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Volcanic soils of the High Börzsöny and their relationship with geomorphological conditions

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Abstract

Heretofore very little research has been done on a specific soil type in Hungary called „erubáz", which develops on volcanic rocks. Its largest uniform and unbroken spot is located in the central part of Börzsöny Mountains (High Börzsöny). It is assumed that in reality this spot extends beyond its contours indicated in the soil map of the area. The main objective of the research project was to carry out a detailed analysis of this soil type and to identify its subtypes and varieties. A large scale soil mapping (1:25 000) and geomorphological mapping (1:10 000) was performed in order to determine the spatial distribution of the subtypes and varieties and to investigate the relationship between the territorial extension and geomorphological position. The sampling network was set after a thorough study of environmental conditions (e.g. relief, botanical conditions etc.). 38 soil profiles and 115 boring samples were taken by Pürckhauer auger because of the significant inhomogeneity of the studied area. Our former studies (Madarász, B. 2009) revealed that two varieties of the s-called '*erubáz*' soil, i.e. the brown and the black erubáz can be distinguished in the study area. Black erubáz soils occur on narrow ridges with high elevations as described in the classical definition by P. Stefanovits. After a few 10 meters from the crest of the ridges downslope they will be replaced by the brown erubáz. The latter can be found on the top of the ridges and on their slopes as well whilst the black erubáz appears only above 700 m a.s.l. except one smaller spot. The occurrence of the brown erubáz is controlled by soil climatic conditions. It develops mainly where enough moisture and heat are available for the decomposition of organic material but they are not sufficient and the geomorphic position is not suitable for the development of forest soils.

Keywords: erubáz soil, High Börzsöny study area, DEM, sampling, laboratory analyses

Introduction

One of the most ignored and less studied soil types in Hungary is the so called erubáz or *fekete nyirok* (black, wet soil), a special soil type developed on volcanic rocks. The main reason for this negligence is the fact that this soil occurs in small patches dispersed in the hilly regions of the country, which

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are outside the scope of agriculture. Because of its inferior role in agricultural mass-production and small areal extent, only the forestries and some vineyards are interested in studying these soils.

In the 1950's Stefanovits, P. dealt also with soil types of no major agricultural importance so that his investigations included the forest soils, too. Consequently, the erubáz soil was also included in his genetic soil classification system as an independent soil type (Stefanovits, P. 1951, 1956, 1959; Stefanovits, P.–Szűcs, L. 1961). Since then very little has been done and very few data were assembled on this soil type (Góczán, L. 1968, 1970; Néráth, M. 1997; Szendrei, G. 1998; Barczi, A. 2000; Fehér, O. *et al*. 2006; Fehér, O. 2007). Recently a detailed characterisation of the erubáz soils was provided by Madarász, B. (2009).

The surface occurrence of the erubáz soil can be estimated on the basis of the 1:100,000 scale agrotopographic map of Hungary. According to this map most of the volcanic landscapes are covered by 'brown forest soils with clay illuviation' (luvisols) and 'brown earth' (cambisols), since these soil types are typical under the climatic conditions of Hungary. The areal extension of the erubáz soil is limited to the Börzsöny–Visegrád Mountains and to the basaltic mesas of the Tapolca Basin, covering an area of 44 km^2 altogether, with the largest spot in the High Börzsöny. However, erubáz soils may occur on considerably larger areas than suggested by the agrotopographic map, only their tiny spots dispersed in a mosaic-like pattern are impossible to visualize at this scale.

During the last half-century several soil maps were prepared on the High Börzsöny area. First of these was the 1:200,000 scale genetic soil map prepared by Stefanovits, P. and Szűcs, L. (1961). The above mentioned agrotopographic map was published in 1982. In this map two soil types are shown within the study area, i.e. the 'brown forest soils with clay illuviation' (luvisol) and the erubáz, the latter with the largest areal extension in the country. Láng, S. (1955) in his book entitled "Physical geography of the Mátra and the Börzsöny" modified the version of the Stefanovits–Szűcs map already available in 1954. Járó, Z. (1978) published in his study a special soil map (1:200,000), where ranker soil covers almost 95% of the area. This must be treated with reservations as rankers are 'shallow soils affected by the parent material' developed on massive silicate rocks, but not on volcanic rocks, provided that the soil type developed on volcanites is the erubáz itself. The above mentioned maps are small-scale ones as no large-scale soil mapping was conducted in the Börzsöny Mountain so far which could provide detailed information of the areal extension and properties of the erubáz soil.

The present paper is aimed to report about a detailed field and laboratory analysis of this scarcely known soil type. In the Hungarian genetic soil classification system only the erubáz soil type exists, no sub-types and varieties have been specified. However, it became obvious at the beginning of the study

that this soil type is far from being uniform as it is suggested by its classical definition. The large scale geomorphic mapping (1:10,000) and soil mapping (1:25,000) carried out by the authors in the High Börzsöny study area were aimed to understand the soil types of this area better, to describe the erubáz soil, to identify its sub-types, to learn more about the geomorphological position and to reveal the areal extension and appearance.

The study area

Topography and landscape evolution

The Börzsöny Mountains belong to the inner-Carpathian volcanic chain having mid-Miocene origin. It is the third largest volcanic region of Hungary, containing three topographic micro-regions. The major part of the study area is located in the Central (High) Börzsöny micro-region and some areas close to its boundary belong to the foothills of the Börzsöny (Marosi, S.–Somogyi, S. (eds.) 1990). The calc-alcaline intermediary volcanism in the High Börzsöny (16.5–13.5 Ma) produced block-and-ash-flows and lava flows mostly of pyroxene andesite (Pantó Gy. 1970; Balla Z. 1978; Karátson D. 1997, 2007). The study area (45.9 km^2) includes the highest part of the central caldera rim (Karátson, D. 2007) together with its inner slopes of easterly aspect and with the outer slopes of westerly aspect. The study area has a radial valley network.

As a result of the Pleistocene periglacial landscape evolution the slopes above 500 m asl. are mainly covered by rock debris, stones and are disrupted by cryoplanation steps (Szabó J. 1996). Physical weathering by frost destroyed more the lava strata of bedded lava rocks, while erosion carved tower-like rock formations of the more resistant block-and-ash-flow deposits (e.g. Katalin-szikla, Szabó-kövek).

The caldera rim, i.e. the Nagy-Hideg-hegy–Csóványos–Magosfa range of 800–900 m altitude forms the central part of the study area. The altitude of the study area ranges between 275 and 939 m *(Fig. 1).* It is poorly dissected, with a frequent occurrence of steep slopes and rock debris fields. Slopes are steeper than 25% on ca. 80% of the area and 35% on its 54%, *(Figs 2* and *3).* The relative relief decreases towards the boundaries of the study area from 350–370 m/km^2 to 100–150 m/km^2 (Kertész Á. 1976, 1978). Most of the slopes are exposed to west – north-west and to east–south-east *(Fig. 3).*

Climate

Climate is of primary importance in determining the conditions of soil formation. The study area belongs to the cool-wet climate type, where the annual

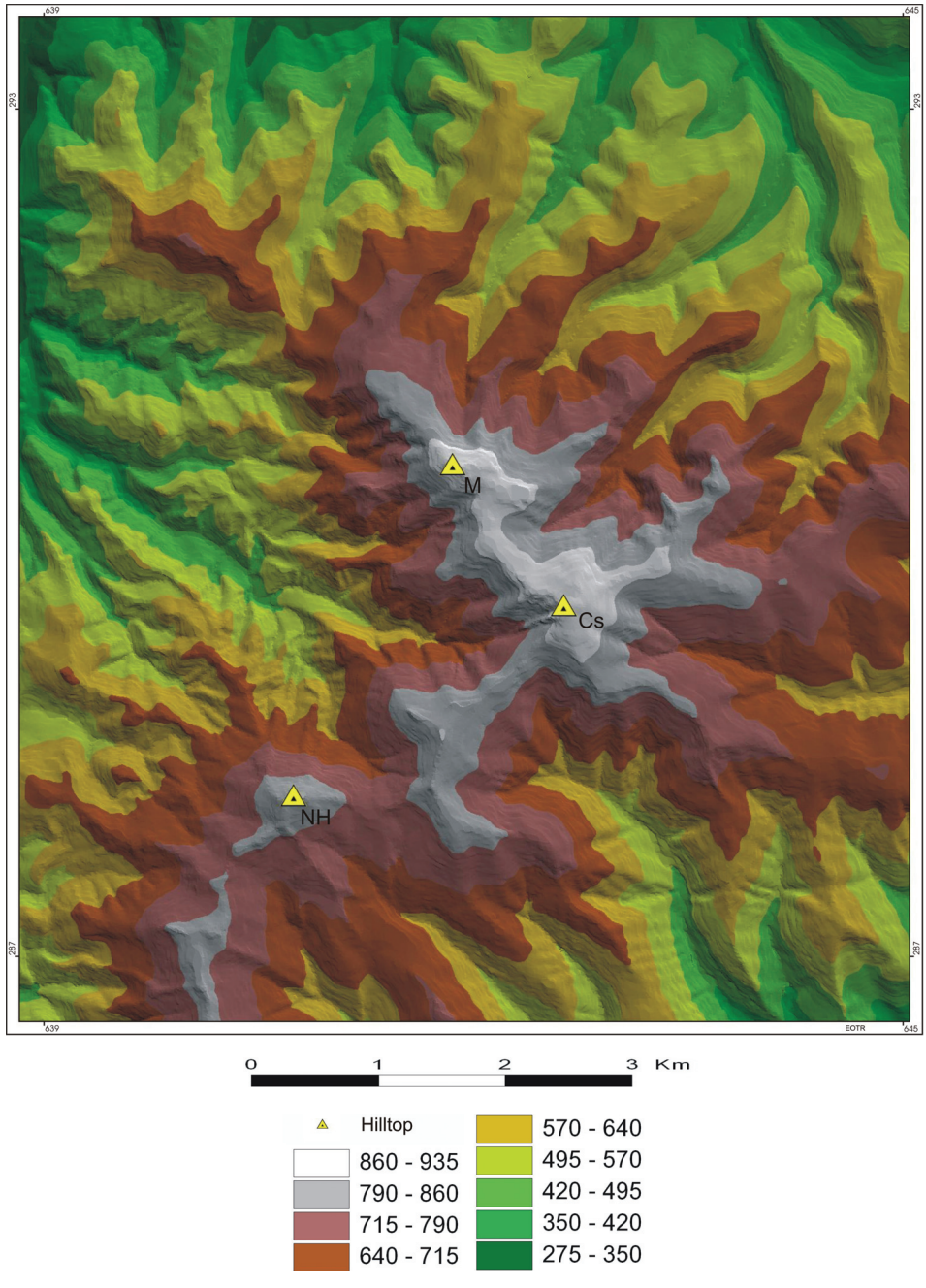

Figure 1. TIN digital elevation model of the High Börzsöny study area, (m). Abbreviations: NH = Nagy-Hideg-hegy, Cs = Csóványos; M = Magosfa

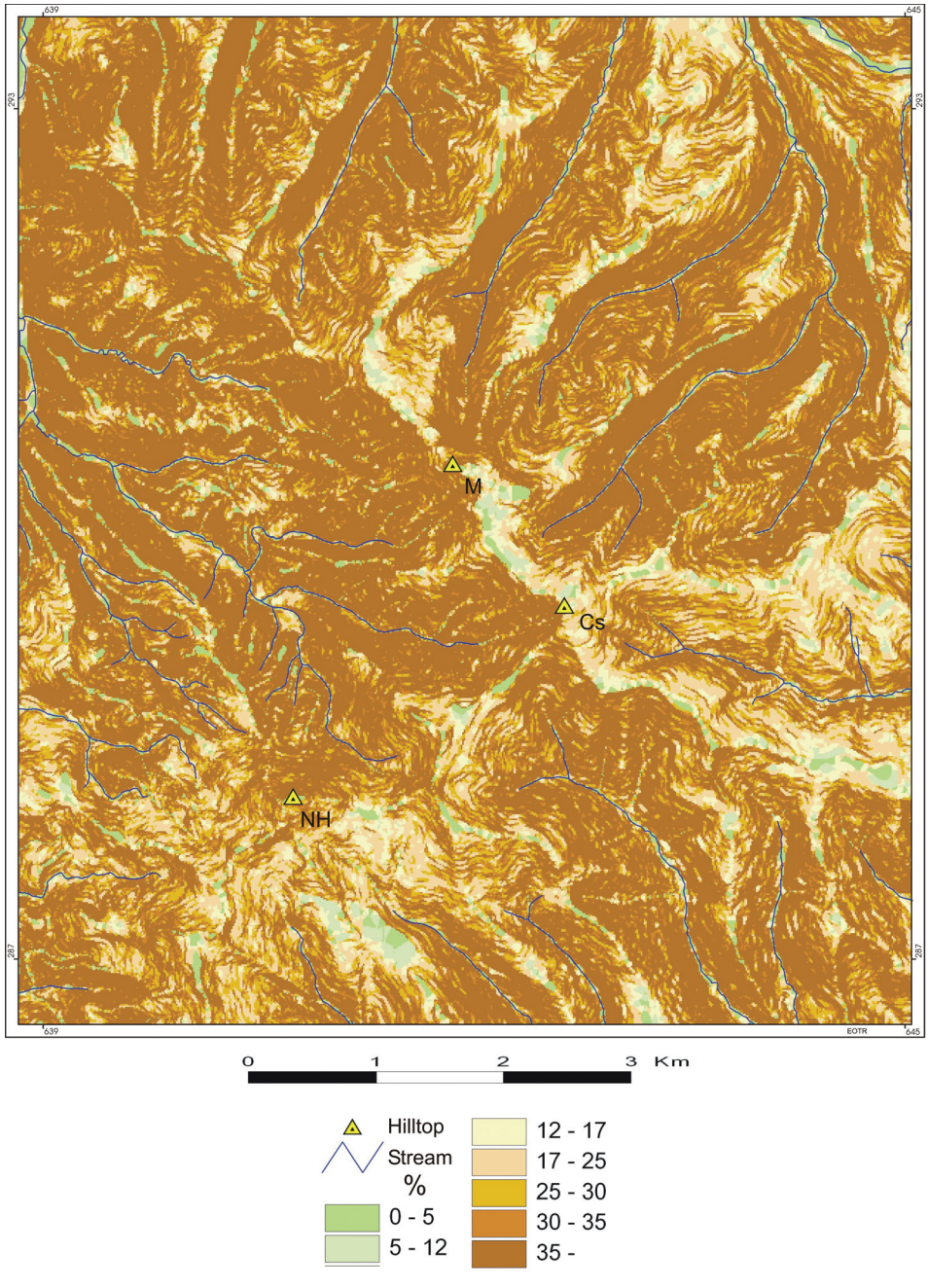

Figure 2. Slope gradient map of the High Börzsöny study area, (%). Abbreviations see in *Figure 1.*

