M HNO_3 and 5 ml 30% H_2O_2. The samples were then heated to 85°C, and maintained at this temperature for 6 hours with intermittent agitation. Later 3 ml aliquots of 30% H_2O_2 (adjusted to pH 2.0 by HNO_3) were added and the samples were heated again to 85°C for 12 hour with intermittent agitation. After cooling 5 ml 3,2 M NH_4OAC and 20% HNO_3 (v/v) were added and followed by dilution to a final volume of 20 ml with DI water. The tubes were continuously agitated for half an hour.

The available iron content of soils was extracted following Lakanen-Erviö method (Hungarian Standard–MSZ21470-2). The extractions were measured by fl-AAS. The conserved water samples were measured using VIS spectrophotometer (Merck SQ118) and gf-AAS (Zeiss AS30).

Statistical methods

Statistical analysis was carried out using SPSS 14.0. Normality of data series were tested by Shapiro-Wilk test. For the relationship analyses Spearman correlation coefficients were used, because the data did not have normal distribution.

Table 2. Physical parameters of solid phase

	Crx0	Crx1	Crx2	Equ2	Urt3	Aln4	aB1	aB2
N	10	7	7	3	5	5	5	3
Sand (%)	6.4	5.6	6.7	6.5	6.1	5.9	6.1	6.9
Silt(%)	88.7	83.8	85.1	85.4	80.1	80.6	84.4	84.9
Clay (%)	4.9	10.7	8.2	8.1	13.8	13.5	9.5	8.2
pH_{dwater}	7.99	7.95	7.82	7.81	7.79	7.76	7.91	7.82
pH_{KCl}	7.85	7.79	7.72	7.70	7.74	7.73	7.76	7.72
$CaCO_3$ (%)	13.7	8.7	3.3	3.3	3.3	3.3	7.2	3.3
TOC (mg/kg)	30899	23393	25049	24551	25602	26415	24934	24159
TNb (mg/kg)	2575	1949	2087	2046	2133	2201	2078	2013
Total iron (mg/kg)	31100	35500	37010	36870	24230	23820	41340	45950
cc. HNO_3-H_2O_2 extractable iron (mg/kg)	21000	20780	16800	13290	12710	11850	25950	38950
Lakanen-Evió extractable iron (mg/kg)	410	1582	580	889	909	840	4511	4832

N = sample size

Results

Environmental parameters

Most of the main soil parameters are quasi homogeneous *(Table 2).* The texture is loam, the $CaCO_3$ content is 3.3% in the valley bottom and it is increasing towards the slopes. The mineral composition of the fine earth fraction is also homogeneous *(Figure 3).* Primary silicate minerals (quartz, plagioclases, K-feldspars, amphibole), primary and secondary phillo-silicates (mica, illite, chlorite), calcite and dolomite are the main minerals. The XRD measurement did not detect iron minerals, however 2.4–4.6% of iron was detected by XRF and by AAS. The total iron content of soils was the highest at the boundary between Crx1 and Crx2 patches (aB1) and the boundary between Crx2 and Equ2 patches (aB2). The cc HNO_3-H_2O_2 extractable iron and Lakanen-Erviö extractable iron concentrations were also higher in these boundaries than in the core part of the patches. This kind of distribution was not observed in the organic carbon content of the solid phase (TOC).

The main meso-climatic parameters (precipitation 909 mm/y; mean air temperature above surface at 2 m: 12°C; mean wind velocity: 8.8 m s^{-2}; annual amount of sunshine hours: 1828 h; number of cloudy days: 254 days; overcast: 114 days; duration of snow cover: 34 days) were modified by microrelief and vegetation pattern and appeared as a characteristic microclimate of ecotope *(Table 3).* The differences in incident radiation *(Figure 4)*

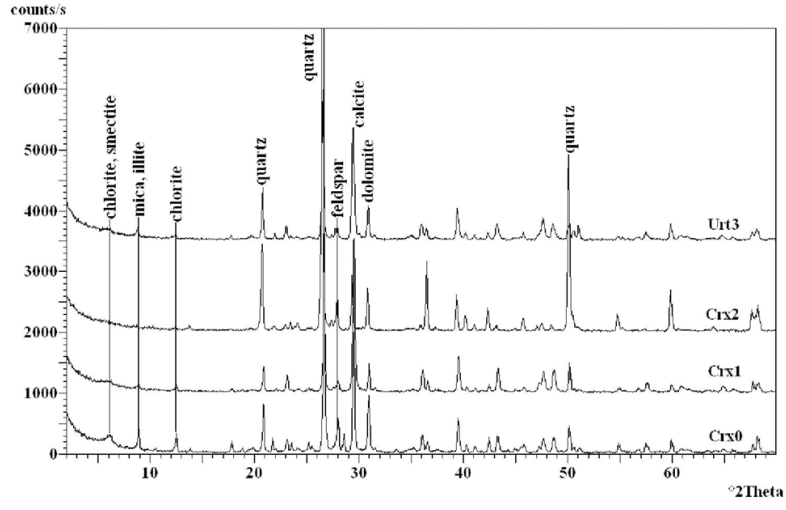


Fig. 3. The mineral composition fine earth fraction. Crx0, Crx1, Crx2, Urt3 = ecotopes

Table 3. Duration of anaerobic conditions, spatial differences in the incident solar radiation and yearly average of porewater temperature in the studied ecotopes

	Crx0	Crx1	Crx2	Equ2	Urt3	Aln4	aB1	aB2
Duration of saturated conditions (days)	156	300	300	300	142	136	300	300
Duration of unsaturated conditions (days)	14	0	0	0	158	164	0	0
Max. amount of PAR (umol m^{-2} s)	1756	1756	1756	1528	1247	712	1756	1756
Yearly average of porewater temperature (°C)	15.8	12.1	11.9	12.1	11.9	11.9	13.9	12.0

PAR = photosynthetically active radiation

and in the duration of saturated conditions appear in the diurnal and seasonal fluctuation of porewater temperature *(Figure 5).*

The pH of porewater was always lower and showed higher diversity between spatial units than the measurements carried out in the laboratory did for pH_{dw} and pH_{KCl} of soils *(Figure 6).* The higher porewater pH values were usually measured during the winter season, while lower ones were observed during the vegetation period. The seasonal fluctuations of pH in core part of wetland patches did not reach the pH unit and it was higher in the studied boundaries. Although high seasonal fluctuations were observed towards the acidic conditions in the boundaries, the observed lowest values were not acidic enough to increase solubility of $Fe(OH)_3$.

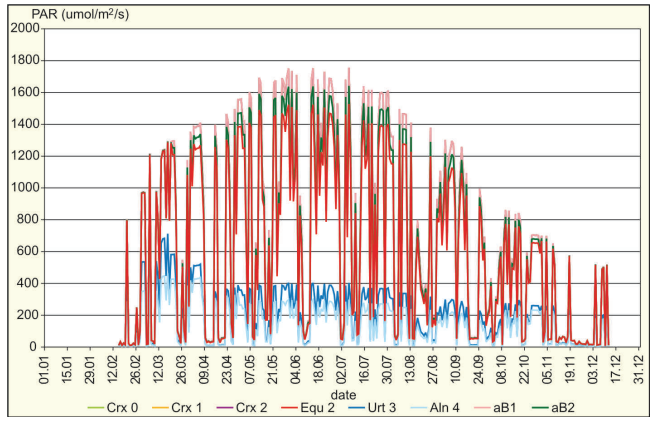
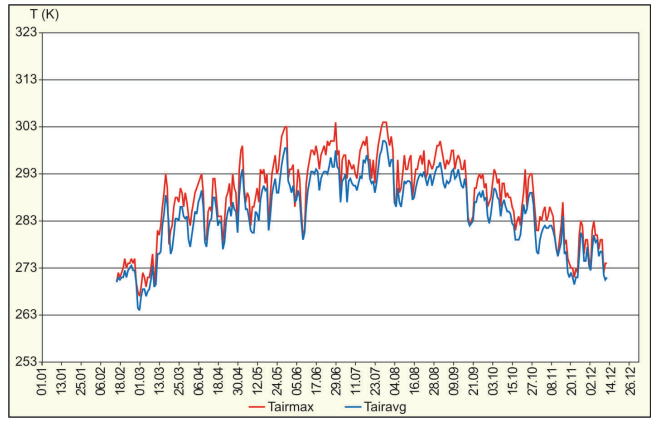
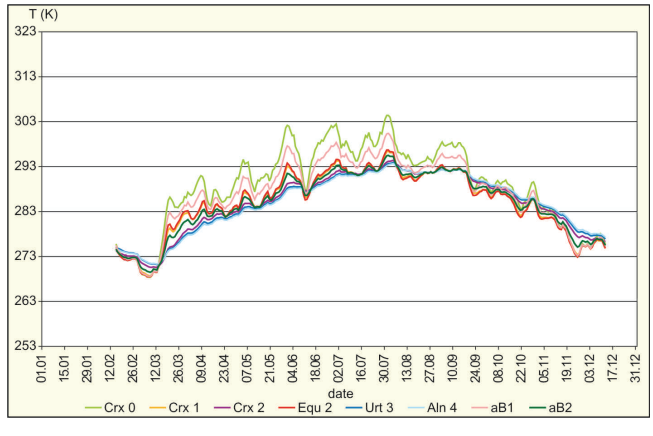


Fig. 4. Seasonal fluctuation of photosynthetically active radiation at the surface of herbaceous vegetation



A



B

Fig. 5. Seasonal fluctuation of (A) air and (B) porewater temperature

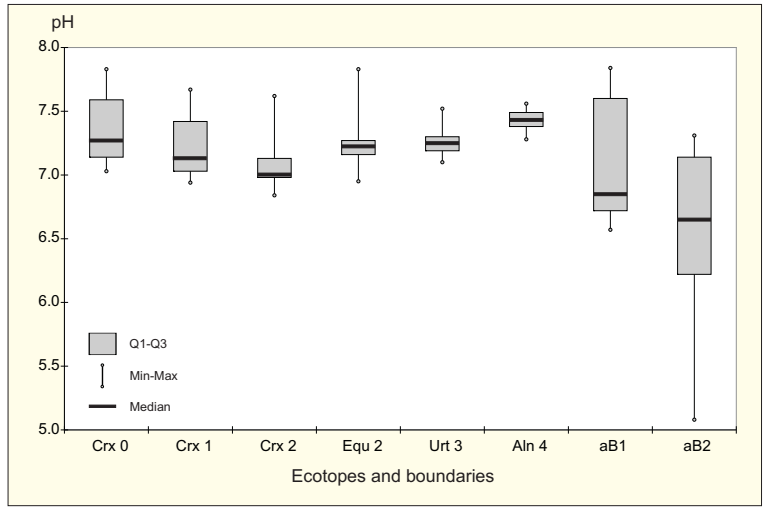


Fig. 6. Fluctuation of porewater acidity in the studied wetland ecotopes. Q1–Q3 = inter quartile; Min–Max = range; Median; N = 2400

3.2. Seasonal fluctuation E_H

The redox status of the soils is depended on the duration of inundation (Dusek, J. *et al.* 2008). Half of wetland ecotopes were inundated for the whole year and half of them were unsaturated for 144–164 days. Anaerobic conditions appeared in all wetland ecotopes. The value and the length of reductive conditions were not only depending on the saturated conditions, it also correlated with the herbaceous vegetation. The shortest anaerobic conditions were observed in Crx0, Urt3 and Aln4 ecotopes. The time of anaerobic environment varied between 38 and 85 days in the (other) spatial units, except for Equ2 where the duration of anaerobic conditions was lasting longer than five months. The E_H value was never below +231 mV in these spatial units. Although the duration of saturated conditions were equal in Equ2, and Crx1 ecotopes, the duration of anaerobic condition was shorter by 64 days in Equ2 than in Crx1 ecotopes. Besides E_H was lower in the sedgy (Crx1) ecotope than in the horsetail (Equ2) ecotope. The time of saturated conditions were also 300 days long in Crx2 ecotope and in its aB boundaries, but the number of the reductive days was higher by 60 days. Moreover, E_H was below +100 mV in the aB boundaries *(Figure 7).*

The E_H values started to decrease in the middle of March, then slightly increased again from July and August *(Figure 8).* While the amount and variability of redox conditions are partly depended on the the time of saturated

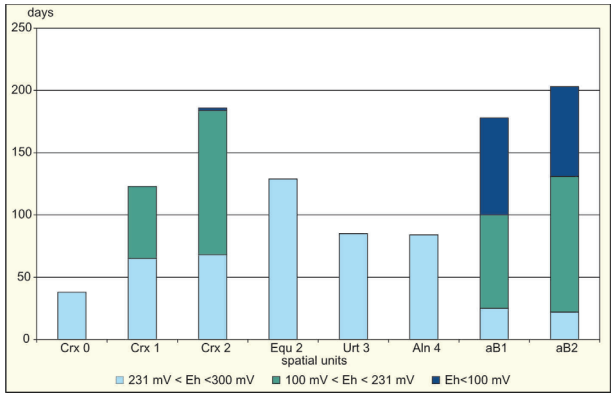


Fig. 7. Duration of anaerobic conditions in the studied wetland ecotopes

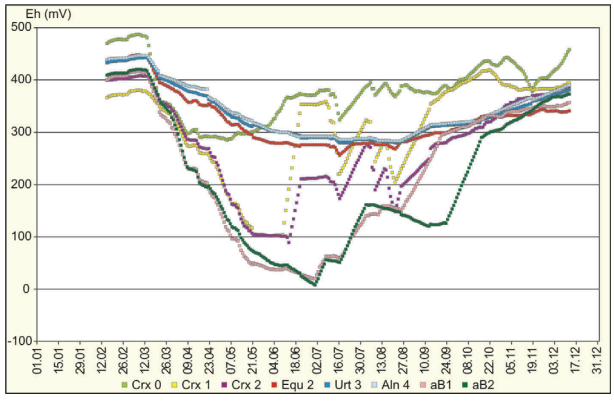


Fig. 8. Seasonal fluctuation of E_H in the studied wetland ecotopes (each box marks a mean of three measurements: 12:50, 13:00, 13:10)

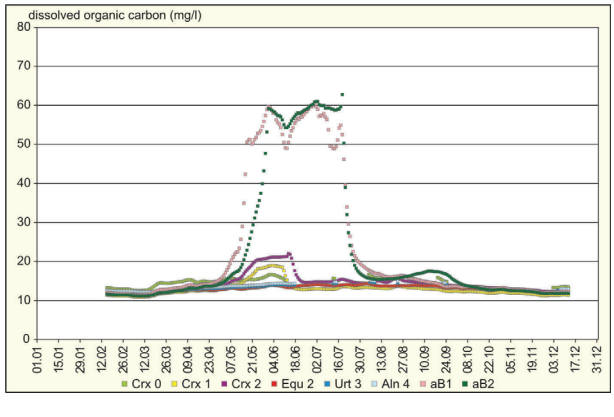


Fig. 9. Seasonal variation of dissolved organic carbon in the studied wetland ecotopes

conditions, the seasonal dynamics of redox potential is only determined by the vegetation. The oscillation of redox status was not as intensive as Dusek *et al.* (2008) have published. This can be explained by the different timing of measurements. Nikolausz *et al.* (2008) and our team (Szalai, Z. *et al.* 2009) also observed high diurnal variation of E_H, in contrast with the midday measurements where similar values were shown.

Relation of redox condition to DOC and to dissolved iron

The DOC concentration of soil solution varied between 12–18 mg/l in the majority (80%) of measurements *(Figure 9).* These values fit to the batch scale results (Callie, N. *et al.* 2003) and two-three times higher than most of the aquifers (Rivett, M.O. *et al.* 2007). The range of DOC concentration (80% of measurements) is smaller than 5 mg/l in each core part of ecotopes.

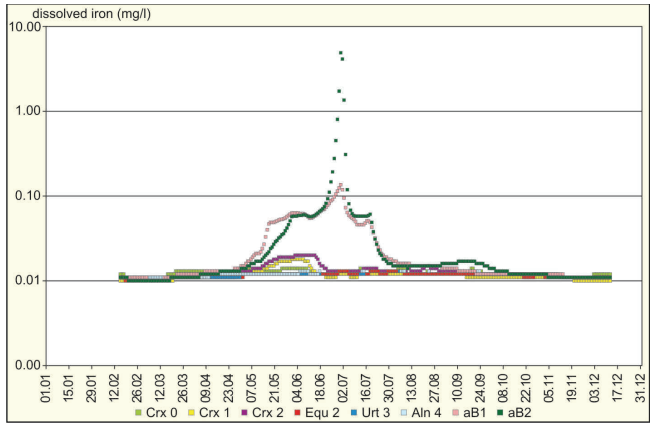


Fig. 10. Seasonal variation of dissolved iron in the studied wetland ecotopes

Variation of dissolved organic carbon has almost reached 50 mg/l in aB boundaries. The winter values of DOC are usually close to 11–12 mg/l, however concentrations reached 15 mg/l by the middle of June *(Figure 10).* The decreasing E_H always indicates increasing DOC content. The highest concentrations of DOC coincided with the lowest E_H.