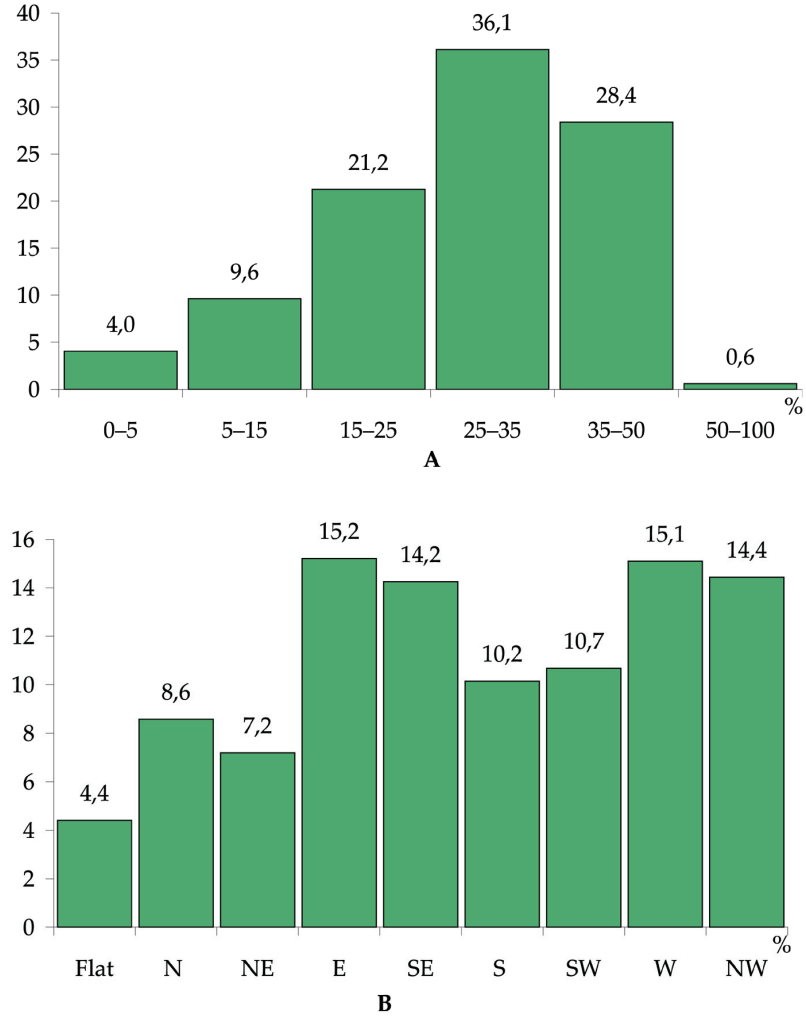

Figure 3. Slope gradient (A) and slope aspect (B) frequency histograms of the High Börzsöny study area

mean temperature remains below 8–8.5 °C. The winter is long and cold and frost is always possible except in summer. The annual mean precipitation is 800 mm, which can be even more in the peak areas. Most of the precipitation arrives at the beginning of summer (May–June), while the second part of the summer is drier and more sunny (Péczely, Gy., 1978; Láng, S., 1955). The number of days with snow cover varies between 60–80 and 100–120 days in the lower and higher regions, respectively. Average thickness of the snow cover is 30–50 cm. The aridity index is 0.82–0.90 (Marosi, S.–Somogyi, S. (eds.) 1990)

The High Börzsöny is almost uninhabited; therefore the vegetation is still almost in a natural state in most of the area. 97% of the study area is forested. The vegetation is montane and submontane beech, forests developed on slope-debris and on rock surfaces, whereas clearings are covered by meadows and rock shrubs (Fekete, G.–Varga, Z., 2006). Part of the andesite rock-fields still is not forested; the growth of the trees is hindered by debris thickness and by the lack of moisture. On the thinner rock-debris, slope-debris forests and acidophilous forests have developed, the former mainly mixed with lime, ash and maple species, the latter mostly with beech, oak (*Quercus petraea)*, some sorb and birch (Kárpáti Z. 1952).

The most important locations of erubáz soils, like e.g. at the top levels on the caldera rim, are covered by ash (*Fraxinus excelsior*) *(Photo 1).* In the opinion of some experts this is of anthropogenic origin, in other words, the consequence of improper forestry policy of the distant past. The beech has considerable bearing only every 7–10 years, while the ash has seeds more frequently. The young ash tree requires light and presumably sunny habi-

Photo 1. Ash (*Fraxinus excelsior*) trees before sprouting on the caldera rim between Csóványos and Nagy-Hideg-hegy

tat, while the young beech grows well in the shadow. Herbivore big game likes young ash, but it consumes the beech only if nothing better is available. Accordingly, if a beech forest was cut in a period when the number of wild-game was low, the forest of saplings in this area was ash instead of beech. In other opinions the stretch of ash in beech forests is a natural process on drier areas with a shallow soil (Király, G. *et al.* 2008).

Methods

As a first step of the soil mapping 1:10,000 topographic maps and the 1:50,000 geological map (Korpás L.–Csillagné Teplánszky E. 1999) were used to establish the network of sampling sites. The main objective of the mapping was the identification of the extension and geomorphic position of the areas covered by erubáz soils. Altogether 38 soil profiles were excavated and 115 Pürckhauer-type auger samplings were performed. For sampling the principles of soil mapping were applied (Szabolcs, I. 1966; Buzás, I. 1988, 1993). The FAO (1990) standard was used for the description of soil profiles. The genetic soil horizons were named and characterized on the basis of Szodfridt, I. (1993) and Stefanovits, P. *et al*. (1999).

1:10,000 topographic maps were used as a basis of geomorpological mapping. The methodology and the legend of Pécsi, M. (1963, 1991) were applied for the mapping procedure.

Analysis of the soil samples was carried out in the laboratory of the Geographical Research Institute, in accordance with the certified standards. $CaCO_3$ content of the soil was measured using Scheibler's gas-volumetric method (Buzás, I. 1988). Inorganic carbon content was leached by the decalcification method developed in the Institute. Organic carbon content was measured using Tekmar Dohrmann Apollo 9000 NDIR spectrometer. Humus content of the soils was determined by the equation of Stefanovits, P. *et al*. (1999): Humus% = TOC% × 1,72. The determination of the pH value ($pH_{(H2O)}$; $pH_{(KCl)}$) was performed with the potentiometric method (Buzás, I. 1993; MSZ-08-0206/2-1978). The colour of the samples was identified by the Munsell colour scale under dry and wet soil conditions. Bulk density was measured on undisturbed samples of known volume, by drying in oven (Buzás, I. 1988, 1993).

After the disintegration of the aggregates the mechanical composition of the samples was determined using Fritsch Analysette Microtech 22 laser diffraction particle size analyzer. Mineralogical and clay-mineralogical analyses of the soils were performed applying X-ray diffraction method in the Geochemical Research Institute of the Hungarian Academy of Sciences by means of a PHILIPS PW 1710 equipment.

For map compilation and graphics as well as for area measurements the ESRI Arc View 3.3 was applied. ESRI Arc View 3.3 and Surfer 8 softwares were used for Digital Elevation Model construction.

Results

Evaluation of the soil map

Soil mapping is a difficult task in landscapes with dissected topography. However, based on field observation and laboratory analyses the relationship between topography and soil types can be identified thus facilitating the mapping procedure. The 1:10,000 scale geomorphological map provided a good and essential basis for the mapping, i.e. some soil types, like the erubáz soil occur mostly in typical geomorphic positions, on top levels, ridges and on steep slopes of southerly exposure *(Fig. 4).* In addition to this land mosaics can affect soil evolution processes (Szalai, Z. 2008; Szalai, Z.–Németh, T. 2008).

Parent materials are usually andesite lava and andesite block-and-ash-flow deposits. Their mineralogical, physical and chemical compositions are widely varied. Where the climate is moderately wet different associations of deciduous forests have developed and soil climate can be described as udic or mesic (Wernstedt, F.L. 1983).

Genetic soil types of the High Börzsöny study area

Below a short description is given about all soil types occurring in the High Börzsöny area. Their detailed description except for the erubáz soils is not provided here.

Skeletal soils (Lithosols)

A considerable area is occupied by stony skeletal soils *(Fig. 5),* especially where soil erosion is an important factor, so that products of weathering are removed from the slope immediately after their formation. They can be found on narrow ridges, small hilltops and on steep slopes. On the inner slopes of the caldera rim rock-debris slopes are encountered frequently as a consequence of Pleistocene periglacial frost riving. Soil formation in these areas is in its incipient phase.

The thickness of the soil cover is less than 10 cm. Soil patches alternate with rocky spots. Rock fragment proportion may reach 70–90%. These soils can

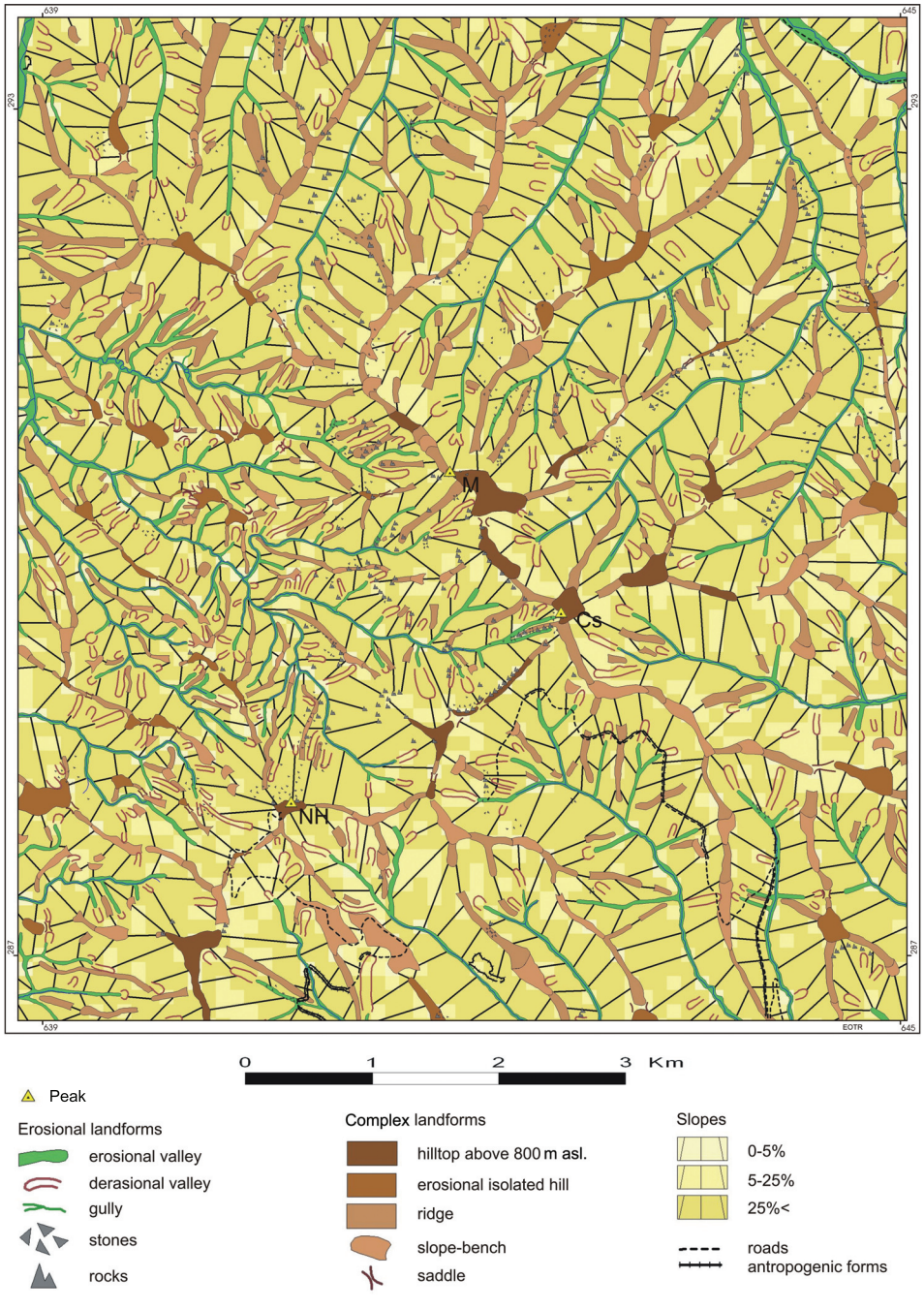

Figure 4. Geomorphological map of the High Börzsöny study area (1:10,000). Abbreviations see in *Figure 1*

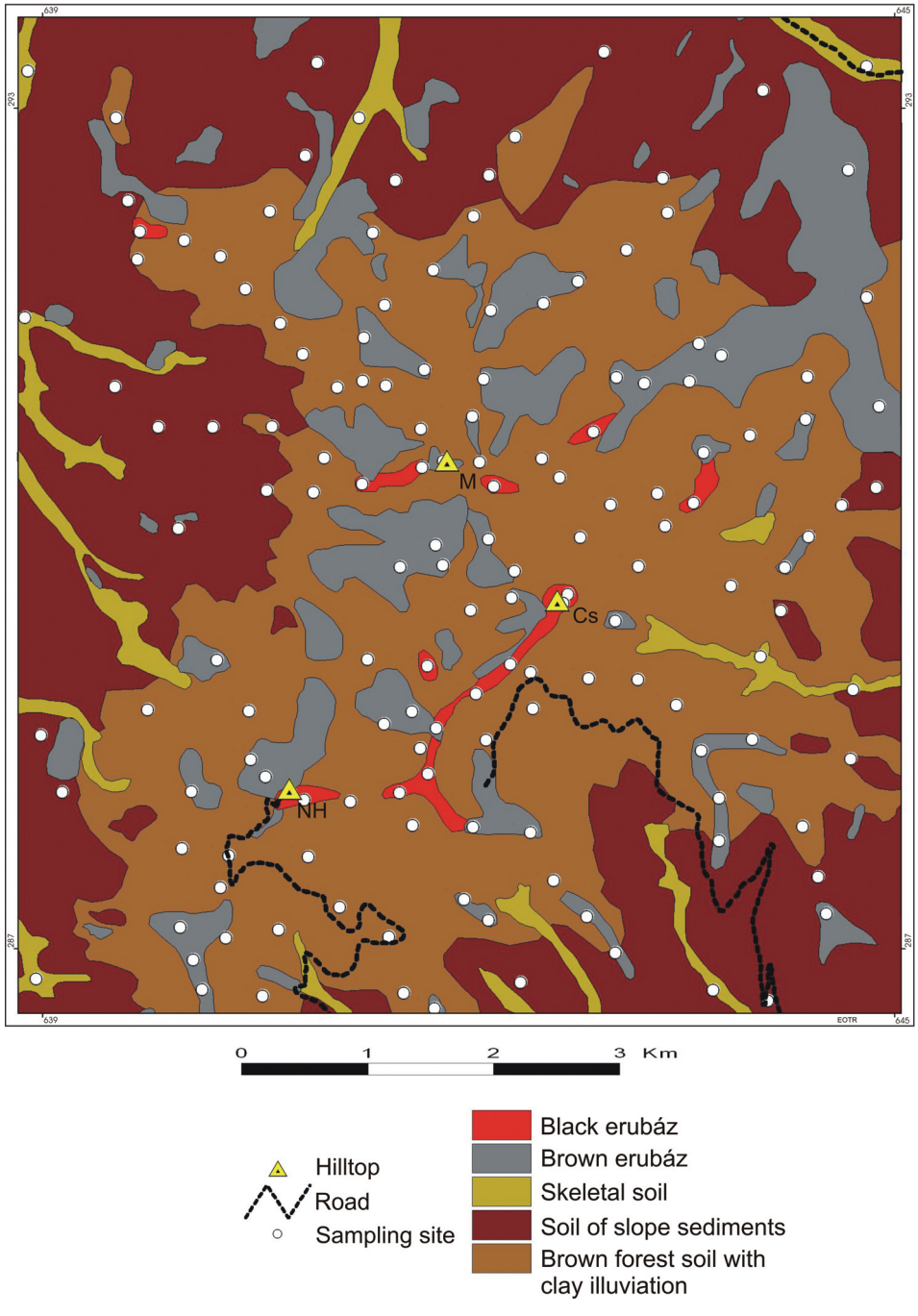

Figure 5. Soil map of the High Börzsöny study area (1:25,000). Abbreviations see in *Figure 1.*

be considered as thin erubáz-like soils, where the soil thickness could not reach the adequate depth. Spots of skeletal and erubáz soils occur in a mosaic-like pattern. Skeletal soils occur in areas with similar geomorphological position.

Shallow soils influenced by the parent material

Erubáz is the most widespread soil type of the study area *(Fig. 5).* Its humus content is very varied as a consequence of differing conditions of organic material decomposition. This diversity is the result of humidity, temperature and pH differences. According to the detailed studies of Madarász, B. (2009) the distinction of two sub-types, i.e. brown and black erubáz is necessary. The humus content of brown erubáz rarely exceeds 4% while that of black erubáz, exposed to extreme soil climatic conditions may reach 10%. The wet colour of the latter (10YR 2/2, 10YR 2/1) and the dry colour (10YR 2/2, 10YR 3/2) refer to dark brown or black colours. The brown sub-type is dark greyish-brown when dry (10 YR 4/2, 4/3, 5/3) and very dark greyish-brown or dark brown in wet state (10 YR 3/2, 3/3).

Scattered spots of black erubáz can be found on the highest levels of the study area, on the hilltops and ridges reaching the altitude of 750–915 m asl. The size of their area rarely exceeds 100 m^2. They vary with spots of stony skeletal soils *(Figs 4* and *5).*

The geomorphological survey revealed that potential areas of the occurrence of erubáz soils are very restricted in the study area. The fairly narrow ridges are only rarely interrupted by slope terraces. Hilltop areas and erosional inselbergs are not predominant, steep slopes dissected by rock fields prevail. According to the geomorphological sketch of the area the percentage suitability of the landforms for the development of erubáz soils is as follows: 1% hilltop areas, 1.5% erosional inselbergs, 8.3% intervalley ridges and 2.9% slope terraces. In spite of this percentage values erubáz soils can be found only on 1.1% of the study area. Brown erubáz soil shows a significantly larger territorial extension. It may develop practically everywhere from the hilltops to the valley sides as its occurrence is not associated with special landforms or slope exposures. In locations where the specific conditions of the formation of black erubáz are not fulfilled, i.e. biological decomposition hindered by winter freezing and summer drought (Madarász, B. 2009), brown erubáz soils have developed.

Their spatial appearance is less mosaic-like than that of the black erubáz forming large continuous soil patches. Brown erubáz soils can be regarded as a transition from black erubáz towards the 'brown forest soils with clay illuviation', the differentiation of soil horizons however cannot be observed yet.

The erubáz soils of the Börzsöny Hills have a slightly acidic pH and their N supply is favourable. Their structure has a granular character and in dry state it is dusty frequently. The average depth of the profiles is 43 cm. They have usually a loamy or sometimes a clayey-loamy texture. The organic material and the clay minerals form a strongly bonded humic horizon. Characteristic clay minerals are caolinite (15–30%), illite (10–20%) and smectite (5–10%). Although severe desiccation of the soil under a forest occur only rarely in the presence of a considerable amount of smectite 1–2 cm wide fissures may develop. There is an abundance in opal and christobalit and goethit is also a major component. Calcium is the most important exchangeable cation. Their saturation is low and no $CaCO_3$ is present in the soil of the study area (Madarász, B. 2009).

According to the classical description the vegetation cover developed on erubáz soils consists of scarce and degenerated specimens. Our field studies do not support this statement. At some locations on shallow soils with transitional character towards skeletal soils the forest was degenerated while in most areas covered by erubáz soils well developed oak and beech forests were found. Nevertheless, vegetation is usually determined by the anthropogenic activities and their intensity.

'Brown forest soils with clay illuviation' (Luvisols)

As a consequence of topographic and climate conditions subtypes of the 'brown forest soils with clay illuviation' are the most widespread soil types of the study area. Their profiles are best developed on gentle slopes and slope terraces. On steeper slopes their profile as a rule is truncated. They occur mostly at altitudes under 600 m asl. as a consequence of slope steepness and dissected topography. *(Figs 4* and *5).*

Slope debris soils

The eroded material is accumulated mainly in the valleys. Its thickness may reach several meters. Accordingly, slope debris soils can be found at lower elevations on the valley floors. Their presence is considerable only in the widened valley floors at the border of the study area (*Figs 4* and *5).*

Conclusions

In the course of the large-scale soil mapping in the High Börzsöny study area the following soil types were identified: skeletal soils, brown forest soils

with clay illuviation, slope-debris soils and erubáz soils (affected by parent material). Two subtypes of the erubáz soil are described as the black and the brown erubáz.

Black erubáz soils occur on high and narrow ridges, in accordance with the classical definition of Stefanovits. Their development is associated with specific soil-climatic and topographic conditions, namely to the zone of biological decomposition hindered by severe winter freezing and summer drying. They are present only in a few 10 meters width on the ridges, along the slopes they are replaced by brown erubáz soils. Except for one small patch the black erubáz soil appears above 700 m asl. At the same time the brown erubáz soil may occur everywhere on lower ridges and slopes. Its development is also controlled by soil climate i.e. it develops at locations where the moisture and heat are high enough for the decomposition of organic material but the conditions are not sufficient for the development of characteristic horizons of the 'brown forest soils with clay illuviation'. Besides their Munsell-colour the threshold value of 6% humus content was used for the differentiation of the two sub-types. Mineralogical and clay-mineralogical analysis of the erubáz soils did not show significant difference between the brown and black erubáz soils.

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Nuclear energy in Hungary

Katona, Tamás János[1]

Abstract

Options for the development of electric power generation industry in Hungary are considered. The Paks Nuclear Power Plant Ltd. is a stable element of the energy system of the country. Its significance in power supply is demonstrated and preparatory works for new nuclear projects are presented. The feasibility of construction of a new plant is outlined. Basic aspects of preparatory work and its results are presented in the paper.

Keywords: energy mix, diversification of energy sources, Paks NPP, operation safety, extension of capacities, preparation for a new project

Introduction

Development of Hungarian economy during the past two decades was accompanied with a growing consumption of electric energy: in 2008 about 40 billion kWh gross was generated, nevertheless per capita use remained low i.e. about 3,300 kWh/a. The demand probably will continue to rise modestly even in case of low economic growth scenario. Energy supply of Hungary is import-dependent therefore the economy is highly sensitive to security of supply and market volatility. More than 70% of total primary energy demand is covered by import. The share of import may reach the level of ca 90% within ten years if the recent tendencies are to dominate in the future. There is a high share of natural gas within energy mix and import from a single source is overwhelming. The disturbances in the gas supply coming from Russia via Ukraine became a regular event occurring practically every winter.

In the energy policy approved in 2008 the Hungarian Parliament recognised the priorities of sustainable development and environmental and climate protection, while the security of supply and economic aspects have also been emphasised. These goals might be achieved by increasing the share of renewables and low-emission technologies in the energy system, improving the efficiency of end-use and energy saving, diversification of energy sources, gas supply lines, and also by the diversification of import markets.

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The electric power generation industry of Hungary is being diversified considering the technologies. Gas, nuclear and coal are to remain the main sources but the share of renewable technologies is bound to grow. Nuclear power plant at Paks has an important contribution to secure cheap and clean energy supply of Hungary.

The power generating system needs further development since a large portion of the existing capacities is obsolete. The average age of plants is over twenty years, and two thirds of them are older than 20 years. After the recent temporary drop in power consumption a moderate economic growth is expected and predicted in the long run with an annual increase of electric energy consumption between 0.5 to 1.5%. The growing demand shall be covered in line with energy policy aimed at the operation of low-emission capacities. While considering the options for the development of power industry, nuclear power should be taken into account: both the existing nuclear power plant at Paks as well as the construction of a new plant *(Photos 1–2).*

Basic features of the Paks NPP

Paks NPP with four Soviet-designed WWER-440/V213 type power generation units was constructed between 1974 and 1987. It was the largest industrial project of Hungary in the 20th century.

The WWER-440/V213 type reactors are pressurised, light-water moderated light-water cooled reactors representing the second generation of WWERs. Basic technical data of the plant are shown in *Table 1*.

Table 1. Basic technical data of the Paks NPP

Unit	Connected to the grid	Net capacity at the start of operation, MW	Net capacity before recent power uprate, MW	Capacity, MW (2008)	
				Net	Gross
1	1982/12/28	410	437	470	500
2	1984/09/06	425	441	473	500
3	1986/09/28	427	433	443	470
4	1987/08/16	425	444	473	500

The reactors are equipped with a six cooling loops, with one horizontal steam generator per loop, main isolating valves on the cold and hot loop legs, and one main circulation pump. The WWER-440/V213 has threefold redundant safety system, and bubbler condenser-type pressure suppression containment, capable of maintaining containment function even after large break loss-of-coolant accident. The WWER-440/V213 has essentially inherent safety features: robust design, low heat flux in the core, large water inventory in the primary system and a large containment volume. At Paks NPP, the

Photo 1. Bird's-eye views of Paks NPP

Photo 2. The site for the two new blocks (above) and visual plan of the NPP after extension (below)

safety deficiencies known for this reactor type had been addressed by comprehensive safety upgrading programme, which resulted in decreasing of the annual frequency of core damage by an order of magnitude up to the level of 10^{-5}/a. The overall safety of Paks NPP is comparable with the PWR plants of the same vintage.

The operation of the plant is very smooth; there were no reactor scrams in 2008. The average number of reactor scrams was less than 0.4/a over the past decade. During the operational history of the plant a serious incident occurred in 2003 at the Unit 2 during the cleaning of fuel assemblies in the service shaft, which did not affect the safety of basic technology of the Unit 2 and there was no harmful effect on the environment. Unit 2 was returned to normal operation in 2004.

The value of Paks NPP in the energy system of Hungary

The importance of nuclear power generation for Hungary and particularly the value of Paks NPP can be assessed in economic and environmental dimensions and also from the point of view of security of power supply. Other positive impacts of the plant operation, e.g. the social ones are obvious; therefore these will not be considered here. The analysis will demonstrate that, Paks NPP is an unavoidable element of the Hungarian electricity system.

Economic dimension

In 2008, the four reactors of the NPP had a gross electricity output of 14,814 GWh, providing a 37.2% share of the national total. The plant is a reliable producer; the cumulative load factor of the plant is 84.39% (details of operational performance see in *Table 2*).

Table 2. Paks NPP operational performance (2008)

Unit	Energy (GWh)	Energy Availability Factor (%)		Load Factor (%)		Annual Time On Line (hours)	Operational Factor (%)
		Annual	Cumulative	Annual	Cumulative		
1	3,670.291	88.9	85.52	89.15	86.33	7,824	89.32
2	2,993.793	76.18	78.87	76.7	79.52	6,669	76.13
3	3,530.425	90.6	86.5	90.97	87.36	7,962	90.89
4	3,671.437	88.36	87.59	88.61	89.13	7,854	89.66

Electricity generated by the NPP is the cheapest in Hungary. During the history of plant operation the rate of increasing of unit generation cost was always below the average price index. Being the cheapest and largest producer on the market, Paks NPP has an essential impact upon the average power production price in Hungary.

Since the contribution of the fuel price to the total generation cost is very low, doubling of the fuel price will cause less than 20% increase of production cost in the case of Paks NPP. Fuel stockpiling helps to overcome the price fluctuations on the fuel market. Consequently, the costs are stable and predictable in case of Paks NPP.

Environmental dimension

In comparison with other electrical power plants, Paks NPP is the least environmentally polluting; it has practically no carbon dioxide or other greenhouse gas emissions. Any replacement technology will cause essentially larger life-cycle emission, e.g. the same generation capacity as the NPP burning natural gas will emit more than 5 million tons of CO_2 yearly.

The only environmental load is caused by the heated-up cooling water let-out back to the river Danube. The operational experience shows that the obligatory temperature limits can be ensured by some measures also in case of "low-flow rate high water temperature" conditions in the Danube. The impact of the heat released to the biosphere is monitored and regularly assessed; after more than 20 years of operation no adverse effects have been identified.