The reduction of Fe^{3+} to Fe^{2+} increased the amount of dissolved iron in the porewater. Although the publications reported threshold values for microbial iron reduction between +100mV (Korom, S.F. 1992) and -130mV (Guo, T. *et al.* 1997), the observed dissolved iron content increased from 10 µg/l to 20 µg/l below +231 mV. The concentration of dissolved iron was much higher in the aB boundaries. The concentration patterns of DOC and dissolved iron were similar until E_H reached +25 mV and then the concentrations of DOC remained constant, while the amount of dissolved iron has reached the 4890 µg/l. This extreme high concentration of dissolved iron was only observed in the aB boundaries for 12 days *(Figure 10).*

Discussion

Interrelationships between porewater temperature, PAR, pH, E_H, DOC and dissolved iron

We supposed that higher plants have direct and indirect effects on soil E_H and pH. The direct influence is the O_2 translocation to the rhizosphere through the aerenchyma and the root excretion of organic acids. The indirect effect can be the shading, which has influence on soil temperature. Both of them are influenced by the incident radiation. In contrast to our initial conception, our results support the PAR has only indirect influence on E_H and pH. It significantly correlates with porewater temperature, but it does not correlate with E_H and pH *(Table 4).* Although we did not studied physiological activities of higher plants, it can be explained with the delay of root excretion to maximum

Table 4. Table of Spearman's correlation

Spearman's rho		PAR	$T_{porewater}$	pH	E_H	DOC	dIron
PAR	Corr. coeff.	1.000*	-0.386*	-0.407*	-0.365*	0.379*	0.404*
	N	2408	2408	2408	2408	1927	1926
$T_{porewater}$	Corr. coeff.		1.000*	-0.466*	-0.609*	0.806*	0.815*
	N		2408	2408	2408	1927	1926
pH	Corr. coeff.			1.000*	0.666*	-0.588*	-0.652*
	N			2408	2408	1927	1926
E_H	Corr. coeff.				1.000*	-0.840*	-0.897*
	N				2408	1927	1926
DOC	Corr. coeff.					1.000*	0.988*
	N					1927	1925
dIron	Corr. coeff.						1.000*
	N						1926

PAR = photoshyntetically active radiation, $T_{porewater}$ = porewater temperature, DOC = dissolved organic carbon, dIron = dissolved iron, N = sample size; *Correlation is significant at the 0.01 level (2-tailed)

intensity of PAR. There is significantly no correlation between soil temperature and pH, there is weak relationship between DOC and pH. The soil temperature correlates primarily with DOC and E_H. The higher porewater temperature usually results higher DOC and lower E_H. The correlation is strong between E_H and dissolved iron and between E_H and DOC, the amount of dissolved iron is determined by the DOC in the +300–+25 mV range.

Estimation of potential intensity of horizontal turnover between wetland ecotopes

The studied wetland ecotopes are divided into two groups on the basis of the time period of saturated conditions. The Crx1, Crx2 and Equ2 ecotopes were continuously saturated, while Crx1, Urt3 and Aln4 ecotopes were unsaturated for five months. The time of anaerobic condition was not directly depending on this parameter, since E_H below +300 mV was more persistent in Urt3 than in Crx1. Similar distribution of E_H was observed in the other group, as well. The anaerobic condition was more intensive and more persistent in Crx2 than in Equ2.

Our results support the view that the spatial distribution of soil physical and chemical parameters directly affected by vegetation pattern of the surface. The spatial heterogeneousness is not constant, it is negligible during wintertime and can be significant between April and August. The diversity of soil physical properties (e.g. porewater temperature) and of soil chemical parameters (e.g. redox) has resulted in concentration gradients of DOC and of dissolved iron between wetland ecotopes.

The DOC (and iron) turnover can appear as diffusion (and convection). The temporary existing concentration gradients can be the momentum of diffusion, while the differences of evapotranspiration of ecotopes may affect convection. Heterogeneity of ecotopes affects both of these processes. The landscape diversity can be measured by several indices (Forman, R.T.T, 1995). The turnovers by diffusion are primarily influenced by the length of the boundaries in the study area (m/m^2).

The quantification of diffusion was not possible owing to the labyrinth effect. Although we did not quantify the DOC and iron turnover by diffusion, we tried to estimate the intensity of these processes. The potential intensity of horizontal turnover depends on the length of boundary of two studied ecotopes, on the duration and rate of the concentration gradient. We suppose to introduce a *"boundary index" (BI)* to estimate this process:

$$BI_{ij} = \frac{B_{ij} - Min(B_1..B_n)}{Max(B_1..B_n) - Min(B_1..B_n)}$$

where,

$$B_{ij} = |l \cdot t \cdot c|$$

l is the length of boundary between i and j ecotopes (m); t is the duration of concentration gradient between i and j ecotopes; c is the mean of concentration gradient (µg/l or µmol/l) i and j ecotopes, n is the number of boundaries.

The value of *BI* varies between 0 and 1, and it allows to compare the potential intensities of diffusion of different kinds of elements and molecules.

Functional landscape units can be characterized by "*landscape boundary index"*, which also varies between 0 and 1.

Table 5. Potential horizontal DOC and dissolved iron turnover on the basis of Landscape Boundary Index

	Crx0-Crx1	Equ2-Urt3	Crx2-Urt3	Crx0-Aln4
	Dissolved organic carbon			
Concentration gradient (µmol l^{-1})	-192	-26	641	328
Duration (days)	24	2	37	30
Direction	to Crx0	to Equ2	to Urt	to Aln4
B (µmol m d l^{-1})	427 622	541	611 899	383 760
Boundary index	0.699	0	1.000	0.627
Landscape boundary index				0.581
	Dissolved iron			
Concentration gradient (µmol l^{-1})	-0.062	0	0.138	0.085
Duration (days)	21	0	31	21
Direction	to Crx0	n.d.	to Urt3	to Aln4
B (µmol m d l^{-1})	121	0	110	70
Boundary index	1.000	0	0.914	0.576
Landscape boundary index				0.622

Our results support that the diffusion driven DOC horizontal turnover is potentially less intensive than dissolved iron turnover. The highest potential turnovers were calculated between Crx2 and Urt3 ecotopes *(Table 5).* This potential is primarily caused by the length of boundary. On the basis of our results, we suppose that the decreasing compactness (Forman, R.T.T. 2001) of ecotopes increases the horizontal turnover within a wetland.

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Hungary in Maps

Edited by
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'Hungary in Maps' is the latest volume in a series of atlases published by the Geographical Research Institute of the Hungarian Academy of Sciences. A unique publication, it combines the best features of the books and atlases that have been published in Hungary during the last decades. This work provides a clear, masterly and comprehensive overview of present-day Hungary by a distinguished team of contributors, presenting the results of research in the fields of geography, demography, economics, history, geophysics, geology, hydrology, meteorology, pedology and other earth sciences. The 172 lavish, full-colour maps and diagrams, along with 52 tables are complemented by clear, authoritative explanatory notes, revealing a fresh perspective on the anatomy of modern day Hungary. Although the emphasis is largely placed on contemporary Hungary, important sections are devoted to the historical development of the natural and human environment as well.

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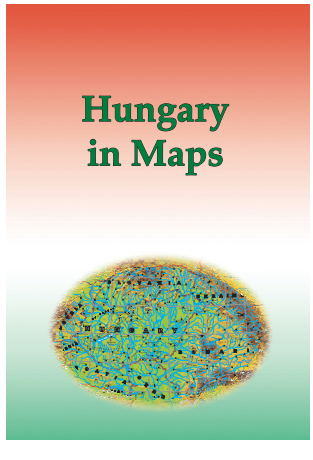

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Spatial diffusion of mobile telephony in Hungary

Tiner, Tibor[1]

Abstract

This article deals with the role of mobile telephony within the information society in general, the conditions of its use and the spatial characteristics and spatial features of its diffusion in different types of Hungarian settlements. The introductory part of the paper gives a short survey about the most important features of wirelessness, as a technological basis of mobiltelephony. The following part of the study outlines some impacts of mobile telephony on the economy and the public sphere showing the main spatial trends observed nowadays in mobile communications development. The third part of the article makes a comparison between Hungarian settlements (small towns) of a developed region (the Budapest agglomeration zone) and of less-favoured rural regions of South West Hungary evaluating the reasons for considerable differences.

Keywords: mobile telephony, spatial diffusion, regional and local inequalities

Introduction

In the 20th century the telephone had to cope with the technical problem of transmitting communications between people over a distance. It operated on the principles of analogy, reciprocity and simultaneity. It enabled the long-distance transmission of the human voice while depriving the speakers of all other sensory modes of communications (Fekete, L. 2001).

The mobile telephone of the 21th century is providing for all the sensory modes of communications between people. But this wireless mobile phone with its digitalizing, dividing into parts and manipulating sensory signs will open a radically new period in the history of telecommunications because it will be free from spatial barriers.

With the appearance of the mobile telephone as a new medium of communication all conventional interpretations of the term 'telecommunications' need to be reconsidered. There is a fundamental new quality to this new instrument of communication in that is not confined to any given place

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(Karácsony, A. 2001). It is no longer a certain place with its particular set of persons that is being addressed but rather a particular person wherever he (or she) might be.

The only way to create an information society is the organic integration of informatics and mobile telecommunications. This is because it is only the mobile telecommunication by the help of which information can be shared in society to a full extent. The essence of the mobile telephone service is a powerful symbiosis of telecommunications and information technologies (Sugár, A., *et al.* 2000). The centre of revolutionary breakthrough is people's communications demands and their satisfaction anywhere and at any time. This is the first service ever that is available in any country joining the network and in a broad sense it is the model of telecommunications infrastructure that the future information society may be built on.

Mobile telephony may be investigated on the basis of its wireless technology, its impacts on economy and society and last but not least on its spatial characteristics of penetration into settlements of different size and alternative level of development.

Global wireless technology as a fundamental technological innovation serving mobile telephony

Two wireless communications technologies have been widely adopted in recent years: the mobile (or cellular) telephones, and the wireless laptop communications through WiFi (Wireless Fidelity). A third phase has been started to appear in the late 2000s when the size and weight of portable computers (notebooks, laptops, palmtops) became much smaller and the new models of mobile phones equipped with top technologies have been transformed into a real 'hand-computers'.

The first limited mobile services were introduced in the United Kingdom 1940 and in the USA in 1947, followed by commercial introduction in 1979. Europe's first modern cellular system was introduced in Sweden, Finland and Norway still in 1981. Despite its early lead in the establishment of cellular telephone systems, mobile networks of the Continent suffered from compatibility problems, making it difficult for subscribers to use their mobile sets outside of country-based calling areas. As a consequence, compatibility and standard issues became critical and led to the development of a Pan-European GSM cellular system. This abbreviation came from the French Groupe Speciale Mobile today known as Global System for Mobile Communications.

By permitting compatibility among national networks GSM has become a crucial factor in Europe's lead in cellular phone penetration. Though mobile phone growth rates have slowed down considerably between 1995

and 2005, counting in compound of annual growth rates (CAGR) in Europe similarly to other continents of the world, the old Continent still has the second highest number of cell phone subscribers and the highest mobile penetration rate (Comer, J.C. and Wikle, T.A. 2008). (The value of latest parameter exceeds 100% when individuals owe more than one mobile phone using separate subscriptions for business and private purposes.)

Due to technical innovations mobile phones were rapidly introduced in the 1990s (Rogers, E.M. 1995; Lacohée, H., *et al.* 2003). In 2003 some 25% of the world population used mobile telephones and ca. 80% of them lived in areas covered of mobile telephone networks. Nowadays ca. 3.4 billion people (more than 50%) use mobile phones, most of them live in Europe, China, and in the USA. Still in 2002 the number of mobile telephone subscribers worldwide exceeded that of fixed ones (ITU 2004, 2009). As for Europe in 2008 there were 28 countries, where the penetration rate of mobile phones emerged above 100%. The same volume was only 19 in 2005. (ITU 2007, 2009).

Wireless laptop communications were introduced in the developed world only in the late 1990s. It is currently limited to areas where proper aerials (mobile towers) are installed (hot spots), such as airports, restaurants, hotels, cafés and urban areas opened to public (downtown squares, city parks etc.). The simultaneous introduction of SMS (Short Message Service) and Internet services over mobile telephones and laptop WiFi communications has implied the availability of these two portable machines. These technologies grew out of the previously developed telephone and Internet technologies presenting a merger of mobility computerized information and communications (Kellerman, A. 2006).

In case of mobile telephony wirelessness is a possible equivalent term to the motorization and telephony relating to values, practices, norms and patterns within three spheres of individuals, society and space. It assumes the wide adoption of wireless communications devices by households. However, when compared to the telephone it obviously facilitates flexibility in both physical and virtual movements, whereas the telephone permits only virtual flexibility.

Wireless communications further simultaneously intrudes users' time and space as compared to possible time intrusion by the telephone. The use of mobile telephone thus ceases possible isolation. The use of either mobile phones or wireless Internet by the help of laptops means disappeared boundaries between the private and the public. Whereas telephones and computers were traditionally devices in communications to be used indoors and involving some privacy of communications, wirelessness implies less privacy and a change of social boundaries regarding the acceptance of communications activity in the public spheres. Finally, it can be stated that wireless communications in general can be considered as a third phase in social communication and networking (Wellman, B. 2001):

– The first phase was face-to-face communication, typifying social relations within traditional physical place-bounded communities.

– The wired telephony have led to the development of a second phase of social relations and networking. This place-to-place communication have replaced some of the local physical face-to-face relations in communities.

– The third phase is the person-to-person communication derived from the possibilities for wireless and placeless communication free from time limits, detached from household location and its communication infrastructure.

The impact of mobile information technologies on the economy and the public spheres

It is a well-known fact that the role of mobile telephony in all branches of economy is of great importance. It is because in the economic sphere technological and institutional changes are interconnected, the new technologies predicate new regulatory modes and new patterns of economic behavior. Being a part of the breakthrough in information technologies, mobile information technologies themselves have contributed to these changes.

It can be stated that mobile techniques as a part of information technologies replace mass production. The spatial spread transforms the micro and macro regular systems of production. As a consequence mobile telephony contributes to reduce transaction costs, enables increasing economic flexibility for firms, offers on-line businesses and influences greater mobility of production factors (Gedeon, P. 2001).

Observing and evaluating the complexity of the connection between the mobile telephony and public spheres intriguing contexts can be discovered. The wide use of new information and telecommunication technologies (ITC) has made clear that it is advantageous to treat the various types of communications within a single theoretical framework. The brand new mobile communication technologies have radically changed the space and time constraint of communications and have altered the habits and patterns of communication between the members of society (Heller, 2001). Consequently, the wide use of mobile phones embedded in modern telecommunication technologies induces a new public sphere. Instead of the former idea of a single public sphere, a complex structure of overlapping layers of various dimensions is coming about (Keane, J. 1966).

The rapid technological changes involve profound social transformation and raise numerous new technological problems. Some scientists are pessimistic seeing a growing cleavage within and between individual societies and the gap becoming irreversible (Castells, M. 1996–1998). But development has its positive aspects. Active creative communications may again

increase as opposed to passive consumption. At the same time the possibility to participate in local, national, regional and global public spheres gives a fresh impetus to the interactive communications of local, national and global citizens. Mobile communication devices make this possibility for development ever more secure and accessible.

Some regional and local characteristics of the diffusion of mobile communications

The development of mobile communications in the last decade was characterized by three marked trends (Erdősi, F. 1999):

1. Globalisation processes in mobile communication. The introduction of continent-wide or even world wide unified services, and intrusion of wireless networks into distant places in underdeveloped countries and regions (eg. Africa, Central-Asia etc.)

2. Integration of wired and wireless technologies and networks. This process first appeared in the USA, Japan and in developed countries of Europe and later it spread towards the Eastern European countries.

3. Fusion of mass media with telematics in developed countries. From the turn of the millennium hundreds of tv-programs (on cable networks or via satellites) and a wide range of telematic services have become accessible for mobile phone subscribers of Western Europe, the USA, Japan and other developed countries owing to technological innovations next generation (NG) mobile sets ('hand-computers') and the wide spread of hotspots, mainly in urban areas.