Operation of Paks NPP cause negligible environmental effect with respect of radioactive releases, too. Paks NPP in 2008 used 0.25% of the release limits with a share of 0.164 % of liquid releases, while of 0.081% of airborne ones. Concerning the liquid releases, for both the corrosion and fission products, and tritium the data of Paks NPP are lower than the worldwide median. According to the calculations the extra dose relevant to a critical group of the public due to plant releases was 58 nSv in 2008. This dose can be received by humans from the natural background radiation within approximately 10 minutes.

The wastes generated during the operation of the plant, including the radioactive wastes, are collected, classified and contained. There are necessary facilities for the processing and storage of solid and liquid radioactive wastes at the plant. The spent fuel, after five years cooling in the spent fuel pool, is stored minimum 50 years in the intermediate storage facility next to the plant.

Results of the environmental monitoring programme analysed in the environmental impact study for prolonged operation of Paks NPP show no adverse effect on the environment after 20 years of operation.

Security of supply

Nuclear power generation provides the necessary diversity of import of primary energy sources.

Obligatory stockpiling of nuclear fuel for two years is an essential element in ensuring the stability of power generation in case of short-term inconveniences in the import. Generally, uranium mining and the nuclear fuel manufacturing industry are located in geopolitically stable regions of the world. Nuclear fuel for Paks NPP is provided by Russia; however, in case of necessity an alternative fuel supply is manageable and might be ensured.

Future of nuclear power generation in Hungary

Necessity of the development of generating capacities

The policy of the European Union, along with the national aspects and the trends and interests of the industry and of the investors call for the development of power generating industry.

The European Council plan has defined a 20% binding target for reducing greenhouse gas (GHG) emissions (compared with 1990 levels), a goal of 20% share of renewables in the electricity mix, a 20% increase in energy efficiency by the year of 2020[2]. With these targets the EU aspires to become the world's most energy effective region and the EU will retain its position as global leader in renewable energy. There is also a strong commitment of EU to reduce emissions by at least 35% until 2030 and by over 50% up to 2050. At the centre of the new energy package stands the target to reduce CO_2 emissions by 20% until 2020, compared with the levels of 1990, without affecting workplaces or competitiveness.

Considering the differentiated targets for EU member states, Hungary seems to be able to increase the share of renewables up to 13% by 2020 compared with the 4.3% in 2005. Higher target will demand unbalanced social effort and cannot be achieved without essential loss of competitiveness of Hungarian economy. The positive effect of the development of renewable power generating sector on the income sources and on the creation of new jobs seems to be very moderate under Hungarian conditions. Consequently for achieving the GHG reduction targets the energy mix has to be developed under strict control of the GHG emissions.

[2] Official Journal of the European Union 5.6.2009, DIRECTIVE 2009/28/EC OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 23 April 2009 on the promotion of the use of energy from renewable sources and amending and subsequently repealing Directives 2001/77/EC and 2003/30/EC.

Behaviour of the power industry in this situation is rather controversial. The industry is oriented to low risk incentives, preparing new project on import gas. Only one ongoing project exists in Hungary utilising domestic lignite. It seems the management of the industry neglects the adverse effects of increasing dependence of imported gas. Development of renewable capacities is strongly correlated by the availability and amount of state subsidies provided in different forms for the investors and producers. An intensive development of renewable capacities is limited by their low technical maturity, economical constrains and grid stability aspects, and also by natural conditions in Hungary.

Assuming that the projects for increasing of energy saving and efficiency of end-use and the new renewable capacities will cover the net increase of demand in Hungary in the forthcoming two decades, assuming further that the growth rate of the economy will be moderate, 3,000–4,000 MW new power generation capacity will be needed between 2015 and 2025 for the replacement of the old plants to be closed down. In case of higher growth rate Hungary will need 6,000–6,500 MW new capacities by 2025. The need in new capacity will be larger by 2,000 MW if Paks NPP is shut down between 2012 and 2017.

Summarizing the above facts and circumstances one can conclude that the energy mix in Hungary has to be developed in line with low-emission, secure supply and stable for long-term pricing which means that the investments into power generating capacities should focus on low-emission technologies and diverse import sources.

Considering the presented situation keeping the share of nuclear power generation in the Hungarian energy mix or even increasing it seems to be a very reasonable option for capacity development. Therefore the Paks NPP has to be operated as long as safe and economically viable and a new plant has to be constructed.

Power up-rate and extension of operational time of Paks NPP

For increasing the competitiveness the capacity of the plant has been extended in two phases: enhancing the thermal efficiency of the secondary circuit, and recently increasing the reactor thermal power (see *Table 1*). By now, Paks NPP has a gross capacity of 1,970 MW. The recently implemented 8% increase of reactor thermal power has been achieved via utilisation of modernised fuel assemblies, improvements in core control and some minor modifications, while the safety margins of the reactor system are ensured. The payback of power up-rate is less than four years. The power up-rate results in emission-less 150 MW capacities producing yearly approximately 1,100 GWh energy.

Licensed term of operation of Paks NPP units is 30 years, which expires between 2012 and 2017. An extension of operational lifetime is feasible due to robustness of design and good condition of the plant. Verification of safety for an additional twenty years of operation is in progress. Solid regulatory system exists for the control and approval of licence renewal. Business assessment shows that the extension of operational lifetime is a reasonable decision.

One of the options for establishing a secure, clean and cheap energy supply is the prolongation of operational lifetime of units at Paks NPP. The design lifetime of units at Paks NPP is 30 years terminating between 2012 and 2017. Starting with a feasibility study in 2000, intensive and systematic engineering work is going on for preparation to prolong the operation lifetime by an additional 20 years. The first step of the licensing procedure was the environmental impact study and environmental licensing of the extended operation of the plant in 2006. The programme for long-term operation was submitted for the regulatory approval in 2008. The programme consists of results of analyses and reviews made for safety verification of 50 years of operation as well as the definition of further measures. The formal licence renewal application for the Unit 1 shall be completed by the end of 2011 and subsequently for the other units.

Prolongation of operation of Paks NPP is feasible both from safety and technical viewpoints; it is reasonable out of business interests and would contribute to an essential reduction in GHG emission of power industry of Hungary. Other conditions as intermediate storage of spent fuel and final repository of radioactive waste are manageable. Renewal of the operational licence of the Paks NPP is a strategic decision, which has also taken into account the social aspects, public and political acceptance. The public acceptance of Paks NPP has been over 70% for many years continuously. In November 2005 Hungary's Parliament passed a resolution with an overwhelming majority to support the lifetime extension of the 1 through 4 blocs of Paks NPP by 20 years.

Preparation of the decision on a new nuclear power plant

Increasing the share of nuclear power generation in the energy mix of Hungary is the way for compensation of volatility of energy import, which was affecting more or less the Hungarian energy policy during the past three decades. The extension of capacity of Paks NPP has practically been on the agenda continuously. (The site at Paks was selected with the intent to build 6,000 MW total capacity.) In the early 1980s significant efforts were made for extension of capacity of Paks NPP by WWER-440/213 type units. During the same decade several other offers were made concerning the construction of a new power plant, e.g. a French proposal for construction of several 1,000 MW units. In

the second half of the eighties preparations were made for the building of two WWER-1000 units. The site north of the existing plant has been prepared for the new units and on-site transportation infrastructure was built. Paks NPP founded a high school for education of future plant employees. Hungarian government cancelled the project in 1988. In 1997 Paks NPP Ltd made an attempt to take part at the MVM tender for new capacities. Feasibility study for constructing two ca 600 MW units has been made considering three technical and business options: a CANDU-6 reactor unit by AECL, an AP-600 unit by Westinghouse (which got its design certificate at that time) and the WWER-640 type of Russian Atomstroyexport which was under development that time. The time consuming preparation of nuclear options did not fit into timeframe of the tender therefore the nuclear proposals failed[3].

In line with international trends, acknowledging the role of Paks NPP in the energy supply of the country and recognising the need of emission-free technologies, the energy policy approved by the Hungarian Parliament in 2008 required preparation of the political or "in principle" decision of the Parliament regarding construction of new nuclear capacities[4]. The "in principle" decision of the Parliament is a mandatory step in preparation of nuclear projects in Hungary required by paragraph 7 (2) of the Act CXVI on Nuclear Energy (1996).

Hungarian Power Companies Ltd[5] (MVM) and Paks NPP Ltd launched a project in preparation for the political decision of the Parliament. Considering the possibility of further development of nuclear power generating capacity in Hungary the following main topics have been studied:

1. Demand-capacity forecast,
2. Analysis of electrical grid,
3. Economical issues and financing,
4. Public acceptance, communication,
5. Technical aspects of feasibility and environment issues,
6. Regulatory framework and licensing.

Engineering companies, research institutes, consultants in financing as well as consultants in public relation and communications have contributed to the project. Preparatory works of the new project required about 300 engineer-year efforts.

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[3] As a matter of fact there were not announced any tender winners in the category of over 200 MW.

[4] The energy policy also emphasises the importance of continuation of the works on solving the radioactive waste and spent fuel depository issues.

[5] Hungarian Power Companies Ltd. (MVM) and companies incorporated constitute Hungary's national power group: MVM Group. Paks Nuclear Power Plant Ltd. is part of the Group. The latter is one of the most important actors on the domestic electricity market.

For backing the proposal for governmental and parliamentary decision the following information sources have been used:

– International Atomic Energy Agency documents regarding preparation of new projects,

– Energy-outlooks of International Energy Agency, OECD Nuclear Energy Agency and U.S. DoE Energy Information Administration,

– European Utility Requirement Document,

– Public information on preparatory works of new projects in different countries, e.g. U.S., Finland, Slovakia, Czech Republic, Romania, Bulgaria and UK.

Arguments of other interest groups within the power industry and also the opinion of non-governmental organisations, including anti-nuclear groups have also been studied.

Three main documents have been compiled on the basis of studies on the topics listed above: a preliminary feasibility study, an environmental impact study and a study on radioactive waste and spent fuel issues.

The need of further power generating capacity development has been justified in the feasibility study. The feasibility of construction of a new nuclear power plant has been demonstrated. Considerations have been made regarding unit capacity with respect to:

– the demand,

– the possibility of integration of the new plant into Hungarian grid system,

– the solutions needed for the integration into Hungarian grid in case of different site options.

Considering the forecast of energy demand and development perspectives of power generation industry in Hungary, and also the targets of the energy policy, building of new nuclear capacity seems to be reasonable and feasible.

Analyses show that a new nuclear power plant with a capacity of two times 1,000 to 1,600 MW might be integrated into Hungarian energy system between 2020 and 2030. However, the system management is more difficult in case of larger unit capacity using the Hungarian system reserves only. Further regional technical and market integration may create better condition for selection of larger capacity units. Also the load-follow capability of the plant is of large importance. Connection to the grid will require significantly less effort and grid development in case of Paks site compared to any other potential sites. (These potential sites are in North-East of Hungary.)

Selection of the Paks site has other advantages too:

– This is already a nuclear site owned by Paks NPP Ltd.

– There is a prepared construction area for the units.

– Well-developed infrastructure and human resources are in place.

– Communities in the region accept and support the new project.

There are several reactor types available at the market with capacities between 1,000 and 1,600 MWe and with acceptable technical and safety features (e.g. AP-1000, EPR, Russian 1,000 MW WWER designs). Obviously the safety should not be an ultimate element of design selection; all possible types of Generation III shall comply with national and international regulations and best international practice. The European Utility Requirement Document (see http://www.europeanutilityrequirements.org) specifies the set of technical and safety requirements. Preference should be given to pressurized water type reactors, since the Hungarian operational experience and knowledge base could be best utilised in this case. However the possibilities for an in-depth analysis of technical options was limited; the Act on Nuclear Energy limits the extent of the activities in pre-parliamentary phase of preparation, e.g. binding communications with potential investors and suppliers shall be avoided prior to the political decision of the Parliament.

Comparing to other options the new nuclear project requires the largest capital investment per unit capacity (EUR/kW) and more than ten years for preparation, licensing and construction, the production cost of nuclear power plant is competitive. The basic options for the financing have been studied and the applicability for Hungarian conditions of different financing concepts of running nuclear projects have been analysed. Final mechanism of financing will be developed in the coming phase of preparation of the project. The project should be implemented with maximum responsibility of suppliers, however a turnkey type implementation of the project is questionable. The involvement of Hungarian subcontractors has an important role.

Licensing of the new plant will be a great challenge for the authorities as well as for the industry. A well-developed legal system exists in Hungary for the licensing of a new nuclear power plant, which is based on the acts for environmental protection, on use of water resources, on nuclear energy and on electrical energy. There is a distributed regulatory system in Hungary, i.e. environmental, nuclear etc. aspects of licensing are the competence of different authorities. Some streamlining of the licensing procedure will be desirable especially in interactions between the authorities. There are scientific and technical institutions to support both the regulators and the industry in licensing processes.

The preliminary environmental impact study has been performed using the conservative bounding parameter values for releases and effluents of the plant and the worst-case probabilities of anomalous events, enveloping the known parameters of the types considered and for the largest possible capacity. The best argument for the acceptability of the new project has been gained from the environmental monitoring data collected during 25 years of operation of the plant and the comprehensive environmental impact study

performed for the renewal of environmental licensing. Although the site is located by the river Danube and the units 1–4 of Paks NPP are freshwater cooled, the new plant should be erected with cooling towers to eliminate the load on the aquatic biota and freshwater resources. The preliminary environmental impact study demonstrated the feasibility and acceptability of the new plant at Paks site. In the energy policy approved by the Hungarian Parliament in 2008 the obligation of the state has been underlined defining the necessary governmental actions for the solution of disposal of radioactive wastes and spent fuel.

In a 30 March 2009 vote, the Hungarian Parliament has given overwhelming preliminary support to a government proposal to begin the detailed preparation for the construction of new nuclear generating capacity at the Paks plant.

Further actions for preparation of the new project

After the in-principle approval of the Parliament the second phase of the project preparation has been started. A new MVM preparatory project was launched in July 2009. In this phase the main tasks are the following:

– Development of the proposal for an ownership and financing structure, which provides the adequate financial resources for the project. Mapping of feasible investment and procurement strategies, analyses of their effect on financing,

– Development of tender document and preparation of the bidding process,

– Solution of technical issues, such as the development of the concept for cooling system of the plant,

– Preparation of the site and environmental licensing, also the licensing for use of water resources, preparation of the licensing process of the construction,

– Implementation of an effective communication programme,

– Development of the nuclear cluster around the new project with its social and economic issues duly taken into account.

Summary

Prolongation of operation of the existing nuclear power plant at Paks and construction of a new plant will improve the security of supply and produce essential share of electricity with practically zero emissions and negligible environmental effects.

The new nuclear plant will really contribute to the sustainable development and reduce the vulnerability of economy due its dependence on import. The new project is to stimulate the development of scientific, engineering and construction capacities in Hungary, and to create thousands of jobs for more than ten years.

The experience of nuclear operators, knowledge of engineering and scientific support organisations, and the legal system should serve for the preparation, construction and licensing of plant. The Paks site is well studied, possesses the necessary infrastructure and provides opportunities to use the synergies offered by the site. Hungarian population supports the prolongation of operation of Paks NPP and the extension of the nuclear capacities.

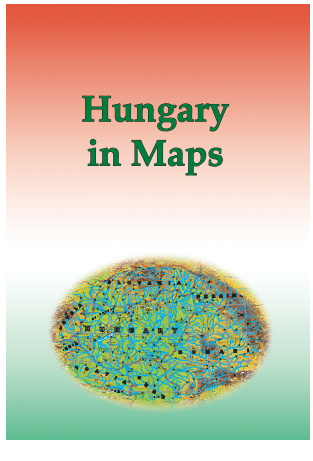
NOW AVAILABLE!

Hungary in Maps

Edited by
Kocsis, Károly and **Schweitzer, Ferenc**

Geographical Research Institute Hungarian Academy of Sciences. Budapest, 212 p.
Budapest, 2009

'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.
In its concentration and focus, this atlas was intended to act as Hungary's 'business card', as the country's résumé, to serve as an information resource for the sophisticated general reader and to inform the international scientific community about the foremost challenges facing Hungary today, both in a European context and on a global scale. Examples of such intriguing topics are: stability and change in the ethnic and state territory, natural hazards, earthquakes, urgent flood control and water management tasks, land degradation, the state of nature conservation, international environmental conflicts, the general population decline, ageing, the increase in unemployment, the Roma population at home and the situation of Hungarian minorities abroad, new trends in urban development, controversial economic and social consequences as a result of the transition to a market economy, privatisation, the massive influx of foreign direct investment, perspectives on the exploitation of mineral resources, problems in the energy supply and electricity generation, increasing spatial concentration focused on Budapest in the field of services (e.g. in banking, retail, transport and telecommunications networks), and finally the shaping of an internationally competitive tourism industry, thus making Hungary more attractive to visit.
This project serves as a preliminary study for the new, 3rd edition of the National Atlas of Hungary, that is to be co-ordinated by the Geographical Research Institute of the Hungarian Academy of Sciences.



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Geographical and historical aspects of the situation of Muslim population in the Balkans

Bottlik, Zsolt[1]

Abstract

Muslim groups in the Balkans speak various languages and live in several countries. These countries followed different paths of development in the 20th century so the followers of Islam were repeatedly involved in social conflicts because of their different culture. Due to Albania's isolation for decades rooted in socialism, the dissolution of Yugoslavia through bloody conflicts in the 1990s, the EU membership of Greece reaching back some decades, the new EU membership of Romania and Bulgaria and the unique geopolitical and social circumstances in Turkey the countries inhabited by the majority of Muslims will probably take different paths in economic and social development. The generally marginalised social and economic status of Muslims in the countries examined and their frequently deviating demographic behaviour compared to neighbouring ethnic groups are expected to widen the gap between them and majority societies. Due to their delayed political integration and increasing difficulties in social integration they will probably remain destabilising factors.

Keywords: Balkan, Islamisation, religious and lingual patterns, area of Muslim settlement

Introduction

Following Cold War a tangible conflict of interests has prevailed in the globalised world between the North Atlantic cultural and economic centre and the Islam world. A further aggravation of this conflict was brought about by the sequence of events after the turn of the Millennium that focused public attention on the Muslim population of almost 16 million living in Europe *(Fig. 1).*

Mention must be made of immigrant workers from Turkey who settled in Germany from the 1960s onward, as well as of a large number of Muslims from the former colonial territories (e.g. Maghreb countries, Pakistan) who arrived in France and Great Britain mostly as economic refugees. The integration of the second and third generations of these immigrants into society today is still problem-laden.

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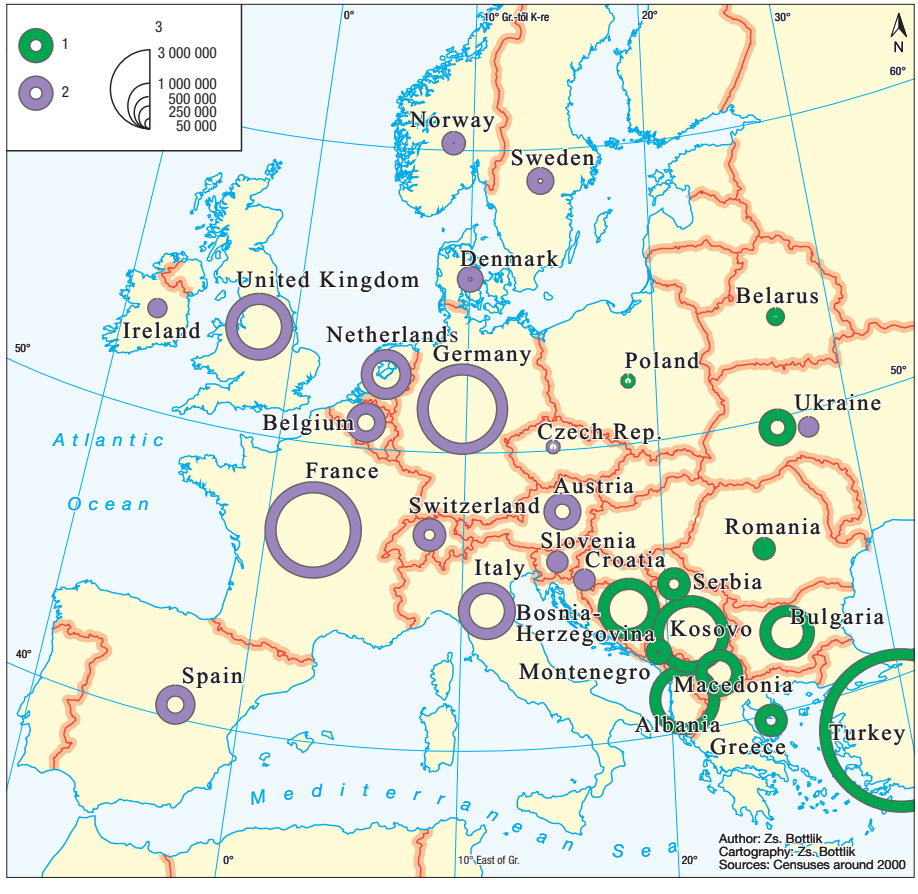

Figure 1. Number of Muslim population in European countries at the turn of the 3rd millennium. – 1 = autochthonous Muslim population; 2 = allochthonous Muslim population; 3 = number of Muslims. *Source:* Censuses, FISCHER Weltalmanach

The emergence and settling of the mostly Sunni Islam Muslim population (by now regarded as autochthonous) in Eastern Europe (Crimean Tatars) and in the Balkan countries goes back to earlier times in history. The settlements of the Muslims in the Balkans whose presence is considered the most significant due to their higher proportion in overall population form blocks in some places only and no town can be considered as a central settlement (Heuberger, V. 1999). Their presence, the spread and consolidation of Islam culture is related to the expansion of the Ottoman Empire onto the Balkans in the 15th century.

The study contains an analysis of the socio-economic differences between the above mentioned Muslim groups and the majority societies, includ-

ing their characteristics and geographical aspects. The comparison will include the different political environment of the Muslims in the Balkan countries, language differences and geographic aspects of their living environment (urban-rural areas) and the factors that influenced the changes in the location of their area of settlement.

The emergence of Muslims in Europe

The emergence of Islam culture in Europe on the Mediterranean periphery of the territory considered the centre of European culture was the result of expansion of countries with Muslim leadership. As early as in the 8th century the first large Islam population settled in Europe after the conquest of the Iberian Peninsula by the Arabs. There was probably significant Muslim population in the area of today's Spain and Portugal, although the region was situated on the westernmost periphery of the Muslim Caliphate of the Umayyad dynasty with the capital in Damascus. As a result of the Spanish Reconquista the Muslim Moors were driven out of the area by the end of the 15th century and today only the structure of settlements and some significant buildings (e.g. in Cordoba, Sevilla, Granada) remind of Islam presence centuries ago.

In addition to the smaller merchant colonies that arrived from Asia to the Eastern European peripheries the most significant Muslim group reached Europe in the 13th century with the Mongol invasion. This group was mainly comprised of political leaders and soldiers at various levels of the military hierarchy. The descendant of these Muslims can still be traced in Poland and Lithuania. There is a Muslim population of some thousands in these countries who have already been assimilated in terms of language.

Contrary to the above mentioned groups Muslim culture and religion became widespread and consolidated much more dynamically in local societies in the Balkan region in the 14th century. As a result it still has perceptible effect on the social and economic life of present-day countries. After the fall of the Roman Empire the various groups of the Romanised indigenous population of the region (Thracians, Macedonians, and Illyrians) were either assimilated by the Slav tribes invading the area in the 5th century or forced to the peripheries. Later in the mid-7th century the Ancient Bulgarians of Asian Turk origin (who later adopted Slavic language) came with well-organised military and settled in the north-eastern part of the Balkans. They gained power by the gradual weakening and withdrawing from the area of the Byzantine Empire and made efforts to unite ever larger areas under their rule. The Bulgarian Tsardom and the medieval Slavic state fell into smaller principalities due to internal problems and thus were unable to resist the attacks of the Ottoman Empire just taking shape with an expansive policy at the time for the Balkans *(Fig. 2).*

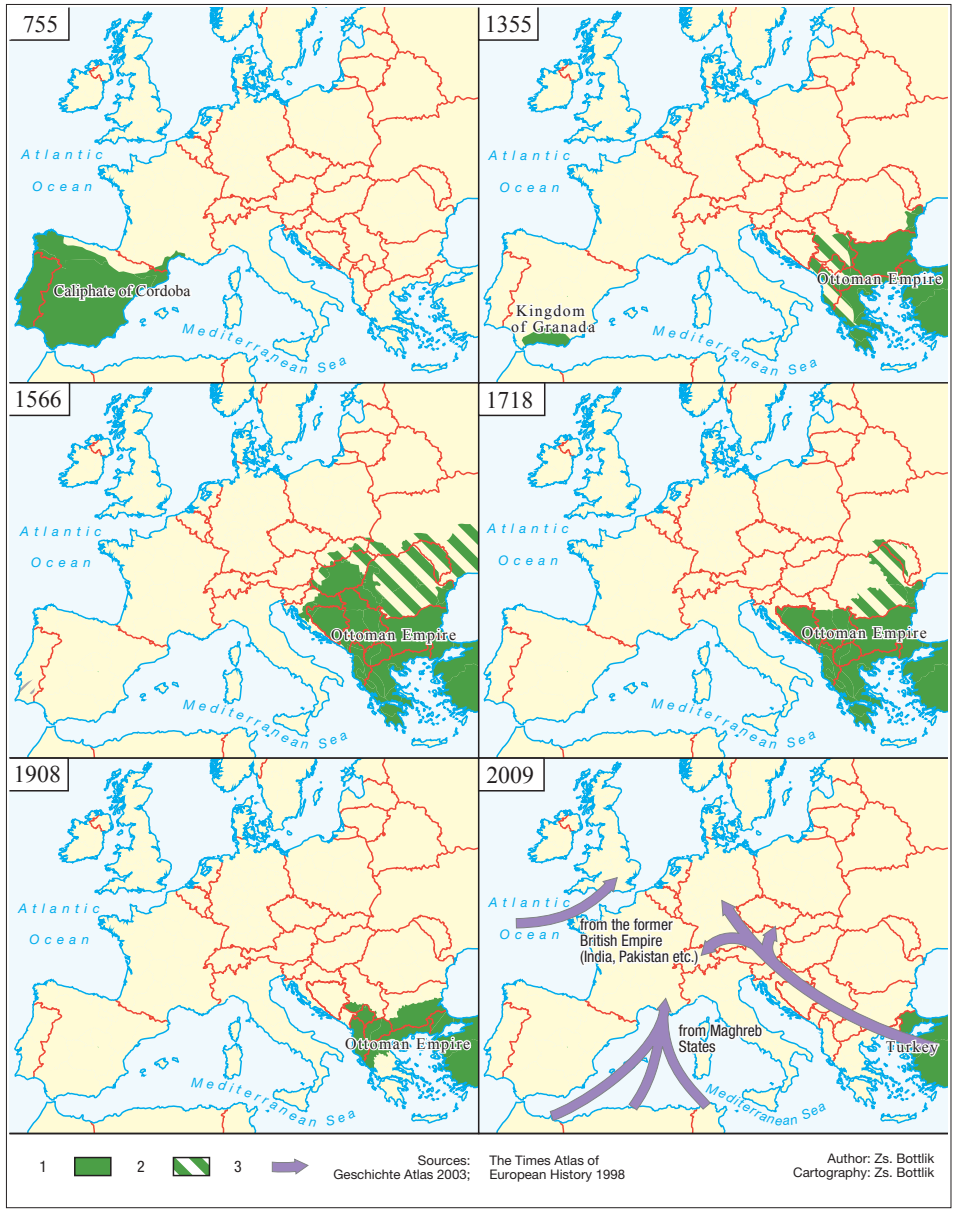

Figure 2. Changes in areas under Islamic rule and influence in Europe and the main routes of recent migration. – 1 = territories under Muslim authority; 2 = territories under Muslim influence; 3 = the migration directions of Muslim population after 1945.
Source: The Atlas of European History 1998, Geschichte Atlas WESTERMANN 2003

The history of the Ottoman Empire goes back to the time in Asia Minor when the former Seljuk Empire disintegrated into small principalities. In line with its intensive expansion policy – and with power vacuum created in the geographically and politically torn Balkans – the interest of the Ottoman Empire focused on the region. Due to the inadequate military power of Christian rulers and the lack of a uniform defence strategy the Ottomans managed to integrate the entire Balkan Peninsula into their empire within a century.

Islam played a crucial role in this process both from political and socio-political aspects. With the seizure of Constantinople in 1453 and making it the capital city of the Ottoman Empire as Istanbul, Islam had become consolidated all over the Balkan region.