Here it should be emphasize that mobile devices may permit the development of geographically more flexible regional and local services, mainly for metropolitan areas. Mobile phones give the ability to provide location-based services to physically moving potential clients by identifying their exact location inside a given region via GPS (Global Positioning System) technologies (Kellerman, A. 2002). Furthermore, wireless devices encourage more travel, notably business travels mainly between cities, through the availability of virtual mobility, while physically on the road or in train.

Mobile telephone may permit faster more efficient and flexible use of time and space by individuals to fit the more flexible social nature of second modernity cities (Townsend, A. 2001; Zook, M. *et al.* 2004). This device leads to more efficient management of direct contacts in CBDs, as well as more efficient use of highways connecting large cities, where mobile phones are widely adopted as this communications device permitting immediate contacts when, for example, some rescheduling is required because of any unforeseen congestion. Moreover, mobile phones may further imply 'personal globaliza-

tion' as overseas destinations may be reached immediately from any location, frequently at high costs for calls, but at lower ones for SMS.

The adoption of mobile telephones has been expanding fast in less developed countries of East Central Europe, such as Hungary, where at the same time mobile telephones have began to supersede the fixed wired telephones operated by MATÁV (Hungarian Telecommunication Company) and now they are decisive factor of telecommunications. The spread of mobile telecommunication services in Hungary has taken place according to the model experienced world-wide, in the framework of a process spreading from the centre towards the periphery. Namely, the coverage penetration has run from the capital city (Budapest) towards other regional centers along the main radial expressways.

A brief review of two decades of mobile and wired telephony in Hungary

In Hungary there are three mobile communication companies: T-Mobile Hungary (before May 2004 named Westel Hungary), Pannon GSM and Vodafone. They have started their activity in 1993, except for Vodafone which entered the market only in 2000. These three companies after having divided the Hungarian mobile market have became very prosperous and profitable firms. Nowadays T-Mobile is the largest GSM network provider in the country.

Deregulation of the economy in the 1990s has led to an explosive and permanent growth of the mobile communications market in Hungary. This process has resulted more than 12 million mobile phone subscribers in the country (121 mobile subscribers per 100 inhabitants) at the end of 2008. T-Mobile the biggest mobile operator in the country already providing services to over 5,5 million mobile users (44.7%). Pannon GSM has 4 million subscribers (33.4%) and Vodafone has nearly 2.6 million ones (21.9%).

Since the second half of the 1990s mobile operators started to compete with the MATÁV's wired telephone services. This challenge ended successfully. From 2000 the number of fixed phones in dwellings started to fall, in 2002 the number of mobile phones and domestic calls initiated by mobile phones have already exceeded that of fixed phones in Hungary *(Figure 1).* After the turn of the millennium a second phase of this competition started focusing the broadband telecommunication network development (Tiner, T. 2009).

A spectacular increase has taken place in the number of hotspots based on WiFi technology promoting mobile internet use. In 2008 more than 1300 registered hot spots were available for potential users all over the country, 41% of them located in Budapest. The rate of chargeable ones is 56% in the country towns *(Figure 2).* Main part of hotspots in Budapest is concentrated in downtown and can be found in public buildings (hotels, restaurants, pubs,

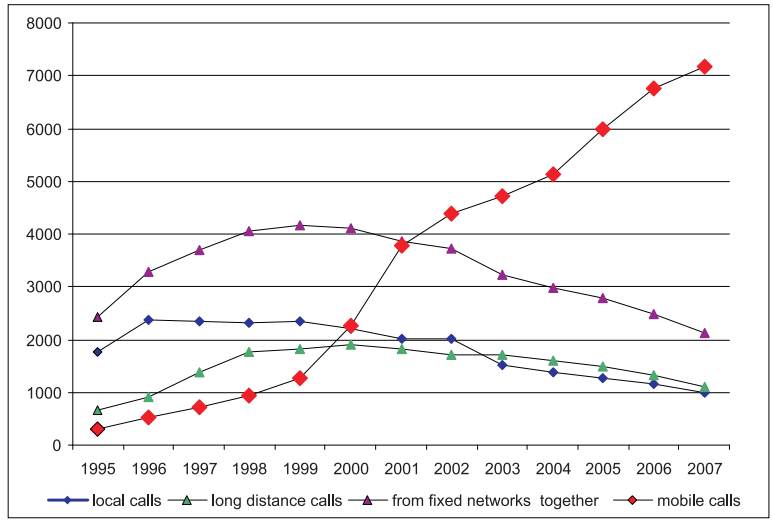

Fig. 1. Telephone calls initiated in fixed and mobile networks in Hungary. *Source:* Statistical Yearbook of Hungary 2009. KSH, Budapest

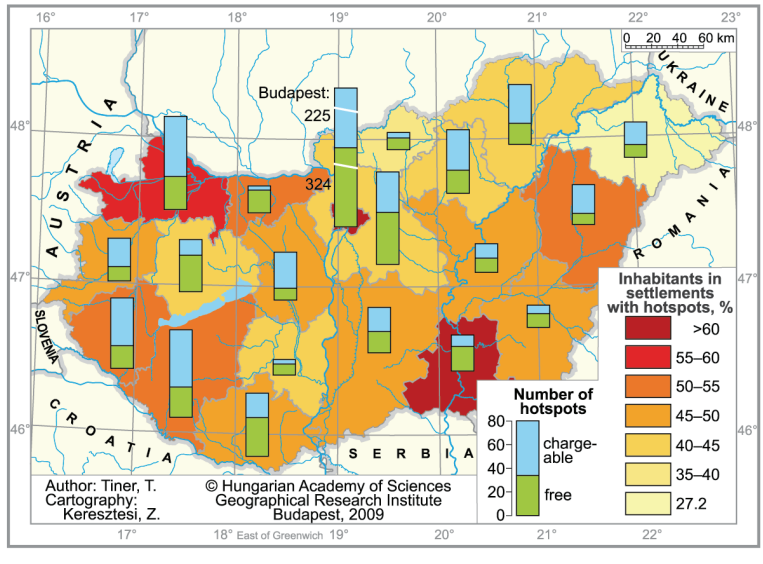

Fig. 2. Spatial structure of hotspot availability in Hungary, 2008. Source: Kocsis, K. and Schweitzer, F. eds, 2009

cafés, telecottages etc.) or in the vicinity of mobile phone towers with aerials *(Figure 3)*. 51% of all hotspots can be used free, the rest is chargeable.

Back to telephone supply, it is worth mentioning that 60% of the Hungarian population had both wired and mobile telephone in 2008. 25%

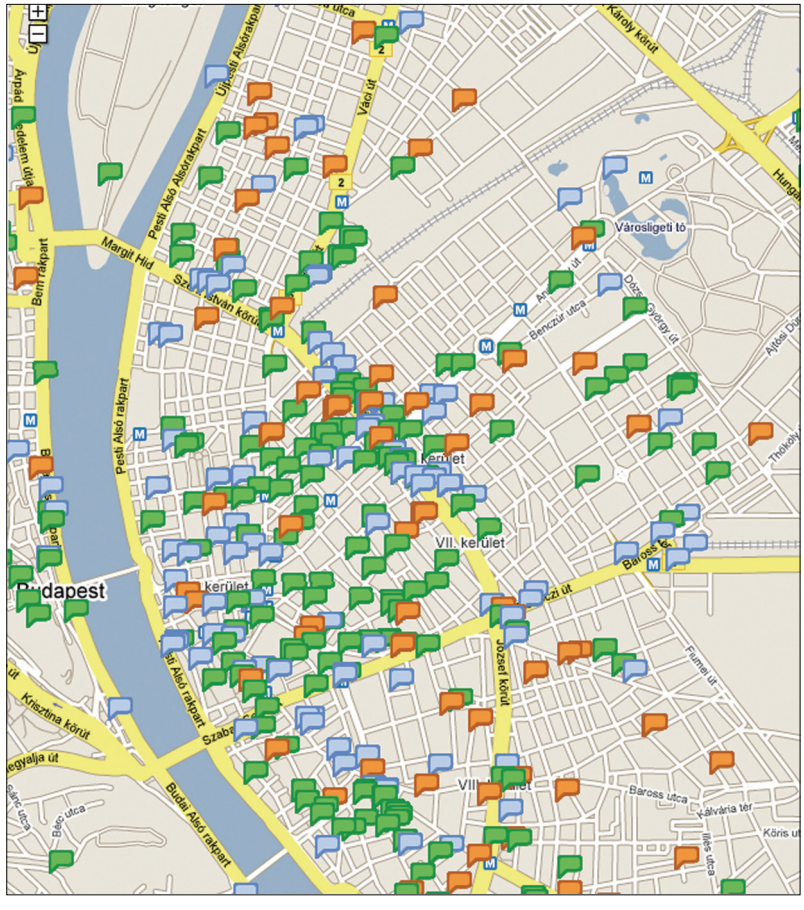

Fig. 3. Hotspots in the heart of Budapest. Green flags mark free access. Source: www.hotspotter.hu

was the owner of only mobile telephone and an additional 13% had a fixed line exclusively. (3% of the population had none.)

Since the early 2000s the expansion of mobile telephony has been accompanied with a sharp and perpetual competition between the three mobile operators and the two fixed-line network operators in Hungary. The main fixed-line telephone operators Magyar Telekom (former state-owned MATÁV Hungarian Telecommunications Company Ltd.) and Invitel Telecommunication Co. the main fixed-line telephone operators investing huge sums of money into technical development of their networks do their best to preserve or maintain their share in telecommunications market of Hungary by investing huge sums of money into technical development of their networks. Concomitantly they are also competing with each other in the field of wired telephony.

The historical background of this process is the following.

In 2000 Deutsche Telekom obtained majority (nearly 60%) ownership in MATÁV. Next year the Hungarian company could become an international telecommunications group when the consortium led by MATÁV acquired majority ownership in Macedonia's national telecommunications company Makedonski Telekomunikacii (MakTel), so MakTel became a consolidated subsidiary of the Group.

2001 was the official date of full liberalization of the Hungarian telecommunications market. The area of fixed-line telephony was the last segment of telecommunications where the market was opened. At that time MATÁV Group achieved leading position in mobile telephony, internet and business data communication markets and obtained over 80% share on the fixed-line telephone market.

In December 2003 MATÁV announced connection of the 100,000th ADSL line. During that year the number of Hungarian towns where this service was available tripled to reach 128. Since January 1, 2004 – when the Electronic Communications Act entered into force that contained EU-compatible market regulatory provisions – fixed-line number portability became a reality in Hungary.

One year later MATÁV acquired a 73% majority ownership of the Telekom Montenegro and has become a strategic investor in the South East European region. In May 2005 the MATÁV Group was renamed Magyar Telekom Group with members T-Com, T-Online, T-Mobile, T-Systems and T-Cable branches jointly offering the full range of telecommunications for residential and business customers.

In 2007 several small local telephone operators (eg. Hungarotel, Pantel, V-holding, Euroweb etc.) merged into Invitel Telecommunication Company, the second largest service provider in the fixed-line telecommunications. From that year Magyar Telekom has been in sharp competition with Invitel. Its concession service area comprises 14 primary districts of the country covering nearly 17 % of Hungary's population.

For 2008 Magyar Telekom has become the principal provider of telecommunication services in Hungary, which operates local telephone services and long distance dialing in 38 primary districts. Its latest technical innovations achieved makes possible to install a 2,700 km long optical NG-WDM (Next Generation Wavelength Division Multiplexing) backbone network in 2009. With the help of it Magyar Telekom offers its customers super-fast wireline broadband access, which is much faster than ever before. The relative commercial values of supplying fixed-line telephony to households and the volume of initiated calls are steadily diminishing since 2000 owing to the rapid spread of mobiles all over the country. Meanwhile considerable regional differences exist in this field of telephony.

Since 2009 both fixed-line operators offer broad band wired internet packages at a decreasing price including a large choice of cable-tv programs and telephone services for their subscribers.

By the end 2013, Magyar Telekom plans to cover approximately 780,000 households with a fiber-to-the-home (FTTH) network and to further upgrade 380,000 households to whom a hybrid-fiber-coaxial network is currently available.

In spite of their efforts these companies will not be able to get back their subscribers living in towns or villages mainly because of the dynamic penetration of mobile internet services and HDSPA offered by the three mobile telephone operators at a low fares.

Spatial diffusion of mobile phones in two different regions of Hungary

This part of the study is aimed to demonstrate the main differences of mobile telephone diffusion process in two poles of regions inside Hungary as sample areas. The first is the agglomeration zone of Budapest (most developed region of the country), and the second is a less-favored rural microregion (Ormánság) in South Transdanubia (Tiner, T. 2004, 2008).

Surveys were made in 2005 (for two small towns chosen from the agglomeration zone) and in early 2006 (for villages of the Ormánság region). Investigation was based on a primary type research, namely questionnaires collected from a sample of 2x150 secondary school students (aged 15–18 years) living in two small prosperous towns of the agglomeration zone of Budapest (Budaörs and Szentendre, both with ca. 25,000 inhabitants), and from another sample of 150 students (with same age structure) living in 29 different small-sized villages (between 54 and 360 inhabitants) of Ormánság microregion *(Figure 4.).*

Questions referred to rate of mobile telephone users among secondary grammar school students (their distribution by place of residence, types of mobile sets, year of getting their first mobile phone, the monthly cost of use, monthly income of the family, educational level of parents etc.).

Comparing the two groups of students living in very different circumstances, investigation has led to interesting conclusions. Instead of detailed verbal explanation of answers the results are demonstrated on *figures 5–8*.

The figures presented above have made it clear the followings:

– Students of towns belonging to the agglomeration zone of Budapest had mobile phone much earlier than students living in villages of the Ormánság region. (Time gap was some 2 to 3 years). The rate of mobile telephone users is much higher among young citizens (94.0% of students in case of Budaörs, and 92.6% in Szentendre) opposite to students of Ormánság region (with a rate of 53.3%).

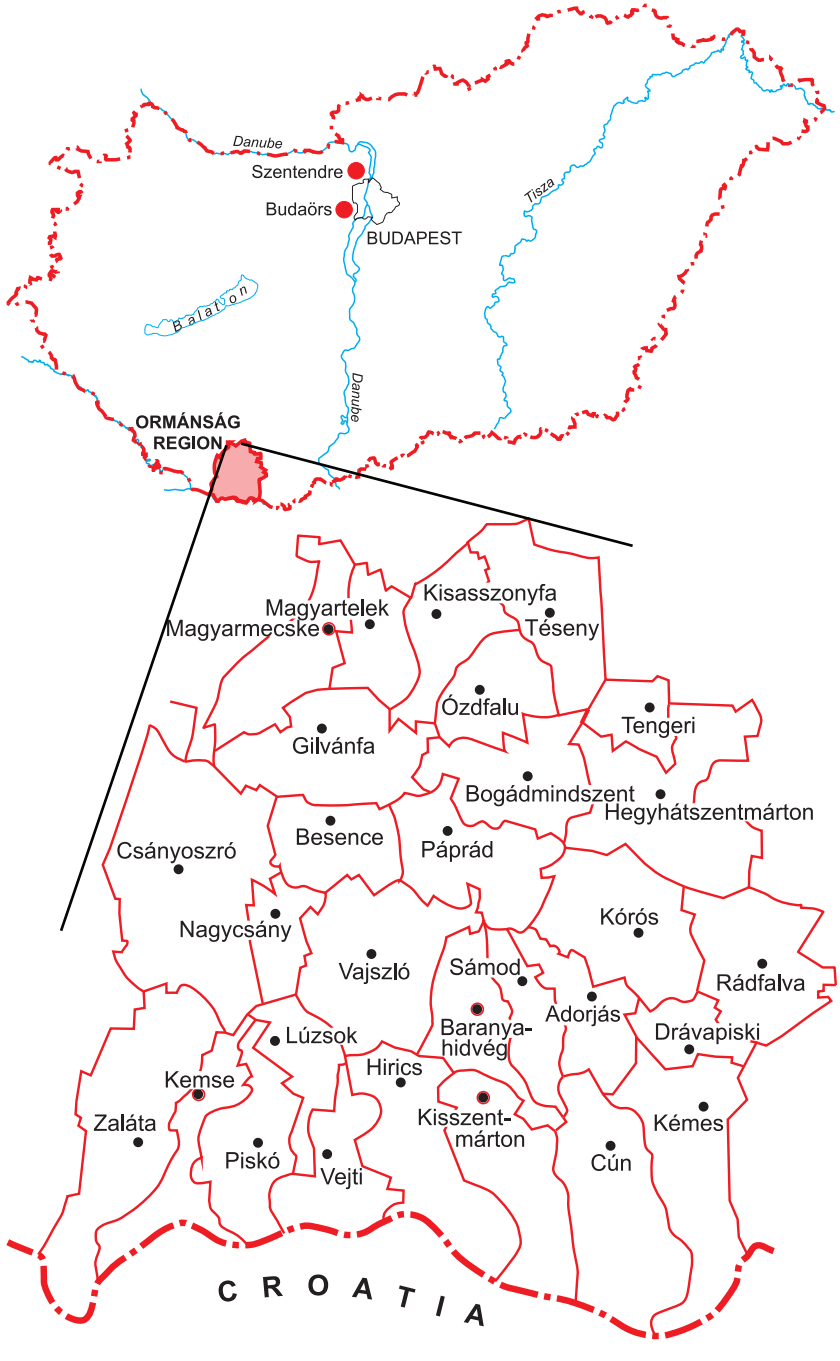

Fig. 4. Map of sample areas

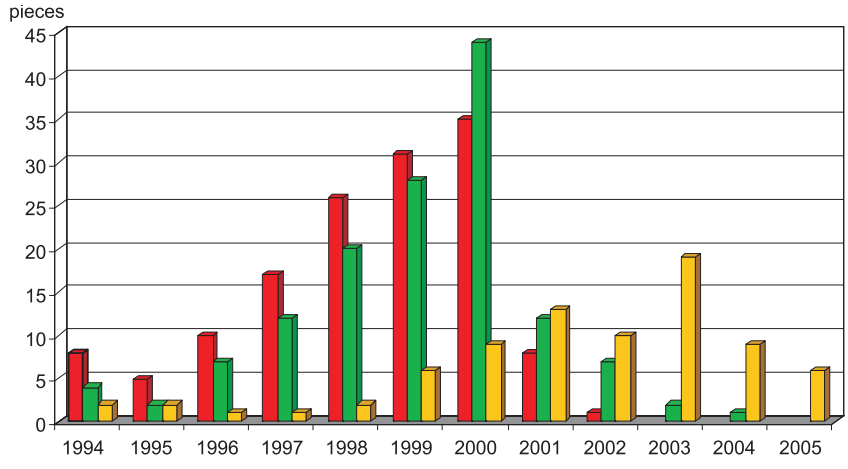

Fig. 5. Annual increase of mobile phone stock in the sample areas

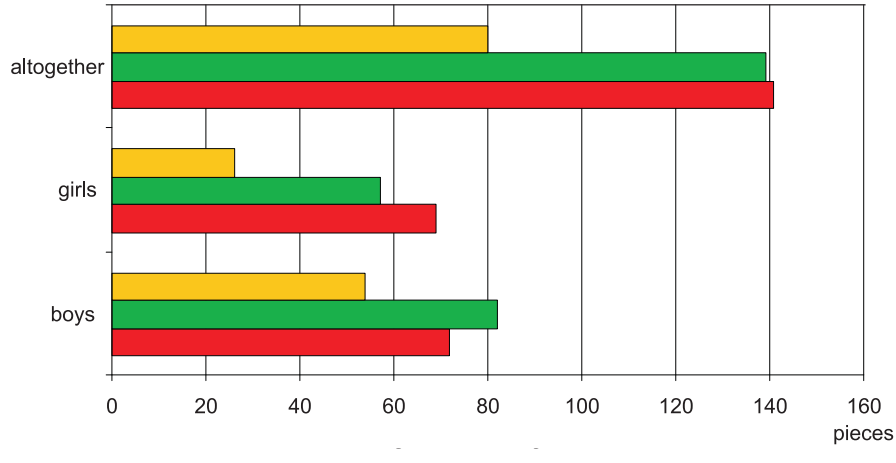

Fig. 6. Distribution of mobile telephone owner students by gender

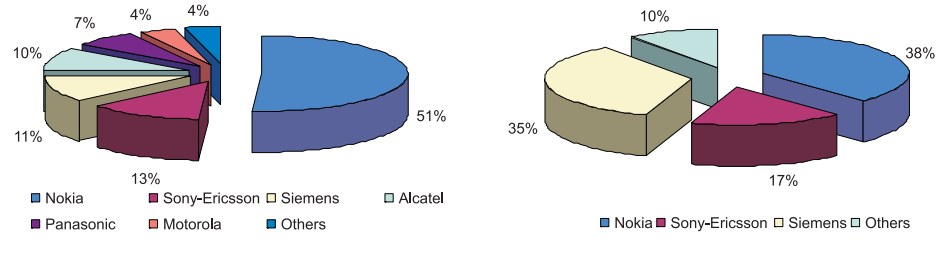

Fig. 7. Share of different type of mobile phones among students in two towns of Budapest agglomeration (A) and in Ormánság region (B), 2005

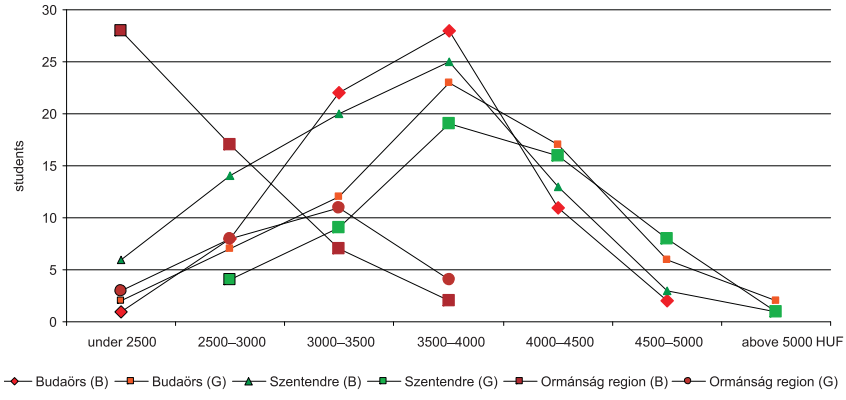

Fig. 8. Average sum of monthly telephone costs among students asked in the sample areas. – B = boys; G = girls

– Rate of girls among mobile users much lower in the less-favoured rural region investigated than among students living in prosperous satellite towns of Budapest agglomeration.

– The leading type of mobile phones used by students is the Nokia, but further two ones (Sony-Ericsson and Siemens) are also popular with users of sample areas. In case of village students of Ormánság region only three types are in dominancy among young mobile phone users. This phenomenon reflects a poorer choice of sets offered by phone stores in this rural region (and in rural regions in general).

– Average sum of monthly mobile telephone costs among the students of villages only one third to one fourth of that students in Budaörs and Szentendre. Furthermore, girls spend more money in general than boys, so their time for call is longer when using their mobile telephone.

Two additional records during the research have to be mentioned:

a) It was generally observed, that the rate of mobile phone users depends on the annual income and the educational level within the family. In case of the students of Budaörs and Szentendre these rates exceed the national average and they are far higher than the average for the villages of the Ormánság region.

b) An interesting phenomenon is, that in case of both type of student groups it is the father in the family who bought the first mobile phone. But in case of the two towns, 64% of children of 14–16 years old become the next mobile owners, and not their mothers. In case of village students the mothers are the second having got mobile phones in the family, and not the children.

Conclusions

Research has made perfectly clear that the spread of mobile phones in regions representing very different levels of economic development followed the hierarchic expansion as found elsewhere.

The process began much earlier in the Budapest area, than in Ormánság where there is still a relatively low level of mobile supply (25%) among the students living in the villages investigated.

Inhabitants with higher education were among the first in these poor communities to purchase their first mobile in the late 1990s and they are still the only group of local communities who use wide range of services offered by mobile operators and other private firms belonging to different branches of commerce and personal services.

Naturally, the increasing spatial diffusion of mobile telephony in a less-developed region is a very positive process. The stable advantage of prosperous regions and cities with dynamically increasing economy present a permanent obstacle for poor regions and settlements located on the peripheries to make improvements in their marginal position.

Additional problems of less-favoured regions:

– Steady out-migration of skilled workers owing to the lack of local workplaces and/or low wages offered by small or middle-sized companies in the rural areas.

– A high rate of retired people in the countryside who cannot afford to spend on telecommunication services.

– Increasing rate of unskilled and unemployed Roma population living in hundreds of villages in north-eastern and south-western regions of Hungary (their number is estimated round 700,000 for 2009). Considerable part of these Roma families (often with 5–9 children) try to make their living basically on social aid coming from state or municipality budget from month to month. Nowadays they do not have any perspectives to get stable workplaces and regular income.

The factors above hinder the diffusion of telecommunications innovations and the effective use of their modern equipments across the backward regions of Hungary.

Consequently, the capital and the towns of its agglomeration zone where the different innovations of new telecommunications technologies (such as mobile phones) appear immediately and soon start to diffuse are able to preserve their advantage in effective and multifunctional use of mobile sets over regions having connected into this process only in later phase. This process hinders the emergence of peripheries and conserves their backward position in the process of long-term regional development.

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Ethnic features of symbolic appropriation of public space in changing geopolitical frames – the case of Oradea/Nagyvárad[1]

Erőss, Ágnes–Tátrai, Patrik[2]

Abstract

If a person, a group or a society takes possession of a place, a territory, after naming it makes an effort to indicate its boundaries and to mark it with peculiar features typical of that person or group. But what happens, if another – in our case: ethnic – group lives there in mass, forming an organized minority as the former 'ruling nation'? This place may become the scene of power struggle. Culturally diverse Oradea (Nagyvárad in Hungarian) as every city in North Transylvania went through several power changes in the 20th century, which have affected its demographic features (e.g. ethnic structure) as well as the image of the city. Every power (local or national) tried to prove the right to ownership by the control of ethnic composition and of the image of public space. Street names, statues/monuments, specially chosen colours and different types of buildings have always referred to the characteristics of the actual power. In this paper an attempt is made to present these changes in power, their effect on the (ethnic) image of Oradea, the city lying at the Hungarian-Romanian state border and ethnic boundary. It is aimed to present the endowment of spatial features of changing street names, monuments and buildings with symbolic meanings.

Keywords: *ethnic relations, urban space, symbolic conflicts, street names, commemoration*

Introduction

After physically occupying a territory every human group and political power make an effort to seize it in symbolic meaning as well. The tool for this is the so called symbolic appropriation of space, as its aim is to clearly make the local inhabitants and the external world know about who the owner of the territory is. From the onset of nationalism the previously neutral ethnic marking has

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been replaced with the ethnic based concept of nation, as the proprietor of the space. In the forming of ethnic identity those characteristics play a pivotal role along which the boundary is drawn between „us" and „them", indicating the separate existence of the "other" group (Barth, F. 1969). At the moment when several ethnic communities would compete to feel themselves master of the same place and indicate certain parts of it, tensions may occur.

This relation implies the core of conflict, since the group in possession of the local political power is able to control the frame of local conflicts over symbolic issues, allowing or restricting the similar aspirations of the other group by administrative way. In this manner the urban space, its formation, next to/instead of practical standpoints can easily become the field of hostilities between ethnic groups, where the majority controls the situation. Although these processes naturally are not independent of nationwide tendencies, locally there can be divergences to both authoritarian and democratic directions. The minority ethnic group keeps alive a different, alternative urban space which promotes the emergence of a „doubled world" (Barna, G. 2000). In this complex system the act of naming of a street, placing a commemorative tablet or choosing the colour of a public building all have some significance beyond itself: they become the topic of power struggle between the ethnic groups.

The research site, Oradea/Nagyvárad is situated along the Hungarian-Romanian state and ethnic border. In view of frequent changes in geopolitical and ethnic composition during the 20th century the symbolic appropriation of urban space has had a pretty various pattern. An attempt will be made to outline how the spatial frame has been being formed by the two ethnic groups, the Hungarians and Romanians since the end of the 19th century. It is to be set forth how the urban space becomes the subject of political power struggle in a multiethnic city.

Ethnic and geopolitical changes in Oradea/Nagyvárad

During the 20th century, Oradea/Nagyvárad passed through changes of state power several times, which considerably influenced the ethnic structure and the image of the city. Before 1919 Oradea/Nagyvárad situated almost in the centre of the Hungarian Kingdom; it was the seat of Bihar County. The city had an overwhelming Hungarian majority population (about 90%) during the period of the Austro–Hungarian Monarchy, while the Romanians represented about 5% of the total. The third important ethnic-religious group were the Jews (20–24% by religious affiliation), who spoke mainly Hungarian and German as vernacular (*Table 1*).

After the World War I, Nagyvárad was ceded to Romania and under the new name Oradea Mare became the seat of Bihor County. The new

Table 1. Ethnic structure of population of Oradea/Nagyvárad between 1880 and 2002 (%)

Year	Total	Romanian	Hungarian	German	Jewish	Roma	Other
1880m	34,231	6.3	87.4	3.6	..	..	2.7
1890m	42,042	6.1	89.5	2.5	..	..	1.9
1900m	54,109	6.4	89.6	2.7	..	..	1.3
1910m	68,960	5.5	91.3	2.1	..	..	1.1
1920e	73,025	11.8	62.2	0.8	24.6	..	0.6
1930e	88,830	26.3	53.7	1.1	16.7	0.6	1.6
1941m	98,621	5.2	92.1	0.9	1.3	0.1	0.5
1948m	82,282	32.8	63.9	0.2	2.2	..	0.9
1956e	98,950	36.0	59.0	0.3	3.6	0.0	1.0
1966e	122,534	46.1	51.4	0.4	1.2	0.0	0.9
1977e	170,531	53.9	44.1	0.4	0.5	0.6	0.6
1992e	222,741	64.8	33.3	0.4	0.1	1.0	0.4
2002e	206,614	70.3	27.6	0.3	0.1	1.2	0.6

Legend: m = mother tongue; e = ethnicity; .. = no data. Source: Hungarian (1880–1910, 1941) and Romanian (1920, 1930, 1948–2002) census data: Varga, E.Á. (1999)

Hungarian-Romanian state border was drawn near the western edge of the city. Hungarians still formed the majority, but the share of Romanians and the Jews (the latter newly established as an ethnic category) had increased (Fleisz, J. 2005).

According to the second Vienna Award in 1940, North Transylvania (included Oradea/Nagyvárad) returned to Hungary. The state border was drawn almost at the southern edge of the city. As a consequence of the wartime events (e.g. mass forced migrations, changing power situation of ethnic groups, Jews subjected to discrimination) the overwhelming majority of the population declared themselves Hungarian again at the 1941 census.

The Hungarian rule lasted only four years, as the Soviet and Romanian troops captured Oradea/Nagyvárad in 1944 and Northern Transylvania got back to Romania. After the Holocaust in 1944, only 37% of the deported Jews had returned to Oradea/Nagyvárad (Remember…, 1985). During the communist regime the proportion of Hungarians decreased because of the mass colonisation of Romanians in the frame of the state-controlled socialist urbanization. The decrease was slower in the first period until the middle of the 1960s then accelerated during the communist Ceauşescu-regime with a fairly strong nationalistic course (*Table 1*). The colonisation processes and the favourable demographic characteristics of the Romanian settlers resulted in turning of Romanians into the most populous ethnic group in the city by around 1973. This date meant a turning point in the struggle for local political power as well: since then the mayor has always been Romanian. Between 1948 and 1956 two villages (Episcopia Bihorului/Biharpüspöki, Seleuş/Váradszőllős) with Hungarian majority were annexed to the city as well as later Podgoria/

Hegyalja (Varga, E.Á. 1999). Until 1980 new housing estates were built up, some of them by demolishing the old districts of the town.

Nowadays Oradea/Nagyvárad is a municipality, the seat of Bihor County. Due to the emigration after 1989, the number and proportion of the Hungarians decreased further. On the other hand, the share of Romanians and the Roma has increased steadily.

Since the political changes in 1989, the Democratic Alliance of Hungarians in Romania (a political party, called RMDSZ in Hungarian, UDMR in Romanian,) is represented in the local government and since 1996 occasionally in the state government too. The local position of the Hungarian community has always depended on the composition of the central government, on the strength of the party's negotiation position. But independently of the fact that RMDSZ has Romanian allies or not if an ethnic-related issue is at stake the Romanian parties generally join forces against it. In the last few years the Hungarian community has been polarized politically to a moderate wing (RMDSZ) and a more radical one (EMI: Hungarian Youth in Transylvania).

Methods of symbolic appropriation of urban space

In multiethnic settlements like Oradea/Nagyvárad, the symbolic appropriation of space generally has an ethnic connotation too. The aspiration for dispossess the urban space is carried out by various space appropriation strategies and procedures. Using Harrison's categories we can observe all four types of symbolic struggles: the valuation, the proprietary, the innovation and the expansionary (Harrison, S. 2000), but most frequently used are the expansionary and valuation.[3] These are perceptible proceedings, moreover they are made visible in the cityscape. Therefore, from the several ways and possibilities for symbolic appropriation (see Bodó, J.–Bíró, A.Z. 2000) we focused on the striking features, which influence and transform the public spaces and the image of the city.