The central Turkish leaders had no concern for the interference with everyday life or religious practices of the conquered Christian population; they only expected local religious dignities to recognise the Sultan's authority. However, it was in the Empire's interest to support and strengthen the groups loyal to the central power. This support was mainly manifested in the extension of privileges for Muslim population. As a result there was an obvious difference in the standard of living between Muslim and non-Muslim population that was also apparent in the extent of their economic activity and in their use of space.

The situation of Muslims under Ottoman rule

The increase of the number of Muslim believers and the expansion of their settlement area – although with declining intensity and ensuing territorial consequences – in some places lasted from the 15th century to early 19th century. The process was facilitated by two factors, immigration policy and the actual islamisation of the Christian population. The settlement of Muslim population was focused on strategic points and fortresses, towns situated by main trade and military roads. Large urban, peasant and nomadic population was resettled from Anatolia, the core territory of the Empire and they assimilated the population of Macedonia, Thrace located closer to the centre of the Ottoman Empire and also the population of neighbouring Greek and Bulgarian regions in terms of language and culture. This process probably generated significant conversion in the Rodope Mountain but without language assimilation in the mountainous areas (Ermann, U.–Ilieva, M. 2007). Direct islamisation was focused on Bosnia and the Albanian plain of the river Shkumbini (Džaja, S.M. 1993).

In the areas inhabited by Albanians the primary motivation of population to convert to Islam was of economic nature as more favourable taxation rules applied to Muslims (Bartl, P. 1968). Another attractive factor for the large number of people who converted was the better organised social, economic

and political structures of the Ottoman Empire (compared to local structures) transmitted by Islam characteristics in the first phase of conquests. For obvious reasons, these positive factors were generally neglected in textbooks of history. Forced islamisation was manifested in the introduction of child tax (*devşirme*) applied only to non-Muslims population exerting indirect pressure (Minkov, A. 2004).

The dividing line between voluntary and forced conversion to Islam was not sharp. In the area where the largest number of people converted (mainly in Bosnian regions) the border zone of the contesting Orthodox and Catholic churches should also be taken into consideration. People who lived in this religious contact area often changed (were forced to change) their religion, consequently they lacked a strong attachment to either denomination. In addition, the weak presence of the Catholic Church and its suppression by the Turkish administration mainly in areas inhabited by Albanians also has to be mentioned here. Under these circumstances it is no wonder that dervish orders (especially the Bektashi order) play an important part in the religious culture of south-east European Muslims (and in the spread of Islam) and that various forms of Islam-Christian syncretism are present.

To sum up: it can be assumed that the islamisation process in the Albanian territories was slow at the beginning and only accelerated in the 17th century when people converted to Islam for economic reasons (Baxhaku, F. 1994). As a result, their settlement area rapidly expanded. In Bosnia, however, mass conversion from the very beginning was supported by a religious factor: the Bosnian heretic Bogomils were in conflict with the Catholic Church that wanted to reconvert them to Catholic faith (Bartl, P. 1968). As for the geographic aspects, the number of Muslim population increased most significantly in plains, river valleys and basins of the west Balkan region with land suitable for agricultural purposes where most strategic trade and military roads also ran.

Another geographic aspect of the expansion of the Muslim settlement area is that Muslims inhabited towns and the surrounding areas in a higher proportion than the Christians did. Muslim urban culture was characterised by religious schools funded by foundations, handicrafts industry (trade guilds) and by the most important Ottoman field of art: architecture (Ibrahimi, N. 2009).

In addition, there were obvious differences in legal and consequent social status. Muslims were granted opportunities to rise socially by their special legal status in the state, by employment possibilities in the army and various state institutions. The Turkish administration considered religious differences the major division in the relationship of countries within the Empire. Ethnic differences manifest in the variety of languages were considered a secondary factor only (Tibi, B. 2002).

The Muslims in the Ottoman Empire formed a uniform group not only through their identical legal status but because of their shared material and spiritual culture of strictly Muslim nature (from the observance of religious practices to everyday culture including gastronomy) so their community was more than a formal religious group.

The situation of Muslims between 1878 and 1913

The Balkans had undergone dramatic political changes from the end of the 19th century. The aspirations of the various small states aimed at the division of the Ottoman Empire usually thwarted each other. The often unfounded territorial claims were generated by the ambitions of the smaller Balkan peoples to expand. They made strenuous efforts to expand the territories of their countries just taking shape often totally ignoring the characteristics of the ethnic and religious environment within the target regions. Actually, they did not have information of this kind.

The Balkans not only do have one of the most colourful ethnic spatial structure in Europe but are located by the intersection of three continents, various religions and cultures, social, economic and political structures. This is evidenced by contemporary ethnographic-ethnic maps of the region.

The most precise map that revealed political aspirations and can be taken as a starting point for the analysis of the highly complex ethnic and religious situation in the Balkans is the one produced by the consul of the Austro-Hungarian Monarchy at Edirne in 1877 (Sax, K. 1877). Due to the already mentioned expansion attempts the maps of ethnic distribution in the Balkans drawn in the last third of the 19th century usually revealed the author's ethnic affiliation or lack of expertise or the customer's political aspiration. In its surface description the map failed to represent the anomalies resulting from population density so the data provided could only be used indirectly. However, it represents religious distribution of various ethnic groups speaking roughly the same language.

Based on the map by Karl Sax the spatial structure of Muslim groups did not change significantly until the conclusion of the peace treaties at the end of the Balkan wars and World War I. (*Fig. 3)*. On the other hand, there were dramatic changes in the number of Muslim population and their proportion to overall population. The decline in population was the result of voluntary and forced emigration and population exchange. The sphere of influence of the Ottoman Empire shrank and as a result Muslin population dwindled.

In the first half of the period the decline in Muslim population and in the proportion to total population as well as the shrinkage of Muslim settlement area can mainly be explained by the following factors: soldiers and of-

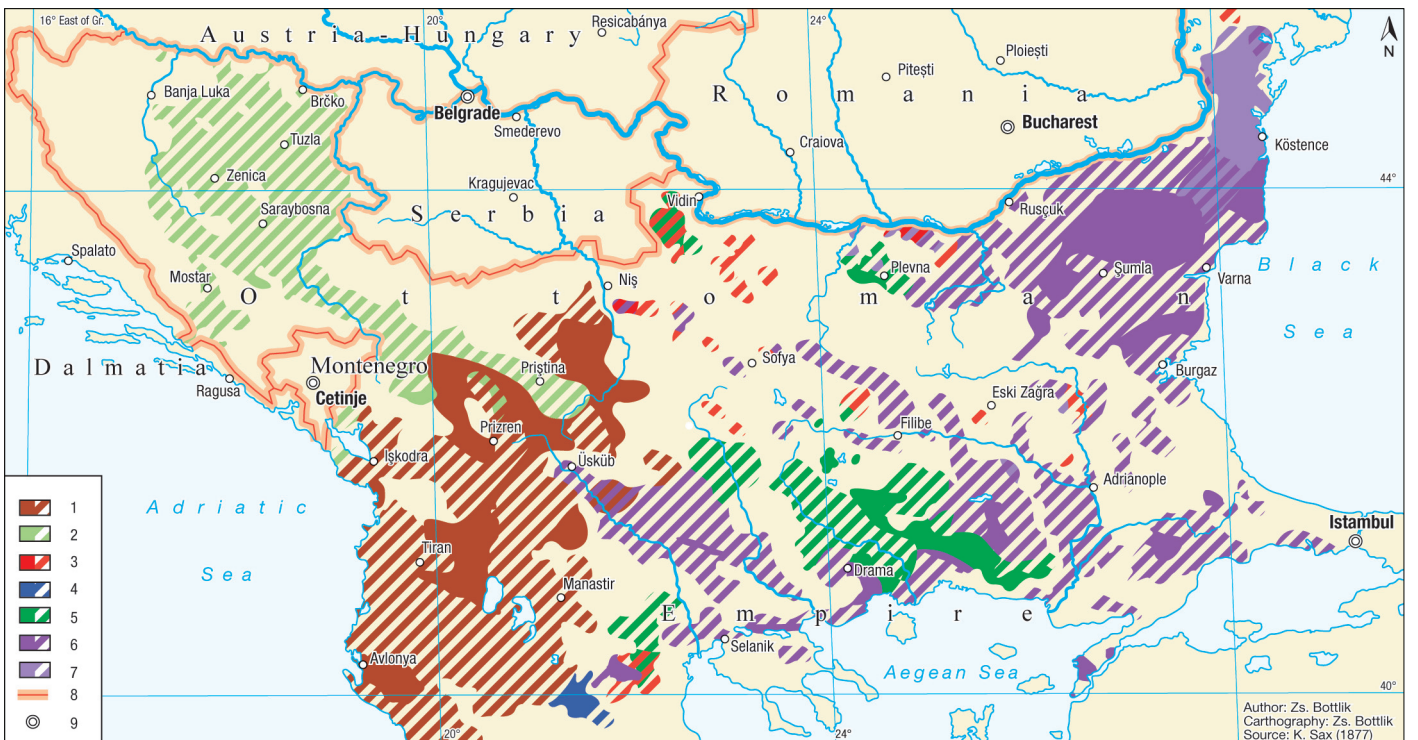

Figure 3. The ethnic (lingual) pattern of Muslim population in the Balkans in the 1870s. – 1 = Albanians; 2 = Bosniaks; 3 = Circassians; 4 = Greeks; 5 = Pomaks (Bulgarian); 6 = Turks; 7 = Tatars; 8 = state border; 9 = capitals. (Shades of colours designate more or less continuous settlement areas, hachures denote Muslim majority.) *Source*: Sax, K. (1877)

ficials no longer holding positions emigrated; there was significant migration as Muslim population came under (often violent) pressure due to the changed political environment. As a result, the Muslim (mainly Turkish) population of large towns almost completely disappeared by the turn of the century (Eminov, A. 1999). In addition, large Muslim groups left the region surrounding Niš in the south of Serbia. These Muslims had been settled there in the beginning of the 19th century to increase the proportion of Muslim population in Serbia, the country then just taking shape. At the same time, Muslims living in the rural regions of Bosnia and Bulgaria were considered as mere subjects inhabiting areas that great powers cherished territorial aspiration for. They were forced to the periphery of society and emigrated later, during the 20th century.

Muslims in the Balkans in the 20th century

With the withdrawal of the Turkish Empire from the Balkans as an outcome of the Balkan wars (1912–1913) the situation of Muslim believers changed fundamentally. Not only did they find themselves on the periphery of power but they were regarded as the unwanted heritage of the Turkish Empire in the successor states. Consequently, not only their Islam culture but the roots of their life and traditions were menaced (Joffé, G. 1996).

It is clear from previous paragraphs that Muslim identity in the Balkans was based on a common culture and not on a common language. On the other hand, the official national cultural ideology of the new countries promoted a common language as the primary identity factor. Muslims in the Balkan can be divided into the following groups in terms of languages: Turkish, Albanian and Slavic *(Table 1; Fig. 4)*. This distribution will serve as a basis for the analysis of their religious geography in the 20th century.

Albanian speaking Muslims

Members of the Albanian ethnic group are considered by experts the descendants of an indigenous group in the Balkan Peninsula called the Illyrians. With the invasion of the Slavs in the 5th century they were forced to move to the mountains in the north of today's Albania. Later they managed to expand their settlement area mainly to the south until the advance of the Ottoman Empire in the 14th century.

After the Albanians were defeated by the Ottoman Turks the areas by the border of western and eastern Christianity – inhabited by Catholic and Orthodox Christian Albanian population respectively – had been successfully integrated into the Ottoman Empire. These areas, however, did not make

Table1. Distribution of Muslim population in the Balkans by country and language

Country, region	Albanian speakers	Turkish speakers		Slavic speakers			Multilingual
	Albanians	*Turks*	*Tatars*	*Bosniaks*	*Pomaks* speaking Bulgarian	*Torbeš* speaking Macedonian	*Gypsies**** *(Roma)*
Albania	2,287,000	..	..	..	..	..	..
Bulgaria	..	850,000	..	..	250,000	..	60,000
Bosnia-Herzegovina	..	..	..	1,836,700	..	..	..
Dobrudja (in Romania)	..	27,580	23,409	..	..	..	..
Greece	..	56,000	..	..	38,000	..	18,000
Croatia	..	..	..	50,000	..	..	..
Kosovo	1,932,000	..	..	16,500**	..	..	10,000
East Thrace (in Turkey)*	..	1,819,633	..	..	..	..	..
Macedonia	509,000	78,000	..	..	..	70,000	15,000
Montenegro	31,000	..	..	75,000	..	..	..
Serbia	55,000	..	..	165,000	..	..	..
Total	4,814,000	2,811,633	..	1,531,500	296,000	70,000	103,000

* excluding Istanbul; ** This is a Musliman group (Gorans) speaking a south Slavic dialect who have managed to preserve their language and unique identity in an Albanian environment; *** estimate

Source: Kocsis, K. (ed) 2007; Преброяване на населението, жилищия фонд и земеделските стопанства през 2001 – ОБЛАСТИ том 4. книга 1–28. Национален Статистически Институт – СОФИЯ; Census of Population, Households and Dwellings 2003 POPULATION – National or Ethnic Affiliation (Data by Settlement and Municipalities); Dokos, P.T.–Antoniu, A.D. (2002); Demographic Changes of the Kosovo Population 1948–2006. – Statistical Office of Kosovo (SOK) 2006; Census of Population Households and Dwellings in The Republic of Macedonia, 2004 Final Data Book X; Census of Population (National and Ethnic Affiliation – Data by localities) Statistical Office of Republic of Serbia 2002; Sallnaz, J. 2007