Six main fields of the visible symbolic appropriation of space were examined closely, which form quite a correlative system. On the one hand they are direct methods for symbolic appropriation of space: *street names*, *commemorative tablets* and *statues/monuments*. The term of "direct" means that these tools are primarily in the competence of the local government, so can be ruled by the political majority. Besides, their message is easy to be identified for locals and

[3] Harrison, S. (2000) investigated the political uses of symbolism, especially those signifying group identity. He found that during political struggles conflicts emerge over important symbols. In case of valuation conflict the rival groups make attempts to mutually undermine each others' symbols while glorifying their own, meanwhile the purpose of expansionary conflict is to replace the competitor's symbols explicitly.

outsiders alike. On the other hand the built environment was also dealt with, which could serve as indirect methods for symbolic expansion, such as *sacred places,* some *features of buildings* e.g. style, colour (flags including) and *public inscriptions*. These fields differ according to their visibility and to the grade of discretion of the proceedings, but this symbolism can be interpreted primarily among the locals. Naturally, both the direct and indirect tools have common features: their underlying contents are very important and in both cases it matters whether they are found in public or hidden (internal) spaces.

Street names

In Oradea/Nagyvárad the number of streets has increased from 160 to 739 over the last 150 years. During that time, the earlier, hitherto quite stable street names changed many times, mostly in the wake of the shifts in the state power. One can find only three, ethnically neutral names, which could survive at least two changes of state power (Volga, Michelangelo, Schubert), while none of the names survived throughout the 20th century.

Until the end of the 19th century street names were natural, motivated names in the city, similar to the contemporary trends. It means that about half of the streets were named after their characteristics (big, short, wide) or the institution and function found in the street (bath, brickmaker, Capuchin, nun etc.). Later, with the spread of nationalism, the names of settlements and streets had turned to be 'nationalised', which resulted in an abundance of streets renamed mostly after Hungarian historical persons (e.g. kings, politicians with local origin) instead of ethnically neutral names. The share of the street names with Hungarian connotation coincided approximately with the ratio of the Hungarian population.

This naming process was stopped by the World War I and the following events, when Transylvania (included Oradea/Nagyvárad) was annexed to Romania. Since then the share of street names with ethnic connotation has never dropped below 30% (*Table 2*) and most of them were named after persons

Table 2. The number and ethnic connotation of street names in Oradea/Nagyvárad, 1859–2006 (%)

Year	Total	Romanian connotation	Hungarian connotation	Ethnically neutral	Without name
1859	160	0.0	1.9	80.0	18.1
1902	209	0.5	22.5	62.7	14.3
1931	536	47.4	3.7	48.9	0.0
1942	611	0.5	51.8	45.9	1.8
1957	710	33.1	19.9	46.2	0.8
1980	716	29.2	2.1	68.1	0.6
2006	739	38.4	4.3	57.0	0.3

without local linkage. In the interwar period new districts were built up mainly for Romanian colonists, which had doubled the number of the streets. This gave the chance to expand the patriotic-national naming practice, which was intended to make clear the ownership of the city. Among the early arrangements next to the order of bilingual official and shop inscriptions the so called 'nationalisation' of street names came into force in 1919/20 (Fleisz, J. 2000).[4] At that time most of the newly given names were those of canonized Romanian historical persons, politicians and of the royal family. The Romanian related names were located in the central parts of the city, while some suburbs were dominated by neutral names. The names of main roads and squares also had Romanian origin.

During the four years of the returned Hungarian authority in 1940–1944, a revision took place in case of street names as well. The proportion turned over: Hungarian street names dominated the urban space (52%) while only three Romanian related names could survive. Most of the street names given were unmotivated referring to personalities without any relation to the city and some of them reflected Hungary's actual geopolitical motivations (e.g. Hitler, Mussolini and Horthy). In this period, the number of an important category of names increased: the (mostly unmotivated) geographical names, of which many were intended to support the revisionist targets of Hungary (e.g. Pozsony [Bratislava], Temesvár [Timişoara]).

The history of the Romanian communism can be divided into two periods regarding the character of political system. During the first era (1947–1958) – uder the aegis of the idea of internationalism – the formerly meticulously supervised ethnic-based naming was changed by a relatively tolerant attitude of the government; the street names reflected a fairly balanced situation between the ethnic groups. Although the Romanian was the ruling nation and the Romanian related street names formed the majority, there were more Hungarian related names than ever before and after in minority position. Moreover, among these names Hungarian kings and (not only communist) politicians could be found which had been unprecedented for ethnic groups out of real power. Among the ethnically neutral names the share of those related to the actual ideology (communist politicians, artists, and important dates) were significant (8.2% of the total street names) with about half of the main access and ingress roads and one third of the squares.

After the retreat of Soviet troops in 1958, a socialist regime of an increasing nationalistic line had been built gradually. This went hand in hand with the elimination of Soviet related names (Benedek, J.–Bartos-Elekes, Zs. 2009). With the building of new, big housing estates (Rogerius, Nufărul) huge

[4] A decree came out already in 1920 to 'nationalise' the 50 most important streets, which means that these got Romanian names (Fleisz, J. 2000).

amount of streets appeared which unmotivated, artificial names (e.g. subjects, plants, persons) were given to, except some geographical ones referring to the surrounding villages. The most important categories of the street names (persons, geographical names and plants, animals) formed two thirds of the total names. In the wake of the above-mentioned 'desovietization' it is not surprising, that the share of the names related to the communist ideology decreased to 3.8% by 1980.

Following the collapse of communism, as a general feature of the transition period in this region, the nationalism kindled again and as a matter of fact, superseded the former official internationalist ideology. Many street got new or its interwar name, so the proportion of the street names with Romanian roots, especially of the persons' names increased. Nowadays Oradea/Nagyvárad has 739 streets from that 57% is ethnically neutral. Romanian street names dominate the city centre, while the few Hungarian names are concentrated in areas, where they live in higher proportion. Only two important public places have Hungarian name and none of the Hungarian names represent the history of Hungary (politicians, kings, dates), most of them are artists or have local connotation. In case of new streets (at the edge of the city) a tendency can be seen: the naming practice approximately follows the present ethnic proportions – without neutral names.

Table 3. Relationship between the ethnic composition of the inhabitants (e) and the ethnic connotation of street names (s) in Oradea/Nagyvárad, 1900–2006 (%)

Year	Romanian	Hungarian
1900e	6.4	89.6
1902s	2.1	97.9
1930e	26.3	53.7
1931s	92.7	7.3
1941e	5.2	92.1
1942s	0.9	99.1
1956e	36.0	59.0
1957s	62.5	37.5
1977e	53.9	44.1
1980s	93.3	6.7
2002e	70.3	27.6
2006s	89.9	10.1

It is also necessary to research the connection between the ethnic structure of the population and the ratio of street names with ethnic connotation. As we can see in *Table 3*, these two indicators only have coincided during the Hungarian rules, but even in that case the local Hungarian government made an effort to monopolise the street names for Hungarians, excluding the Romanian minority. So the (re)naming of streets is rather a tool for the actual local government – in harmony with the measures of the current central government – to rule and control local communities, particularly in case of culturally diverse cities like Oradea/Nagyvárad.

Another important issue is the visibility and usage of the different street names by locals. Since there is a significant, autochthonous Hungarian

minority in the city, they generally use the Hungarian names originated from the first half of the 20th century.[5] Nowadays only Romanian street name plates can be found in the city, despite the share of the Hungarian community reaching 20%. So, local Hungarian EMI started to claim for bilingual plates, which is a legal demand (Veress, E. 2006). The local council accepted the resolution to have bilingual plates, but then an endless negotiation started, because the claims of the two ethnic groups have not coincided. Romanian representatives would have only put out plates with Romanian names (without translation) and place the Hungarian 'utca' (= street) inscription at the bottom only. Representatives of the moderate, Hungarian ethnic party (RMDSZ) having participated in earlier governance would have been satisfied with the translations, while EMI demanded the 'original' Hungarian names under the official Romanian names.

There is still no solution, just tensions, as the local government finally took a decision about the bilingual street name plates but it is still unwilling to act properly. The EMI's activists did not wait years; they started to paint the Hungarian names to buildings whose owners they had agreed on. Since then a 'hare and hounds' has been going on between Romanian and Hungarian nationalists (sometimes the Romanian officials also get involved): paint down or draw over the Hungarian names then paint again (*Photo 1*).

Photo 1. Official (Romanian) and painted (Hungarian) street names in Oradea/Nagyvárad (photos by Kocsis, K.)

[5] Many Hungarians (mainly elders) use exclusively the traditional Hungarian street names and they do not really know the official ones.

Politicians also started to deal with this case; a complex discussion has emerged about the issue. In this case the front lines run not among the political parties rather than among ethnic groups, meanwhile the majority of the local Romanians in principle do not oppose the bilingual street names.

This case demonstrates the importance of being visible. The Hungarian community of Oradea was previously a majority and ruling ethnic group; they would like to strengthen their ethnic identity and their importance, they want to make their presence visible even at the expense of arousing conflicts.

Commemorative tablets, statues/monuments

With commemorative tablets or with statues in the first place the exact part of space becomes marked, it modifies the neutral public space, while central or periphery position differentiates in importance (Jakab, A. Zs. 2004). On the other hand these tablets/statues serve as a "lieux de mémoire" with the term of P. Nora (1999, 142): mark an exact (but not necessarily real) person, event from the past which is highlighted by the present as decisive part of the (community's) collective memory. These also reflect the historical narrative of the group and era when the memorial was erected (Azaryahu, M.–Foote, K.M. 2008). Every tablet/statue has a target group and the same memorial can have different judgement by different groups. Hereby in case of a commemorative tablet not just the exact content of the memory text, but the whole context is needed to be investigated: the place where it is, the ceremony built around it, and even the history of the erection or replacing, demolishing.

Placing a new *commemorative tablet* is perhaps the easiest way of symbolic appropriation of the space. In Oradea/Nagyvárad commemorative tablets have been placed since the 19th century; that time the texts were written both in Hungarian and in Latin; the latter were located mostly on churches. The tablets commemorate persons[6] or events, e.g. end of war, construction of a building (see Vende, A. 1901).

By our days, beside the religious inscriptions, only those tablets survived, which were quite hidden ones (e.g. in gardens, in cemeteries). In open public spaces, we only found Szigligeti's tablet from this period and it is interesting that it has no Romanian translation. Nowadays the most of the tablets are only in Romanian and these commemorate Romanian persons and events. Only a few bilingual plaques can be found mostly about ethnically neutral subject (e.g. memorials about institutions or about characters of novels). Placing

[6] At the end of the 19th century we could identify only three tablets commemorated persons (all in Hungarian); two of them were local victims of the Hungarian War of Independence in 1849, the third was a famous Hungarian writer, E. Szigligeti.

of commemorative tablets proliferated in the 1990s, when many monolingual Romanian tablets appeared, some of them with nationalistic message.[7] At the same time Hungarian tablets were not equipped in public space. But since 2001 several Hungarian tablets can be found inside the building of the Partium Christian University, which is the first autonomous Hungarian university in Romania since 1959. In 2007 a new Hungarian tablet were placed in open public space and it is without Romanian translation.[8] On the whole, commemorative tablets do not serve as scene of joint celebration of ethnic groups, they are rather for the in-groups.

Comparing to tablets, *statues and monuments* are more spectacular signs in public space. According to A. Vende (1901) St. Ladislaus' first (horseback) statue was erected already in 1390.[9] Until 1923, the statue(s) of this "great national Saint" (Vende, A. 1901. 177) were dominated Oradea/Nagyvárad's symbolically most important point, the main square, at that time bearing his name.[10] This square has always been occupied symbolically by the contemporary power. In 1924, after the change in state power, Romanian King Ferdinand's horseback statue was erected in the same place, whereas St. Ladislaus' statue was moved to the current place, to the park of the Roman Catholic Basilica (Fleisz, J. 2007). During the communist regime, a Soviet war memorial took place here, while in our days (since 1994) the Romanian prince from the 16th century, Mihai Viteazul/Michael the Brave (on horse) can be found here (*Photo 2*).[11]

In case of erecting statues, the 20th century can be characterised with the aspiration for absoluteness, which means the lack of tolerance towards the monuments of 'others'. In the interwar period, by 1937, almost all Hungarian statues, even the politically neutral ones were gradually removed from public spaces (Fleisz, J. 2007). As a retort to these events, the Hungarian authorities did the same in the first half of the 1940s.[12] The majority of the recently ex-

[7] In Cluj-Napoca/Kolozsvár, the same has happened (Benedek, J.–Bartos-Elekes, Zs. 2009).

[8] This tablet is dedicated to the memory of a café which served as a meeting place for artists at the turn of the 20th century.

[9] St. Ladislaus was a medieval Hungarian king, considered to be the founder of Oradea/Nagyvárad. His first statue destroyed during the Turkish occupation in the 17th century.

[10] St. Ladislaus' second statue (made of stone) was erected in 1739; it was replaced with a statue made of bronze in 1893.

[11] According to the Romanian official historiography, Mihai Viteazul (Michael the Brave) was the one who united Transylvania, Wallachia and Moldova for the first time (1599). Additionally the main square, where it is now, called Unity. While for the Hungarians he is not more than the Habsburg's mercenary, who occupied the Hungarian Principality of Transylvania for the Habsburgs.

[12] In the interwar period nine Romanian statues and tablets were placed, but only one is still standing (Fleisz, J. 2007).

Photo 2. Symbolic appropriation of Oradea/Nagyvárad's main square by using statues: St. Ladislaus' statue (photo by Fekete, S.) during the Austro–Hungarian Monarchy and Mihai Viteazul's one (photo by Tátrai, P.) nowadays

isting statues were erected during the communism. First, mainly artists got memorials and until 1960 – like in case of street names – the minorities also had the chance to place their own memorials (Banner, Z. 2002). Later, during Ceauşescu's nationalistic communist regime, Dacian and even Roman kings, emperors were sculptured to confirm the Daco-Roman(ian) continuity about the origin of Romanians and secondly but implicitly to prove the right for Transylvania.[13] Parallel to this process, the memorials of ethnic minorities were getting to be removed.

The real revival of erecting statues and monuments has occurred after the political transformation in 1989. Similarly to the case of the commemorative tablets, in the 1990s only statues of Romanian persons (first of all kings and politicians) were set up., The first new Hungarian statue of this period was erected in 1996, but during the last ten years a wave of raising has started – not without conflicts: the right-wing Great Romania Party (PRM) denounced

[13] A whole statue park (with Dacian, Roman and Romanian historic persons) was created in the garden of the former Roman Catholic bishop's palace by 1977, the date of Ceauşescu's visit in Oradea/Nagyvárad. A new entrance had to be opened at the back of the palace for the dictator (declared as main entrance), this way he could not have a chance to notice St. Ladiaslaus' statue at the front (information by Rev. József Tempfli, former Roman Catholic bishop).

the Calvinist Church because the inscription of the statue was in Hungarian instead of the permitted Latin.

In our survey 17 Romanian statues/monuments (plus the 'statue park') 10 Hungarian and 8 ethnically neutral (mostly religious) similar objects were counted in the city. This distribution basically fits to the present ethnic proportions. But if their spatial position is investigated it could be found that – with the exception of two Hungarian artists' sculptures –, they are located in parks, gardens in almost hidden positions, while Romanian statues dominate the main squares and roads, the symbolic hearts of the city (*Figure 1*).

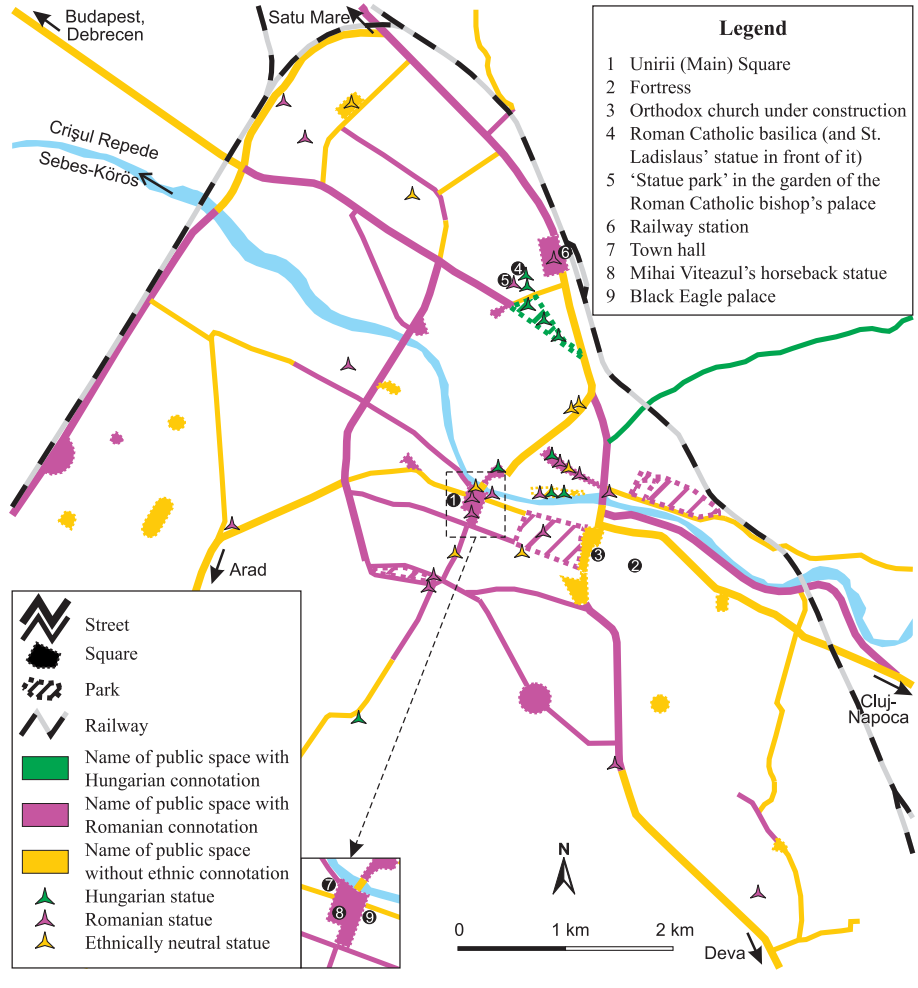

Fig. 1. Contemporary ethnic connotation of main streets, squares and statues in Oradea/ Nagyvárad

So in the last 20 years, parallel with the political strengthening of the Hungarian community, new ethnic-based but rather political tensions originated from almost every attempt of visible monopolisation of public space by either of the sides. In the followings the focus will be put on less visible, more hidden, more refined methods for symbolic appropriation of space.

"Onion dome conquest" and the built environment

Since in Romania ethnic and religious boundaries coincide more or less, the expansion of churches has always been supported by ethnic groups, and even by the contemporary state. During Hungarian rule, generally the Roman Catholic Church was favoured, while the Romanian state has always been preferred the Orthodox Church, even during the declared atheist period between 1947 and 1989.

Building a new *church* is a spectacular but rather indirect method of the symbolic expansion. In the city with the increasing of Romanian population, there was a growing demand on building new churches. The location, style and size of these new churches clearly refer to symbolic appropriation of space. In the interwar period seven Orthodox and Greek Catholic churches and chapels were built, all in the so called "neobrâncovenesc" style (Péter, I. Z. 2005).[14] Even so, in that period Hungarian Churches (Roman Catholic and Calvinist) also built new temples.

Table 4. Number and distribution of churches according to the language of the service in Oradea/Nagyvárad (2007)

Churches	Number of churches with		Under construction
	Service in Romanian language	Service in Hungarian language	
Orthodox	23	–	6
Greek Catholic	3	–	–
Roman Catholic	–	12	–
Calvinist	–	10	–
Lutheran	–	1	–
Unitarian	–	1	–
Baptist*	10	2	1
Pentecostal*	11	1	–

* In case of Baptist and Pentecostals the figures include rather house of prayer than real church. In the city, there are three synagogues too, but only one functions

After the anti-religious era of communism, a new wave of church-building has begun in 1990. As the financial conditions were not equal, mainly the Orthodox Church has been the winner of this rush (*Table 4*), which resulted in tensions between denomina-

[14] The neobrâncovenesc is an archaizing style based on Wallachian architecture from the reign of prince Constantin Brâncoveanu in the 17–18th century (Péter, I.Z. 2005. 261–263).

tions.[15] By the Calvinist Church over the last 20 years approximately 2000 Orthodox churches were built – or has just started to build – in Transylvania, using state sources.[16] Although the expansion of the Orthodox Church is observable, the proportion of the Romanian and Hungarian churches fits to the contemporary ethnic proportions. The onion dome conquest not only could be emphasized by the growing number of the Orthodox churches but also by their spatial position: usually they occupy centre positions and fill any small free spaces.

Out of the churches, other *public buildings* can also be suitable for symbolic gaining ground, through their *style, size, colour, decoration or function*. But these are quite refined methods, perceptible almost exclusively for locals.

How do they work? As it was mentioned earlier, style is a very telltale sign; for example in Oradea/Nagyvárad art nouveau considered to be 'Hungarian style', because during Hungarian rule up to World War I edifices were erected typically in this style, while neobrâncovenesc considered to be 'Romanian style'. So if a building is constructed in the latter style, this will expand the 'Romanian territory' in the city. Moreover a building, as a real, 3D spatial object is effectively suitable for dwarfing or covering other ones, as it has happened in case of the most important Hungarian heritage, the fortress, which is absolutely covered by housing estates and the new Orthodox cathedral (*Photo 3*).

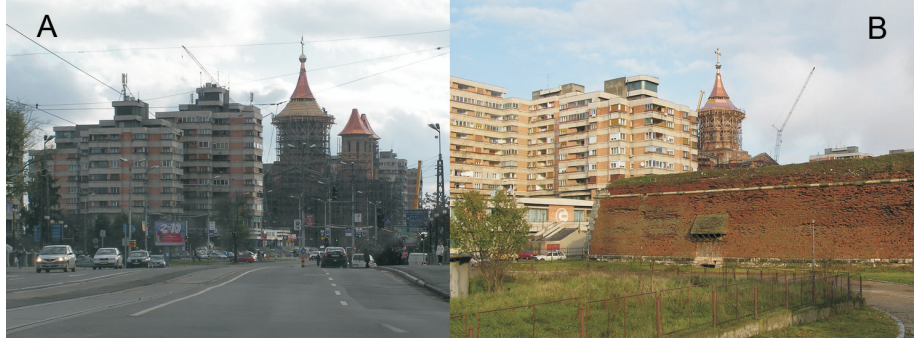

Photo 3. The fortress is invisible from the main road (A), being in the shadow of the Orthodox cathedral and a block of flats (B) in Oradea/Nagyvárad (photos by Kocsis, K.)

In Romania *colours* have special importance in symbolic struggle. Generally green is associated with Hungarians, while yellow is considered to be a Romanian colour (think of the two national banners!). In the main square of Oradea this dual colouration is striking. The most of the buildings

[15] Two important conflicts have been observable: the rather ethnic-based tension between the Orthodox and the Calvinist Church and the tension between the Orthodox and the Greek Catholic Church of restored independency.

[16] Information by Mr. János Antal, Calvinist Church, Oradea/Nagyvárad.

are painted with yellow, only the Roman Catholic church is green. Here, the Black Eagle is built in art nouveau style: the palace also represents the importance of colours: this building was renovated in 1984 and got back its original turquoise green colour. Two years later it had to be repainted to yellow.[17]

Although *flags* are not really the part of buildings, they have to be mentioned here as a frequently used decoration. Excessive use of flags is an everyday phenomenon in Romania (*Photo 4*).[18] In Oradea/Nagyvárad, Romanian and EU flags wave on public buildings. In the centre, one can find public building with five national flags on the front.

The above-mentioned methods (street-names, statues, 'onion dome conquest', style, colour, covering) can be concentrated into a common one, which resulted in a very significant transformation. This method is directed to occupy the city centre (generally the main square). We could identify two (even simultaneous) steps of this process. At first the transformation of the historic centre is carried out by replacing others' memorials with own ones, constructing new buildings – mostly churches –, changing the colours, etc. Then a possible second step may follow to create a new civic centre. In Oradea/Nagyvárad this second phase is not as spectacular as in some cities in Transylvania (e.g. Cluj-Napoca/Kolozsvár, Satu Mare/Szatmárnémeti, Baia Mare/Nagybánya), but there have been efforts to create a new centre in the Independence Square. Erecting of the monument to the Romanian soldier and the construction of the new Orthodox cathedral are worth mentioning in line with appropriation of symbolic space.

Photo 4. Romanian national colours on the roof of the hen-roost in the zoo of Oradea/Nagyvárad (Photo by Kocsis, K.)

Other inscriptions

In the city, we can find many inscriptions from the advertisements to the official inscriptions. Starting with the commercial ones, it is observable that in Oradea/Nagyvárad there are only a few Hungarian inscriptions on shops and even less

[17] Information by Mr. Vági, László architect and councillor in Oradea.

[18] During the last decades Cluj-Napoca was a typical case for this; even the dustbins were painted to blue-yellow-green (Benedek, J.–Bartos-Elekes, Zs. 2009). In Oradea only a few extreme case of using of national colours can be found, mostly in the zoo (see *photo 4*).

on advertisements at the street. The bilingualism of the shop signs depends on the owner and on the size of the shop. In small shops owned by Hungarians we can see inscriptions in both languages, while Romanian owners usually do not pay attention to this issue.

In case of official inscriptions, both languages are used on the most important public buildings, e.g. town hall, prefecture, railway station (*Photo 5*). Only those schools have bilingual sign, in which the language of the education is Hungarian.

The examples above have a common feature: the order of the inscription always starts with the Romanian sign and under that continues with the Hungarian one. The only exceptions are the inscriptions of the Calvinist Church, where generally the Hungarian is the first language.

It is not a research objective but we have to emphasize that the order or the language of the inscription can change immediately if we enter into the 'private' sphere, inside the buildings.[19] In private sphere minorities are in a 'safe space' they can use their language without control. So the distinction between the private and public sphere is very important as in case of other fields of symbolic struggle.

Photo 5. Bilingual inscription on the railway station in Oradea/Nagyvárad (Photo by Kocsis, K.)

[19] For example Hungarian Churches can be Hungarian monolingual inside the church. Contrary to this, one can find such bilingual school, where the inscriptions inside become only Romanian.

Conclusion

According to the attitude of the contemporary power, we can identify eight periods in the last 150 years with different strength and direction of symbolic appropriation of space. In five of these periods, local government made efforts to monopolize the public space for the favoured ethnic group.[20] In other periods, the ethnic-based symbolic expansion did not have importance (before the end of the 19th century) or the ruling ideology was more tolerant (from 1945 till the 1960s) or the democratic rules have balked the one-sided activities against cultural diversity (since the end of the 1990s). Among democratic frames both actors of the power struggle has been capable to take part in the symbolic contest, naturally the majority dominates the context.

Evaluating the different methods for symbolic expansion, it can be stated that every power applied the direct methods by choice. The different regimes have renamed the streets, have removed and erected statues and commemorative tablets. Of course, these are less expensive and more effective ways than creating new buildings even a civic centre. The common feature of every symbolic conquest by local governments is that primarily the locals were targeted with these signs to demonstrate the power relations. Next to this it has to be mentioned that these methods are materialized mostly in public space. Investigating it from the aspect of the urban space, latter has won an underlying, extra connotation: its formation became a tool for the rival groups that has formed remarkably the image of the city.

We reckon that the visibility is the key of the issue and through symbolic appearance one can recognize (or not) different groups – in our case ethnic groups. In Oradea/Nagyvárad, only two ethnic groups aspire to be visible; the two most significant ones, Romanians and Hungarians. Both of them have already formed ethnic and political majority too in the last hundred years. Both want to be visible to win the struggle, which cannot be won and both want to strengthen the identity of the group through symbolic actions.

According to the visibility, we can identify an ethnic hierarchy. In present day, on the top the Romanians can be found, followed by Hungarians. But this ethnic system of the city does not form an organic system; it is the complex of parallel societies. There is the official, Romanian society, which can be seen almost everywhere, and a 'hidden', Hungarian society also exists with their parallel institutions, networks and with different perception of the city.

[20] Under Hungarian rule: between the end of the 19th century and 1919, between 1940 and 1944; under Romanian rule: between 1919 and 1940, from the 1960s to 1989 and from 1989 till the end of the 1990s. The changes were sharp only in case of changing state-power.

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LITERATURE

Hungarian Geographical Bulletin 59 (1) (2010) pp. 69–76.

Kocziszky, György: Methodology of Regional Development. University of Miskolc Press 2009. p. 258. ISBN 978-963-661-898-8

György Kocziszky makes an important contribution to current debates on territorial planning and regional development, providing an empirically rich analysis of the theory and methodology of regional development. The book mainly addresses graduate students and is divided into four parts. The first one critically reviews economic theories explaining regional development; the second presents different types of spaces and space delimitation methods; the third provides an analysis of spatial level, time horizons and databases used in the spatial planning; and the fourth focuses on methodological questions linked to the preparation of regional development plans.

Readers with previous knowledge of the literature on regional development theories should be familiar with the polemics and questions reviewed in Chapter 1: economic growth, economic theories of regional development, and regional development as an instrument of economic policy. The second part of the book examines different types of space delimitations, according to administrative, identity-based, functional, statistical and economic criteria, while the third part presents the spatial levels of development plans, the typology and nature of development plans. The sources of data and information used in planning are presented as well.

A novel and important contribution of this book is to provide an insight in the methodology of preparing regional development plans (Chapter 4). The author divides seven steps in the preparation of regional development plans. For each of them are determined a range of specific objectives, tasks and methods. The first of these steps, exploration and analysis, is largely presented on the basis of thematic sections: environment, demographic potential, living conditions, economy, labour market, infrastructure and spatial structure. Through a well-planned selection the focus is on the presentation and discussion of quantitative methods of analysis, starting with descriptive statistical methods, continuing with methods of structural change measuring, examination of stochastic relations, cluster forming, and factor analysis. A qualitative method, the SWOT analysis is presented as well. A novelty for this kind of books is the next step: the positioning of the analysed territorial unit, on the basis of complex indices like the Human Development Index. The concept of regional innovation potential is taken into the field of analysis, due to the fact, that innovation is considered to be one of the key factors determining the global position of regions and localities. The chapter ends with a short overview on activities like documentation, implementation, monitoring.

In summary, this book represents a good and compact addition to the literature on regional development both in educational form as well as in practical form. Using personal reflection and a comprehensive source material gives mindful insights to the methodology of regional development. The result is a most valuable tool for economists, geographers, planners, and policy-makers.

József Benedek

Lóczy, Dénes; **Tóth, József and Trócsányi, András (eds) Progress in Geography in the European Capital of Culture 2010.** Zoltán Dövényi (series ed.) Geographia Pannonica Nova 3. Institute of Geography, University of Pécs. Imedias Publisher, 2008, 335 p.

Three occasions were listed in the preface of this volume of studies edited back to 2007. Firstly: it was dedicated to the oncoming 31st International Geographical Congress (Tunis), secondly: conceived to commemorate ten years of the foundation of the publishing Institute of Geography, and thirdly: to provide preliminary information about geographical aspects of Pécs: host city as the European Capital of Culture (ECC) in 2010. (Along with Istanbul, and Essen Pécs won the national and Brussels tenders and was entitled as one of the three capitals in 2005.) Since the establishment of the institute within the university (PTE) in 1998 nine departments have operated to comprise earth sciences in a broad sense: from physical geography and geology, environmental geography, cartography and geoinformatics, through human geography also including urban studies, tourism and political geography, to regional aspects of Hungary and of the wider surroundings, with a special reference to South East Europe. The doctoral school pursues fruitful activity as it has been witnessed by the volume as well. Altogether 28 contributions were selected written by nearly 80 authors and grouped in five chapters thus providing a complete cross-section of the discipline. The editors have chosen an unorthodox way of the aggregation of contents: theoretical foundations, methodical approaches and applied research reappear in each of the five topics: human geography, its regional application, tourism, geomorphology and environmental geography. The chapter on human geography abounds with conceptual writings (with reference to cultural geography, urbanisation), at the same time it contains overview of spatial aspects of economic sectors (viticulture) and social formations (microvillages, non-profit organisations) in change.

Applications include an analysis of the past fifty years of internal migration the two decades since the systemic change included also putting marks of question (e.g. on specific features of female migration). With the advent of EU enlargement (accession of two East Balkan states) the Western Balkans affairs (those related to the future of the successor states of Yugoslavia) came to the focus of interest of the workshop of political geographers at Pécs. Breakout points are numerous in the South Transdanubian Region (one of the seven NUTS2 entities in Hungary) with Pécs as its seat. Higher education and cross-border cooperation are some of them, but tourism also has chances on its own right. Beside the explanation of complex spatial categories the latter chapter raises concrete trends of the development: designation of thematic routes, raising ecotourism and infrastructure that need considerable intellectual and financial input. The chapter on geomorphology might be characterised as a traditional topic studied with modern methods of investigations (impact of agriculture, geomorphological hazards, loess and red clays as paleoclimate indicators, studies on karst and geomorphological surfaces). A modern volume of studies in geography in Hungary is inconceivable without essays on sustainability and local economies, renewable energy sources, hazardous waste disposal including the radioactive ones. A special flavour has been added by topics such as rainwater harvesting and atmospheric aerosol scavenging. GIS applications and modelling are reappearing features all along the volume.