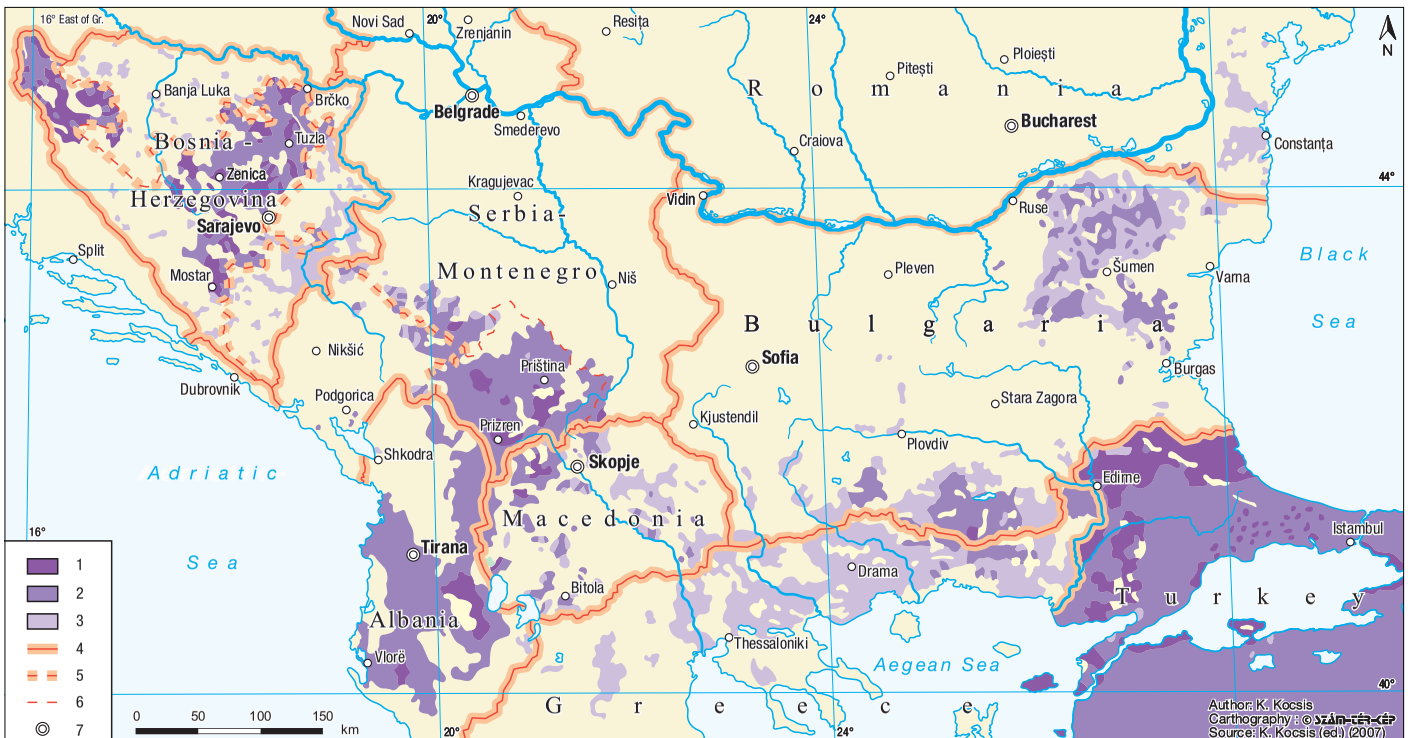

Figure 4. The change in areas inhabited by Muslim majority population between 1910 and 2001. – 1 = territorial expansion of Muslim majority; 2 = territories inhabited by Muslim majority at both dates; 3 = shrinkage of the territories inhabited by Muslim majority; 4 = state borders in 2001; 5 = boundaries of entities and member republics in 2001; 6 = boundaries of Kosovo in 2001; 7 = capitals. *Source:* Kocsis, K. 2007

up separate administrative units. Due to the new political environment and the operation of the moderately aggressive dervish order (*Bektashi*) masses of people converted to Muslim faith in the strategically important places, at geographically lower areas, mainly in the plain of River Shkumbini. The areas of Kosovo and in the upper reaches of Vardar River were populated later in the 17th century by Albanians (who became majority population) due to their higher mobility and loyalty to the Ottoman state organisation. The Slav population fled creating a demographic vacuum (Bartl, P. 1996).

The intention of establishing an independent nation state became articulated by the national movement of Albanians rather late and the conditions were created after the second Balkan War in 1913. Nevertheless, significant regions of the ethnic Albanian area did not and still do not form parts of Albania. Muslims inhabit the geographically lower areas in the middle of the country while the great majority of Muslim Albanians outside Albania became residents of a south Slav country formed after World War I later called Yugoslavia. The most significant Albanian communities within Yugoslavia lived in Kosovo and Macedonia and also formed a sizeable minority in Serbia and Montenegro.

Due to the above described distribution of Albanian speaking Muslims their situation, political orientation and attitudes reveal differences that are also in line with their historical traditions. Albania established after the Balkan wars was one of the most underdeveloped area of the former Ottoman Empire. During the two world wars the Albanian government focused on the improvement of internal cohesion and overcoming economic backwardness (Lienau, C.–Schukalla, K.J. 1986).

At the same time Albanian Muslims stuck outside Albania and mostly living in royal Yugoslavia suffered from open and brutal Serbian oppression. The Albanians were not involved in the repartition of land and were not allowed to take positions in state apparatus. Administrative borders (despite various modifications) failed to connect Albanian territories.

In addition to open oppression "Serbianisation" took the form of changing the ethnic proportion in areas of contiguous Albanian settlement, mainly in Kosovo. As a result of these efforts ten thousands of Serbian families were settled in the area in several waves (1922–1929 and 1933–1938). At the same time Albanians started to emigrate. Moreover, the Yugoslav government held negotiations with the Turkish government about the relocation of Muslim population to Turkey (it concerned other ethnic groups but Albanians). Although the treaty had been signed in 1938 it was not realised due to lack of funds and World War II.

The federal restructuring of Tito's Yugoslavia after World War II. proved favourable for Albanian Muslims in the country although at the beginning – mainly instructed by the Tirana government – Albanians were highly

disloyal to Yugoslav government considered a renegade in the Socialist bloc. As Albanians were provided education in their mother tongue and had the right to publish their papers, the Albanian language was practically equal in rank with the official "Serbo-Croatian language" (Reuter, J. 1987). On the other hand, ethnic proportions were not represented in local governments and institutions. Despite the fact that Albanians had the widest scope of action in the second half of the 1970s in the politically more and more self-confident Kosovo, the Yugoslav regime was unable to convincingly integrate Albanian settlement areas into the country (Reuter, J. 1987). Albanians were free to practice their Muslim religion, the primary manifestation of their identity evidenced by mosques we can see today or national costumes closely related to Muslim religion and worn until now.

At the same time, in Albania (officially declared an atheist country in 1967) Enver Hoxha had been fighting against the religiousness of the society for decades. Mosques, churches and monasteries were confiscated and converted into department stores, cinemas or other cultural institutes or simply razed to the ground. Although churches have operated freely since 1989 (fall of Communism) two thirds of the Albanian population declare themselves as atheists and there are only few visible signs of religion.

Deeply rooted conflicts in society escalated at the beginning of the 1990s in Yugoslavia. Member states eager to develop their external relationship from the 1970s took advantage of the favourable foreign political situation and one by one declared secession from Belgrade. This process fundamentally changed the situation of Muslims in the country.

Moderate political forces managed to significantly mitigate the conflicts generated by the secession of Macedonia from Yugoslavia. Moreover, Albanians (the majority of them Muslim believers) whose primary goals were to enjoy equal rights with the Macedonians and to be provided education in their mother tongue at all levels were more or less successfully integrated into the new political environment just taking shape in Macedonia (Reuter, J. 1987).

Attempts to improve the general conditions of Albanians and the issue of the Albanian university in Tetovo proved to be constant sources of tension that last culminated in an armed conflict in summer 2000. The most significant Albanian party is a member of the coalition government (Spasovska, V. 1999).

Although the majority of Albanians living in Montenegro are Muslim believers the Catholics represent a sizeable proportion, too. Unlike Catholics in Kosovo and Macedonia they were involved in the last census held in Yugoslavia in 1991 so we have accurate data about the number of Albanian Catholic believers and its change in time. Their number only slightly increased after World War II because natural demographic indicators resulted in a low-

er growth rate not only compared to Catholics in Kosovo and Macedonia but compared to other ethnic groups in the country, even to Montenegrins (Schmidt-Neke, M. 2002).

The strongest Albanian Muslim community in Kosovo was most severely affected by the events of the civil war. The escalation of the crisis in 1999 culminated in military intervention of NATO. Kosovo still belongs to Serbia de jure but it is already on the path to independence having become an international protectorate and proclaimed its independence on February 17, 2008. Independent Kosovo was the first country with Muslim majority to have shown sympathy for the United States and in exchange enjoyed encouragement and support of the latter to the struggle of Kosovar Albanians for independence.

The change in the ethnic spatial structure of Albanian Muslim population in the 20th century was primarily manifest in the expansion of their settlement area. This expansion can mainly be explained by their outstandingly high natural increase rate compared to other ethnic groups and also by their assimilation effects on other Muslim groups (not Albanian speakers) in the region. Another factor is the gradual emigration from the region and demographic decrease (especially in the past few decades) of the non-Muslim population (Batakovic, D.T. 2007).

Turkish speaking Muslims

Turks. Although the various groups making up Muslim population speaking Turkish are of varied origin they gradually formed a compact ethnic-religious community after the formation of old-new Balkan states (Turkey, Greece, Serbia and Bulgaria) (Stojanov, V. 2001). Specialised literature in the 19th century used "Turkish" not only in ethnic sense but as a synonym for the concept of Muslim that included other ethnic groups (Lopasic, A. 2002).

The number of Turkish speaking Muslims and their connected settlement area gradually declined after the withdrawal of the Ottoman Empire from Europe. Emigration played the most significant role in this process (Prévélakis, G. 1994). With the first wave of emigration a group of Turkish speaking Muslims left Dobrudja in the 1880s fleeing from Russian expansion. A significant number of people emigrated to Turkey after the Balkan War of 1912–1913 leaving mainly Serbia and Bulgaria behind. After World War I they had to leave the newly formed Kingdom of Serbs, Croats and Slovenes as the obligation to protect minorities laid down in the peace treaty applicable for the new country did not apply to Turks.

Population exchange as per the Treaty of Lausanne ending the Greek–Turkish feud in 1923 almost completely eliminated the Muslim settlement area

from Macedonia and Thrace acquired by Greece in the Balkan wars. Only a small Turkish and Bulgarian speaking Muslim community (the Pomaks) remained in North–Thrace (Greece). In return the Greek patriarchy had remained in Istanbul.

After World War II the followers of Islam with stronger devotion to their religion – compared to their Orthodox and Catholic counterparts – were treated as enemies by the political regimes of the region (Kullashi, M. 1994). As a result, a large number of native Turkish speaking residents left Tito's Yugoslavia at the beginning of the 1950s under the framework of a Yugoslav–Turkish interstate agreement. Later the Yugoslav government pursued a more open policy restoring its relations with other Islam countries. The community with the most numerous Turkish speaking Muslims still lives in Bulgaria, even though the Muslim population was under constant pressure by the Socialist regime (there were several waves of emigration to Turkey under the framework of similar interstate agreements (1950–1951; 1968–1978; Stojanov, V. 1997). Contrary to ethnic Bulgarians their number is constantly on the rise due to their traditionally high rate of natural increase. This tendency was severely curbed by a new emigration wave at the end of the 1980s (1988–1989).

In addition to emigration – although to a much lesser extent – assimilation had also cut their number, primarily in towns and their immediate surroundings inhabited by compact Albanian speaking Muslim communities (mainly in Kosovo and Macedonia). In many cases they simply listed themselves in the Albanian or Muslim categories in censuses. Besides the large community in Bulgaria we can find some smaller scattered groups mainly in Macedonia and some in West Thrace, Dobrudja (Romania) and in Kosovo.

Tatars. In addition to the Turks the Tatars also have to be mentioned as another Turkish speaking Muslim group with former strong presence in Dobrudja. Sources mention the so called Nogai Tatars in Dobrudja in the 13th century but their mass arrival in the 18th–19th centuries was mainly related to Russian expansion when significant Nogai and Crimean Tatar population fled from south Bessarabia (1770), the Crimean Plain (1783), Budjak (1812), and from the regions of Danube delta (1829) to the contemporary border regions of the Ottoman Empire and became loyal subjects of the Sultan. They performed military and border guard services or raised animals. As a result of the above migration waves an almost fully contiguous Muslim settlement area was formed in Dobrudja with an estimated population over 100 thousand in the 1870s (Sallnaz J. 2007).

The departure of Ottoman administration in 1878 fundamentally changed the situation of the Tatars. The settlement area in Dobrudja became a buffer zone so masses of people fled to Turkey. Migration was organised and supported by Turkish institutions from 1916. This migration process involved two thirds of Tatars in South Dobrudja whose settlement area later became

a part of Bulgaria. For the Tatars the modernisation process that took place between the two world wars and the measures taken by the governments to foreshadow/facilitate their assimilation to the Turks were attempts to eliminate their identity factors. As a result under the framework of a migration agreement signed by Turkey and Romania (1935) a significant proportion of them decided to emigrate to Turkey.

This emigration wave was halted by World War II. and the establishment of socialism in Romania (and Bulgaria). In Romania collectivisation forced Tatars hitherto mainly living in rural areas to move to urban areas. As a result, their larger communities can be found in coastal towns (Constanța) and their proportion to overall population declined under 20% in agrarian settlements despite their positive rate of natural increase. Masses of Turks emigrated in waves from Bulgaria to Turkey during the decades of socialism (Kőszegi, M. 2008) as they were under severe assimilation pressure and on the social peripheries.

Muslims speaking Slavic languages

There are various groups of Muslims speaking Slavic languages. Their largest community with a very strong sense of identity officially recognised as a nationality (ethnicity) is the group of Bosniaks ("Muslimans") speaking a dialect of the South Slavic languages spoken in Bosnia and Herzegovina. Mention must also be made of the Pomaks speaking Bulgarian with a less determinant sense of identity and the Torbeš speaking a dialect of the Macedonian language.

Bosniaks use the word "Musliman" for their nationality in their language to differentiate it from Muslim (Büschenfeld, H. 1981). Censuses conducted in Yugoslavia included Muslim/Musliman (Bosniak) categories from 1971 and separated these groups from the Serbs and Croats similar in terms of language but different in terms of religion, who lived mainly in Bosnia and Herzegovina whereas they were less numerous in the former Novi Pazar Sandjak (Balić, S. 1996).

In the 1990s after the dissolution of Yugoslavia through armed conflicts the term to describe this ethnic group changed. While attempts were made to spread the use of "Bosniak" in Bosnia and Herzegovina they were only recognised as a religious denomination in "Little Yugoslavia" (later also in Serbia and Montenegro). Nowadays most Muslimans living in the former Novi Pazar Sandjak apply the term "Muslim Bosniak" or "Bosniak" although there are people who still insist on the former "Musliman" term (Balić, S. 1994).