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Pécs is the fifth populous city in Hungary with population number just under 160 thousand. A regional centre for centuries in trade, institutional and cultural respects, it had developed into a big city in Hungarian scales taking advantage of the industrial revolution based on

the development of mining (coal and uranium ore) and manufacturing industries including diverse light and food industries. With the change of the political system (1990) and the ensuing socio-economic restructuring and deep crisis forced the city of Pécs to seek a way-out via post-modern transformation e.g. through the rehabilitation of industrial blights for cultural purposes. These trends have been reinforced by the nation-wide expansion of higher education. Thus cultural heritage, cultural industry and culture-based economy became the pillars the development strategies were based upon during the 1990s.

After an abortive attempt to bring the historic downtown under protection, Early Christian Necropolis of Pécs (Sopianae) was listed among UNESCO World Heritage sites in 2000. During the EU budgetary period 2007–2013 the Pécs Pole Developmental Strategy was formulated and approved with cultural, health and environmental industries as the main supporting pillars with the university strongly involved in all three fields. The status of World Heritage Site is promising in a sense that Pécs enjoys some advantage on the tourism market, and its brand can become more familiar.

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By definition the title of the ECC is purposed to be catalyst for the cultural development and the transformation of the city in concern. When in the year 2005 Pécs applied for the ECC 2010 title the "Borderless City" was chosen as the slogan. Firstly it refers to the Balkan region towards which Pécs has traditionally represented an important gateway. It means that a long-term goal is to turn the city into a regional centre/hub in a cross-border sense. The other meaning is the efforts to remove the physical borders and barriers to interlink sections of the city (historical quarters and modern but worn down ones including industrial blight) through urban revival.

Physically ECC 2010 strategy is based upon five key projects *(Figure 1):*

1. The Zsolnay Cultural Quarter as a central element. This manufacture of ceramics with great traditions is a monument of industrial history and architecture and is going to sustain its initial function only partly. In line with the post-modern concept of urban planning there will be a park in the inner court with Art Nouveaux features, and incubator house, art camp and exhibition facilities for the Faculty of Arts of the PTE, a hotel and restaurants *(Photo 1).*

2. The Regional Knowledge Centre is to be created along the axis connecting this district with the downtown area and accommodate a common modern university, county and city library and a competence centre *(Photo 2).*

3. The Conference Centre and Music Hall complex will enable Pécs with higher reputation, to become involved in international circulation of conference tourism *(Photo 3).*

4. A facility in the historic downtown area called "Street of Museums" a chain of existing enriched with a newly built Grand Exhibition Hall.

5. Last but not least one element of the strategy is aimed at reconstruction and rehabilitation of the public squares and parks and the renewal of the downtown area, but also includes of highly degraded public spaces in the city district centres *(Photo 4).*

The total expenses planned in 2008 reached 50 billion HUF (ca 200 million EUR) shared between the EU, Hungarian state budget, Pécs Municipality (44 billion HUF) and private investors. 35 billion was to be devoted to the above described facilities and renewal and 9 billion to be spent for the organisation of cultural events. As it was written in one of the studies of the volume published in 2008 and reviewed here: «…unfortunately it seems that cultural "software" i.e. the actual programmes, events and the non-infrastructural elements of the portfolio, is becoming shaded out by planning the elements of "hardware"».

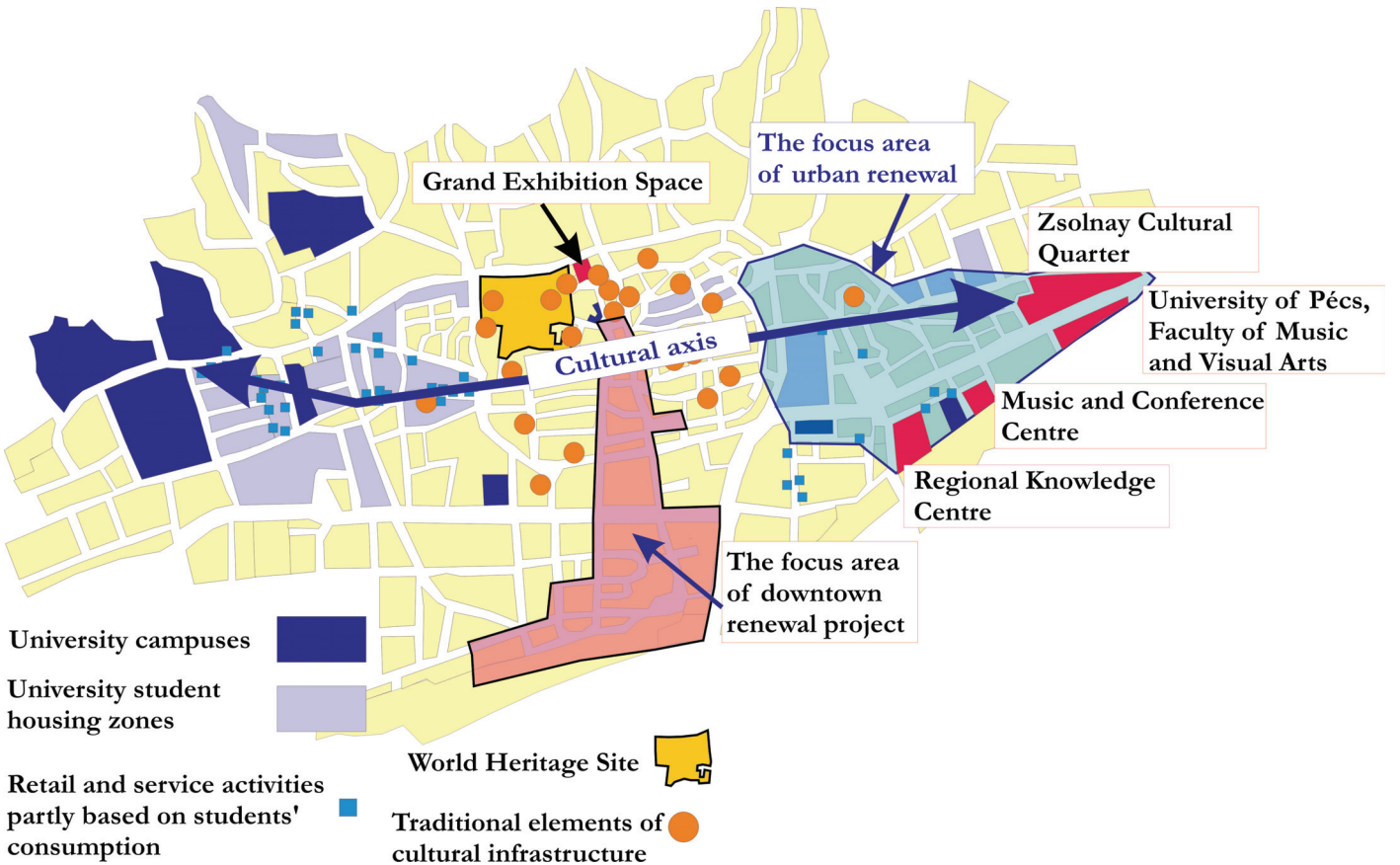

Fig. 1. Space-forming impacts of cultural economy in the city of Pécs. Venues of the key projects of ECoC. (Compiled by G. Pirisi and A. Trócsányi)

Photo 1. Zsolnay Cultural Quarter emerging on the place of a renowned ceramics manufacture (Photo by A. Trócsányi)

Photo 2. Regional Knowledge Centre of South Transdanubia (Photo by A. Trócsányi)

Photo 3. Conference centre and concert hall complex under construction (Photo by A. Trócsányi)

Photo 4. The hub of the city of Pécs: Széchenyi Square in mid-March 2010 (Photo by A. Trócsányi)

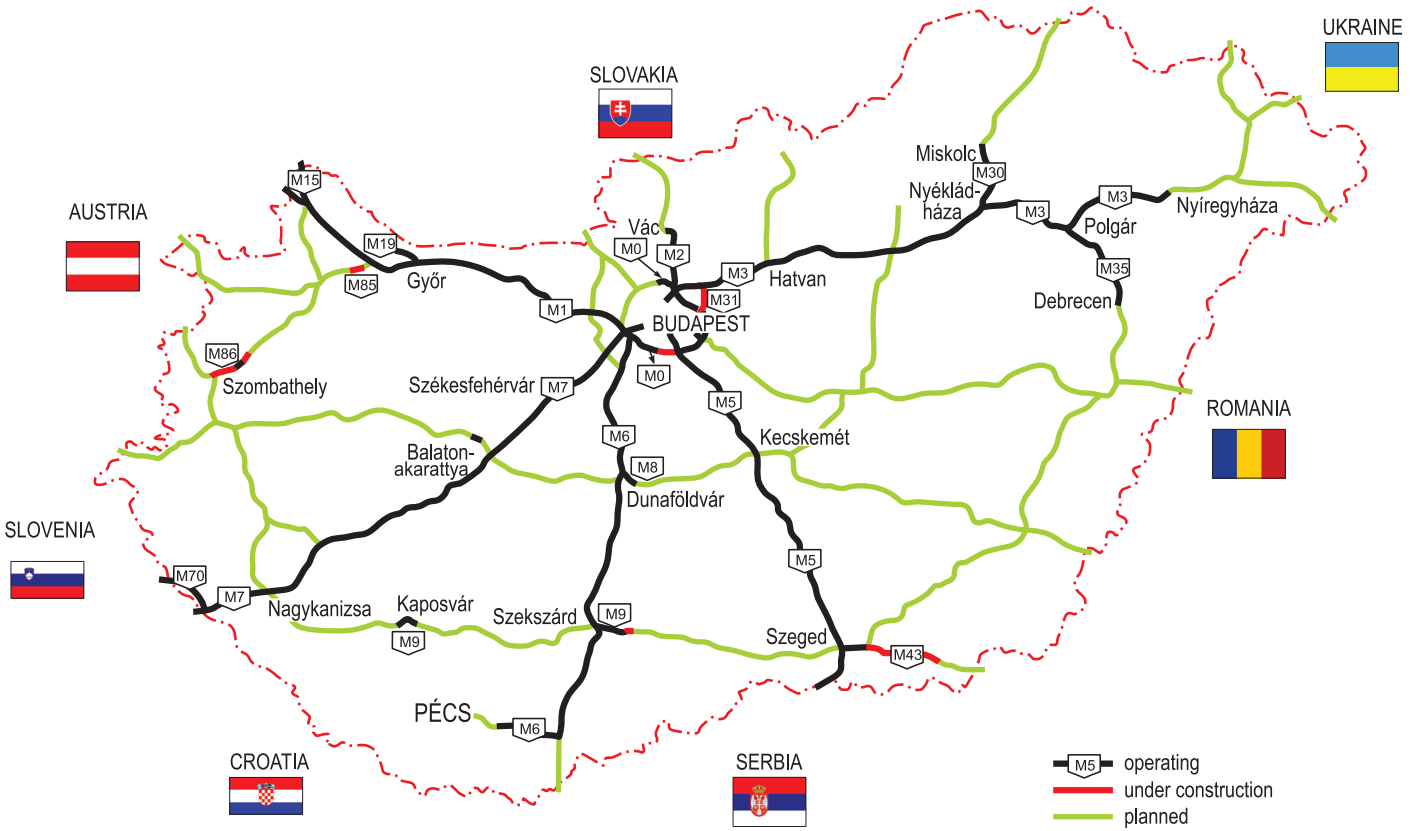

Fig. 2. Motorway network in Hungary (as of the state of March 31, 2010)

In a conspicuous way just the opposite happened: in mid-March 2010 the schedule was 350 cultural programmes for the whole year, 100 civil initiations and 80 regional events to be held. About one million visitors are expected; presumably 20–30 per cent of them will be foreigners. In contrast, the construction of the new centres is delayed heavily: reconstruction of the Museum Street (1.5 billion HUF, 85 per cent from EU sources) might be completed by the end of April, but without the exhibition hall; the regional library and knowledge centre inaugurated in June as the earliest; and the conference and concert hall opened by the end of August. The complex of the Zsolnay cultural quarter will not be completed in 2010, while most of the sites of the public spaces reconstruction pillar are in their new use and design at the moment – unfortunately excluding the emblematic city centre, the Széchenyi square.

At the end of March a 145 km long section of M6 motorway approaching Pécs closely was opened, which improved the accessibility of the city from Budapest by reducing travel time below two hours *(Figure 2)*. With the addition of the new section the total length of motorways in Hungary exceeds one thousand kilometres.

László Bassa

CHRONICLE

Hungarian Geographical Bulletin 59 (1) (2010) pp. 77–83.

GEOGRAPHICAL RESEARCH INSTITUTE
Hungarian Academy of Sciences

Scientific Activity Report'09

I. Main tasks of the research institute in 2009

The GRI HAS continued to pursue research activities as a member of the Association of Institutes in Geosciences of the HAS. The most important tasks included the investigations into the short- and long term natural environmental changes anticipated and into the transformation processes of socio-economic spatial structure. These activities formed part of both projects started in 2009 (Margins, MTA-DFG), and those launched earlier (SefoNe, SOWAP, BORASSUS, ACRE, UNESCO-MOST etc.), and projects announced by domestic research centres and by academic and governmental organizations (OTKA, OFA etc.). An eminent task was the preparation of a map series presenting the change in ethnic patterns on the present territory of Hungary between 1495 and 2001 and the publication of a thematic atlas compiled in a broad national collaboration entitled Hungary in Maps.

The main tasks in the physical geographical domain in 2009 were the continuation of the projects in progress and presentation of the results on Hungarian and international forums. The following topics were cultivated independently or in collaboration:

– BORASSUS project (funded by EU FP6 INCO): The environmental and socio-economic contribution of palm geotextiles to sustainable development and soil conservation

– SOWAP (funded by EU LIFE/Syngenta UK): Soil and surface water protection using conservation tillage in Northern and Central Europe

– Effect of landscape pattern on macro and micro element budgets of wetlands

– OTKA project: The role of gully erosion in the present-day relief development of Hungary

– The start of the „Margins" project

– The elaboration of sample preparation methods for particle size analysis

Research activities in sample areas to facilitate deposition and safe storage of radioactive wastes of low and intermediary activity as by-products of nuclear energy generation continued to be a complex scientific task. Comprehensive studies focused on environmental monitoring, hydrogeographical and soil erosion measurements in the surroundings of Radioactive Waste Treatment Disposal Facilities at Püspökszilágy and of the National Radioactive Waste Repository at Bátaapáti.

Five current OTKA projects were cultivated in support of the solution of the tasks in 2009 (Correlation of Quaternary sediments, Ethnic geography of Hungary and recent eth-

nic processes in the neighbouring countries, Health tourism and quality of life in Hungary, Impact of urban rehabilitation programmes on the quality of life of the population in metropolitan areas, Impacts of industrial investments on the spatial structure and their transport related issues), added by a novel one entitled Ethnic geography and cartography of the countries in the Carpatho-Pannonian area.

An important target was the timely performance of the tasks within current multi-annual EU framework programmes, such as the project ACRE (Accommodating Creative Knowledge: competitiveness of European metropolitan regions within the enlarged Union) and running in EU-FP6 SefoNe (Searching for Neighbours: dynamics of physical and mental borders in the New Europe). Financed jointly by MTA-DFG there were two projects in 2009: „Revitalisierung von gründerzeitlichen Altbauwohnquartieren in Budapest – Prozesse, Strategien, Perspektiven", and „Zwischen Gentrification und Abwärtsspirale".

On behalf of the Presidium of HAS a thematic atlas in English entitled „Hungary in Maps" was published by synthesizing the merits of a book and an atlas thus serving as a business card of the country. Another major venture was reambulation and preparation of the second edition of a 800 page monograph „Inventory of Natural Microregions in Hungary" for publication which included the revision of the manuscript with the thematic checking and edition of insert maps.

Two important meetings were organised. One in preparation for the Fourth Hungarian Conference on Landscape Ecology to be held in 2010. Another was the arrangement of the closing session of SefoNe/Carpathian Basin (conference and cultural event).

II. Outstanding research and other results and their socio-economic impacts in 2009

– SOWAP supported by EU LIFE and Syngenta is aimed to combat landscape degradation. A preliminary conclusion has been that soil erosion represents the highest risk. Special soil tests were purposed for the establishment of technological, agronomic and economic requirements for and consequences of conservation vs conventional modes of cultivation. The amount of pesticides washed off and their enrichment in natural waters were measured too. Concerning soil loss a most conspicuous result is that under wheat the amount of soil loss was 125 times more on the conventional plot compared with that on the conservation plot.

Participants: 10 persons; of them 6 from the Institute

Estimated expenditure of the Institute: 27 m HUF fully covered by the grant support

Applicability: confirmation, and presentation of the advantages of conservation methods in cultivation; and propagation of their contribution to landscape protection and biodiversity. Presentations occasionally attract 40–50 people engaged in farming and decision makers and are instrumental in the propagation of the methods.

– The BORASSUS project terminated in 2009. The most important research results were achieved about soil moisture on the effect of geotextiles on soil moisture. Organic geotextiles cannot only be used as a tool against soil erosion but they can be applied also on embankments and dams in establishing a grass cover on their slopes by providing better conditions for the development of the vegetation cover. Organic geotextiles may have a positive effect also in new agricultural plantations where the water supply of cultivated plants during the first years after plantations comes mainly from the topsoil (e.g. newly planted stone-fruit orchards). The results can be applied in soil loss prevention.

Participants: 16 persons; of them 6 from the Institute

Estimated expenditure of the Institute: 12 m HUF fully covered by the grant support

Applicability: Geotextiles have a positive impact on soil moisture reducing soil loss and promoting the initial growth of new plantations.

– In the frame of SefoNe EU FP6 project the effects of the introduction of Schengen regime was evaluated on the one hand for the Hungarian-Hungarian contacts whereas on the other hand for the interethnic relations. Thanks to the strict border crossing regulations the grade of formerly remarkable smuggling decreased, at the same time the number of temporary legal (or illegal) job opportunities were also reduced. This led to change in life-strategies of local inhabitants, especially in the Hungarian community. Within the Romanian-Hungarian border zone the research site is Oradea/Nagyvárad where the main area of interest is the local interethnic relations. It was found that the local interethnic coexistence is closely related to the local and national political events and actions. (For more information see: www.sefone.soton.ac.uk)

Participants: 18 persons; of them 3 from the Institute

Estimated expenditure of the Institute: 70 m HUF fully covered by the grant support

Applicability: The research results contribute to the framing of problems and conflicts in relation with the social-economic effects of the enlargement of the EU and the introduction of Schengen border control regime. The evaluation of problem and present conditions can contribute to the more effective exploitation of economic-cultural opportunities in neighbouring countries.

– OTKA project entitled „Impact of urban rehabilitation programmes on the quality of life of the population in metropolitan areas" has dealt with the overview of domestic and foreign results on surveys about the quality of life and their evaluation; theoretical and applied aspects of the experience gained from urban rehabilitation in Hungary and abroad and of its social effects; new information obtained from the scientific analysis of the results of empirical studies. A volume of studies was published and information is available on website (www.varosrehabilitacio.net).

Participants: 2 persons, 1 from the Institute

Estimated expenditure of the Institute: 3.8 m HUF, fully covered by the grant support

Applicability: The research project has produced results and a model helping in promotion and development of interdisciplinary approach to urban planning and development.

III. Presentation of national and international relations

The institute pursued extensive cooperation with the earth science institutes of the HAS, and with the Centre for Regional Studies, Research Institute for Ethnic and National Minorities, with the Institute of History, Research Institute for Soil Science and Agricultural Chemistry, Institute of Sociology, as well as with different research stations under ministerial supervision (Ministry of Environment and Water Management, Ministry of Agriculture and Regional Development, Institute for Transport Research Ltd).

The institute participated in several projects of nationwide importance, initiated or organized by Prime Minister's Office, different ministries (Ministry of Environment and Water Management, Ministry of Education, Ministry of Foreign Affairs), or other institutes with nationwide scope of action (National Health Office, Hungarian Central Statistical Office), by foundations.

Thirteen researchers were engaged in tuition at various institutions of higher education (on BSc, MSc, PhD level) as part time tutors. The contacts were the most intensive with universities (Eötvös Loránd University (ELTE), University of Pécs (PTE), University of Szeged, University of West Hungary, University of Miskolc, University of Pannonia, Corvinus University of Budapest, Central European University, Andrássy Gyula University in Budapest, Selye János University, Babeş-Bolyai University), and colleges (Kodolányi János College, Budapest Business School).

The GRI HAS is the headquarters for the Applied Geography Department of ELTE for more then ten years, where active education activity has continued in 2009 as well. In the frame of this cooperation researchers regularly hold courses at ELTE, while the professors from ELTE participate in scientific projects in the GRI HAS. In 2009 nine researchers from GRI HAS participated in geographical PhD programmes in Hungary as professors, eleven researchers conducted degree works on BSc and MSc, thirteen evaluated grants for academic and higher education positions, PhD theses, degree works. Three young researchers, financed by the HAS, attended doctoral programmes in ELTE and PTE.

One scientific advisor is the president of the Committee of Earth Sciences Complex Scientific Research (Section X of HAS), another one is the president of the Scientific Committee on Human Geography (Section X of HAS) and UNESCO-MOST National Committee. The deputy director is the president of Jury of Earth Sciences I (OTKA) and president of HUNGEO-TOP Operational Committee. Several colleagues have functions in Hungarian Geographical Society (vice-president, secretary general).

Seventeen researchers gave eighty six lectures during the year, fourty nine of them were delivered at international scientific conferences. Of domestic scientific events the report meeting of the Association of Research Institutes in Earth Sciences, the international conference of IUSS (International Union of Soil Sciences, Budapest) are worth mentioning.

The institute made efforts to maintain and enlarge its multilateral international relationships. In order to fulfill this aim it participated in several EU and other international projects, making use of the researchers' international contacts. One researcher is employed by Selye János University (Komárno, Slovakia), another by Babeş-Bolyai University (Cluj, Romania).

Among scientific conferences in 2009 two have to be highlighted: one entitled „Creating economic and social neighbourhoods across political borders" was organized by the institute and the University of Bern in Komárno (Slovakia). The „Challenges of ageing in villages and cities: The Central European Experience" conference (Szeged, May) was organized by a scientific advisor of GRI HAS, who in one person is the president of UNESCO-MOST National Committee.

International scientific conferences with participation of researchers from the institute were the followings: 2nd International Multidisciplinary Conference on Hydrology and Ecology (Vienna, Austria), International Conference on Land and Water Degradation – Processes and Management (Magdeburg, Germany), Ancient Landscapes–Modern Perspectives (Melbourne, Australia), 2nd EUGEO Congress „Challenges for the European Geography in the 21st Century" (Bratislava, Slovakia), 3rd International Conference Advances in Tourism Economics (Lisbon, Portugal), ICA Symposium on Cartography for Central and Eastern Europe (Vienna, Austria), Géopolitique et Démographie, Colloque International (Geneva, Switzerland).

The international relations were especially strong with the Romanian, Ukrainian, Croatian and Slovakian academies, with the Institut für Länderkunde (Leipzig), Shevchenko

University (Kyiv), Akademie für Raumordnung und Landesplanung (Hannover), with the universities in Zagreb, Leipzig, Cluj, Bern, Berlin, and the college in Berehove (Ukraine). These relations are associated with special research programmes, research projects or bilateral research agreements. Similarly to former years the GRI HAS received foreign researchers from Romania, Slovakia, Switzerland, Austria, Italy, and from colleges, universities in the Carpathian basin (Novi Sad, Beograd, Oradea, Cluj, Zagreb, Berehove).

Six researchers participate in international scientific associations as comittee members, five researchers are members of the editorial board of international geographical journals. One scientific advisor is the vice-president of ESSC (European Society for Soil Conservation) and president of Hungarian National Committee of IGU (International Geographical Union). In 2009 the researchers of GRI HAS published seven papers in international journals and eleven items in conference publications.

IV. Brief evaluation of successful national and international grants

In 2009 the researchers of the institute won two OTKA grants („The role of gully erosion in the present-day relief development of Hungary" and „Ethnic geography of the countries in the Carpatho-Pannonian Area"). All in all the researchers were working on five OTKA grants.

Two EU FP6 projects continued into the year. In the frame of ACRE („Accommodating Creative Knowledge – Competitiveness of European Metropolitan Regions within the Enlarged Union") project the main findings were published under the title „Comparing paths of creative knowledge regions". Summarising the research results was the main task in case of SefoNe (Searching for Neighbours – the dynamics of physical and mental borders in the Enlarged European Union) project, which conducted research in the issue of interethnic and cross border neigbourhood relations in the Carpathian basin among other areas.

The tasks were fulfilled in the „Zwischen Gentrification und Abwärtsspirale" project in cooperation with Institut für Länderkunde (Leipzig, Germany) and coordinated by HAS and DFG. In the frame of this project the comparative evaluation of neighbourhoods in five Central European cities were performed to promote the outline and implementation of efficient rehabilitation plans.

In SOWAP project started in 2003 the tasks (experiments and their evaluation) planned for 2009 were carried out. The BORASSUS project started in 2005 finished in 2009, publishing of the research results is in progress.

V. The most important publications and patents in 2009

Dövényi Z. 2009. A belső vándormozgalom Magyarországon: folyamatok és struktúrák, *Statisztikai Szemle* 87 (7–8): 748–762.

Egedy T. 2009. Városrehabilitáció és életminőség, *MTA Földrajztudományi Kutatóintézet*, Budapest, 152 p.

Jakab G.I., Madarász B. and Szalai Z. 2009. Gully- or sheet erosion? A case study at catchment scale, *Hungarian Geographical Bulletin* 58 (3): 151–161.

Kertész Á. 2009. The global problem of land degradation and desertification, *Hungarian Geographical Bulletin* 58 (1): 19–31.

Kiss E.É. 2009. Major trends in the development of industrial areas of Budapest in the early 21st century, *Hungarian Geographical Bulletin* 58 (3): 163–180.
Kocsis K., Bottlik Zs. 2009. Magyarország etnikai térképe, Ma. 1: 500 000 = Ethnic map of Hungary, 2001, *MTA Földrajztudományi Kutatóintézet, Budapest*.
Kocsis K., Schweitzer F. (eds.) 2009. Hungary in Maps, Geographical Research Institute of H.A.S., Budapest, 211 p.
Kocsis K., Tiner T. 2009. Geopolitics of pipelines and Eastern Europe with especial regard to Hungary, *Hungarian Geographical Bulletin* 58 (1): 49–67.
Kovács Z. 2009. Hinterland Development In: The International Encyclopedia of Human Geography, Volume 5 (Ed. Kitchin, R., Thrift, N.), Elsevier, Oxford, 128–135.
Kovács Z. 2009. Social and economic transformation of historical neighbourhoods in Budapest, *Tijdschrift Voor Economische En Sociale Geografie* 100 (4): 399–416.
Lóczy D., Kis É. and Schweitzer F. 2009. Local flood hazards assessed from channel morphometry along the Tisza River in Hungary, Geomorphology 113 (3–4): 200–209.
Michalkó G., Rátz T. and Illés S. 2009. The gate of happiness: Budapest in the focus of European mobility In: Migration and citizenship : the role of the metropolis in the European Union process of enlargement (Ed. Morri, R., Pesaresi, C.), *Societa Geografica* Italiana, Roma, pp 143–152.
Schweitzer F. 2009. Strategy or disaster: flood prevention related issues and actions in the Tisza River basin, *Hungarian Geographical Bulletin* 58 (1): 3–17.

Ágnes, Erőss

'Searching for Neighbours': summary of an EU research project

The three-member research group of the Geographical Research Institute Hungarian Academy of Sciences (GRI HAS) participated in an EU FP 6 project called 'SefoNe – Searching for Neighbours: Dynamics of Physical and Mental Borders in the New Europe'. The three-years long research (March 2007–February 2010) was designated to explore and compare models of 'translocal' neighbourhood within the enlarged European Union, where these relations are periodically challenged by „nationalised" political conflicts. The main aims of the project were to understand the interdependency of state borders and mental borders in the creation of good neighbourhood relations, and to try to emphasize what 'good-neighbourhood' means for people in culturally diverse border regions. A special attention was laid on bottom-up activities, initiatives, such as those embodied in cultural events, that aimed to strengthen cultural tolerance and neighbouring in culturally diverse communities.

The research consortium investigated three different borders, from which the GRI HAS carried out research in the first strand that was dedicated to 'Transnational and translocal neighbourhoods across state borders'. In this strand on the one hand the Greek-Turkish Cypriot border (studied by the University of Nicosia) on the other hand the borders of different grades of permeability in Hungary were in focus. In both cases the borders are marked by long-standing political conflicts and separate formerly multicultural settlements, regions, populations.

Kiss E.É. 2009. Major trends in the development of industrial areas of Budapest in the early 21st century, *Hungarian Geographical Bulletin* 58 (3): 163–180.
Kocsis K., Bottlik Zs. 2009. Magyarország etnikai térképe, Ma. 1: 500 000 = Ethnic map of Hungary, 2001, *MTA Földrajztudományi Kutatóintézet, Budapest*.
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'Searching for Neighbours': summary of an EU research project

The three-member research group of the Geographical Research Institute Hungarian Academy of Sciences (GRI HAS) participated in an EU FP 6 project called 'SefoNe – Searching for Neighbours: Dynamics of Physical and Mental Borders in the New Europe'. The three-years long research (March 2007–February 2010) was designated to explore and compare models of 'translocal' neighbourhood within the enlarged European Union, where these relations are periodically challenged by „nationalised" political conflicts. The main aims of the project were to understand the interdependency of state borders and mental borders in the creation of good neighbourhood relations, and to try to emphasize what 'good-neighbourhood' means for people in culturally diverse border regions. A special attention was laid on bottom-up activities, initiatives, such as those embodied in cultural events, that aimed to strengthen cultural tolerance and neighbouring in culturally diverse communities.

The research consortium investigated three different borders, from which the GRI HAS carried out research in the first strand that was dedicated to 'Transnational and translocal neighbourhoods across state borders'. In this strand on the one hand the Greek-Turkish Cypriot border (studied by the University of Nicosia) on the other hand the borders of different grades of permeability in Hungary were in focus. In both cases the borders are marked by long-standing political conflicts and separate formerly multicultural settlements, regions, populations.

In the frame of the second strand three multicultural provincial regions were investigated: Saxony (Chemnitz), Upper Franconia (Bayreuth) and Sicily (Catania). All these regions marked by more recent forms of cultural diversity. In these sites the studies were mainly focused on those mental borders which exist among migrants and local communities. The researches were carried out by colleagues from Chemnitz University of Technology, University of Southampton and University of Catania. The third strand was dedicated to the virtual neighbourhoods of black African migrants mainly in Germany and Austria.

In case of Hungarian border regions the team of GRI HAS performed field work in two selected research sites: Berehove/Beregszász in Transcarpathia, Ukraine and in Oradea/Nagyvárad, Romania. The Slovak-Hungarian border region was represented by Komárom/Komárno, while from the Austrian-Hungarian-Slovenian border area Szentgotthárd–Heiligenkreutz formed the research sites, investigated by colleagues from University of Bern. During the three-year long project intensive co-operation has developed between these research groups, which manifested for instance in common field works and shared tasks in event and conference organising activities as well.

The aspects of the research carried out by the GRI HAS were twofold: on the one hand to map the changes in cross-border activities both on personal and institutional level, on the other hand to explore shifts and patterns in local interethnic neighbourhoods. It can be said in a nutshell that in these sites interethnic relations are basically peaceful, but not without tensions, while the cross-border relations are strongly influenced by the different permeability of the border. From this point of view in Oradea/Nagyvárad the EU accession generates increasing co-operation, while in Berehove/Beregszász the Schengen border has become a barrier.

The research findings were announced in several conferences and workshops, for instance in Debrecen at the 'Neighbours and Partners on the two sides of the border', at the 'IXth Conference of PhD students in Geography' in Szeged, at 'Descriptio Transylvaniae' in Cluj/Kolozsvár, at the GEMMA workshop in Budapest and were presented in Brussels as well. Next to this the GRI HAS has organised two consortium meetings in different research sites (Budapest, Oradea, Komárom), and an international conference in co-operation with the University of Bern and Selye János University in Komárno. Organizing of a cultural event carried out in the frame of the traditional local festival, called 'Days of Komárom' meant a real challenge and presented for all of the participants a vivid experience.

One of the primary objectives of the SefoNe project was the better understanding of culturally diverse neighbourhoods and it can be stated that during the meetings, workshops or conferences the consortium members also managed to put neighbouring into practice.

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