Censuses in Montenegro and Serbia include both categories (Bosniak and Musliman) (Ruzin, N. 2000). The majority of population in the south-east

of the former Sandjak region declared themselves Bosniak rather than Muslims implying that Bosniak identity (attachment to officially recognised identity factors) is stronger where their settlements form blocs *(Photo 1)*. On the other hand, in the contact zones formed with non-Muslim and Albanian population in the north of the region (in the traditional Bosnian–Albanian cultural transfer region) the tendency is the opposite. Also, in the regions outside the above mentioned areas the number of Muslims is much higher, what is more in some areas the Bosniak category remained empty. It has to be noted that in addition to the significant spatial consequences of fluctuating identity the thousands of mostly Bosnian refugees (due to Bosnian War) also influenced census data.

Photo 1. Husein Pasha's mosque (Husein Pašina Džamija) in Pljevlja (Montenegro, Sandjak region) with the talles minaret (42 m) in the Balkans (Photo by Kocsis, K.)

The ethnic origin of Muslim ***Pomaks*** speaking Bulgarian as vernacular, consequently of an ambiguous identity, has always been highly debated, obviously for political reasons (Telbizova-Sack, J. 1999). The most probable hypothesis is that they are the descendants of indigenous Slav peoples who converted to Muslim faith in the 15th century. The terms "Pomaks" and "Achrjani" used by Pomaks to express their identity were contrary to terms used in definitions by majority Bulgarians (Bulgarian Muslims, Muslims living in Bulgaria, Bulgarians of Muslim faith, etc.) (Brunnbauer, U. 2002). The political intention behind the use of the latter terms is to emphasise Bulgarian language as the major identity factor for the Pomak ethnic group. In addition, for some time the Greeks have been trying to point out that Pomaks have "their own" language that was under strong Slavic influence throughout the history but it is more similar to Greek in terms of structure and vocabulary (Voss, C. 2000).

Pomaks inhabit the area between Rodope Mountains and the coastal region of the Aegean Sea. Also large groups live by the lower course of the River Isker near Pleven, in the Struma Valley and in the region of Prilep in Macedonia. Pomaks has never been officially recognised by Bulgarian governments as a genuine ethnic group; rather they have been considered "Turkalised" Bulgarians – their number could only be estimated from statistics.

The ***Torbeš*** speaking Macedonian primarily live in Macedonia mainly in areas neighbouring with Albania, near Debar and Tetovo. The insecurity of their identity can be explained by the fact that they feel strong attachment to their (mainly) Muslim culture and cultural traditions and this draws them closer to Albanians living nearby and to Turkish language to a smaller extent and not to the language they speak (Macedonian, the official language of the state). The assumption that their Slavic mother tongue does not fully express their identity is evidenced by the fact that after the dissolution of Yugoslavia a large number of Torbeš people demanded Albanian and Turkish education (schools) for their children and their main publication Mlada Mesečina (The Young Crescent) has been published in three languages since 1987 (Voss, C. 2006).

Other Muslim ethnic groups. In addition to the above mentioned Muslim groups the ***Gypsy*** (Roma) Muslims also have to be mentioned. Their number can only be estimated due to their unique identity and relation to majority groups (Kőszegi, M. 2008). As they are extremely open to their environment in terms of language and religion they show a very mixed pattern from both aspects. In countries with significant Muslim population a large number of them became the followers of Islam. Due to their peripheral position in society and special lifestyle they live in high concentration in their close environment. Their largest group lives in Bulgaria where about 20–40% of

them can be estimated as being Muslim (Krasteva, A. 1995; Eminov, A. 1999). In addition, Muslim Gypsies are also represented in Macedonia, Greece and Kosovo (as many as 10 thousand/country, *tables 1, 2*).

Table 2. Distribution of Muslim groups in the Balkans according to types of areas inhabited

Types of areas	Immigrants	Converted
Rural areas	Turks, Gypsies, Tatars	Torbeš, Pomaks, Albanians
Urban areas	Turks*, Gypsies**, Tatars **	Bosniaks, Albanians

* emigrated or assimilated to Albanian population

** moved to urban areas in the second half of the 20th century

Spatial structure of Muslims in the Balkans at the turn of the millennium

The Balkanian Muslim population of 9.67 million currently lives in 10 countries with substantial differences in territorial concentration *(Fig. 5).* The largest communities can be found in Albania (2.287 million), Kosovo (1.932 million) and in Eastern Thrace in Turkey (1.819 million), where they make up the absolute majority of overall population. Although the largest Muslim community lives in Albania, only 70% of the country's population belongs to Muslim denomination (Asche, H.–Bërxholi, A.–Doka, D. 2003). They form the absolute majority of population in the prefectures located in the middle and eastern parts of the country. The settlement area of Muslims is the most homogeneous in the Eastern Thracian region where almost 100% of the population is Muslim due to waves of migration from other regions of the Balkan Peninsula in the 20th century. In Kosovo almost 92% of total population is Albanian, mostly Muslims. In addition to Albanians, 1.5% of the population is also Muslim (Gorans and Gypsies). Only four Serbian communes (kommunats) fail to have Muslim majority: Leposaviq, Zveqan, Zubin Potok in the north of the country, and Shtërpçe in the south (Kicošev, S. 2005).

Muslim population of 1.84 million in Bosnia and Herzegovina makes up the relative majority of overall population (47% in 2004). No census data is available from recent past about their location at the level of smaller administrative or statistical units. The only information is the estimates (2004) on the website of the Federal Office of Statistics of the Bosnian-Croatian Federation and a map showing the proportion of Muslim population at commune (opština) level. Based on available information it has become obvious that the Bosnian War in the first half of the 1990s fundamentally transformed the spatial pattern of their settlement. Due to migration processes after the war the territorial concentration of Muslims increased and they formed a significant closed settlement area in the east and north-east of Bosnian-Croatian Federation (near Sarajevo, Tuzla) and in the north-west opštinas (near Bihač). Large groups of Muslims live in various communes in Herzegovina as a minority and their settlement areas form smaller or bigger blocks. Based on

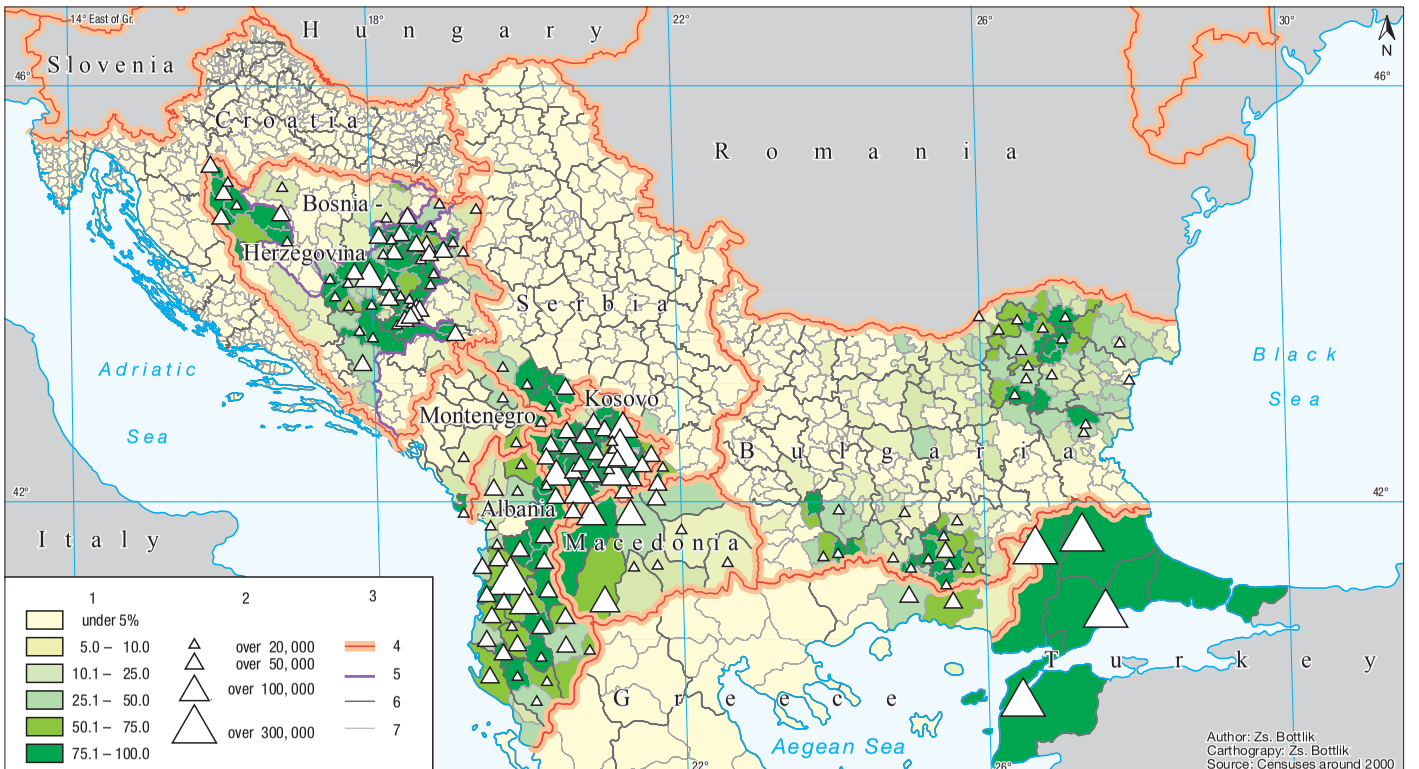

Figure 5. Muslim inhabitants on the Balkan Peninsula at the turn of the 3rd millennium. – 1 = ratio of Muslim inhabitants; 2 = number of Muslim inhabitants; 3 = boundaries; 4 = state borders in 2009; 5 = boundary of entity; 6 = boundaries of NUTS 2 level or of equivalent units; 7 = boundaries of statistical units (LAU-1)

indirect estimates and the above mentioned map there might also be small scattered groups present in the Bosnian Serb Republic.

Muslim population with connected settlement area makes up strong religious minority in countries formed after the dissolution of Yugoslavia: Macedonia (33%), Montenegro (17%), and Serbia (3%). The most significant community is located in the opštinas forming a settlement area in the valley of upper Vardar in Macedonia next to the blocks of settlements of Muslims in Albania and Kosovo. The majority of Muslims in Serbia and Montenegro live in the former Novi Pazar Sandjak region. This area of settlement forms a contiguous belt of Muslim settlement proceeding with similar areas in Kosovo and in Albania. In addition, Muslims make up absolute majority in three communes in Serbia (Bujanovac, Medveđa, Preševo), currently the scenes of Muslim Albanian transgression. Bulgarian Muslims make up only 12% of the country's population and their settlements rarely form blocks. They form blocks in the north-east of the country, north of Shumen and in the opštinas in the south alongside the Greek border. Muslims living in the three small regions in West Thrace make up just over 2% of the total Greek population. They form absolute majority in the valleys of Rodope Mountains with peripheral location and in areas far away from strategic roads.

The Muslim population of 50,000 in Dobrudja makes up only 5% of the total population of the two Romanian counties within the region. The settlements do not form closed blocks and their scattered nature will increase in the future. Their largest community can be found in the biggest urban centre on the coast, Constanța.

Summary

Muslim groups in the Balkans speak various languages and live in several countries. These countries followed different paths of development in the 20th century so the followers of Islam were repeatedly involved in social conflicts because of their different culture. Due to Albania's isolation for decades rooted in socialism, the dissolution of Yugoslavia through bloody conflicts in the 1990s, the EU membership of Greece reaching back some decades, the new EU membership of Romania and Bulgaria and the unique geopolitical and social circumstances in Turkey the countries inhabited by the majority of Muslims will probably take different paths in economic and social development. The generally marginalised social and economic status of Muslims in the countries examined and their frequently deviating demographic behaviour compared to neighbouring ethnic groups are expected to widen the gap between them and majority societies. Due to their delayed political integration and increasing difficulties in social integration they will probably remain destabilising factors.

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The capacity and potentials of Budapest to attract creative economy

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Abstract

The triggering factors of urban development have changed continuously over the past decades, always adapting themselves to the processes of globalisation and to the related trends. As a consequence of the shift from the Fordist production system to the post-Fordist economic structures the metropolitan regions have acquired an ever growing importance and became the centres of economic and social development of countries and regions. International experience shows that in economic competition an increasing role is played by creativity (and particularly by culture), invention and innovation. Concerning further development of the European metropolitan regions it might be decisive how these city-regions will be able to attract and integrate firms in the sphere of the creative knowledge sector and their manpower. Regarding to the new economic development tendencies drawn above this paper highlights the capacity and potentials of the Budapest Metropolitan Region based on statistical analyses and results of empirical questionnaire surveys and in-depth interviews carried out amongst employees, managers and transnational migrants working in the creative knowledge sector.

Keywords: creative knowledge sector, innovation, ACRE project, Budapest Metropolitan Region, soft and hard factors, decision on settlement

Introduction

Creativity, knowledge and innovation are broadly recognised as the essential ingredients of economic success in the advanced capitalist world. Naturally, they have always been important to economic progress, but their importance has never seemed as crucial as in the early 21st century. Creative and knowledge-intensive industries are increasingly seen as the most important economic activities for international competitiveness in the advanced capitalist world. Still, what exactly makes some city-regions more attractive locations for these industries and their workers is not entirely clear (Scott, A. 2003; Florida, R.–Tinagli, 2004; Musterd, S. *et al.* 2007).

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In October 2006 the ACRE project (*Accommodating Creative Knowledge – Competitiveness of European Metropolitan Regions within the Enlarged Union*) financed by FP6 of the European Union was started to improve the empirical evidence base of urban regional conditions for creative knowledge. In this project the international consortium aims to assess the impact of the emerging 'creative class' and the rise of the 'creative industries' on the competitiveness of EU metropolitan regions. The project compares the recent socio-economic development trends and economic development strategies in 13 metropolitan regions across Europe to get more insight in the extent to which creativity, knowledge and innovation are indeed the keys to a successful long-term economic development *(Fig. 1).*

The central research questions that the project wants to address are: What are the conditions for creating or stimulating 'creative knowledge regions' in the context of the extended European Union? More particularly, what is the role of so-called 'soft' factors in creating and stimulating 'creative knowledge regions'? The most important topic to consider is which metropolitan regions might develop as 'creative knowledge regions', and which regions might not (Chapain, C. *et al.* 2009).

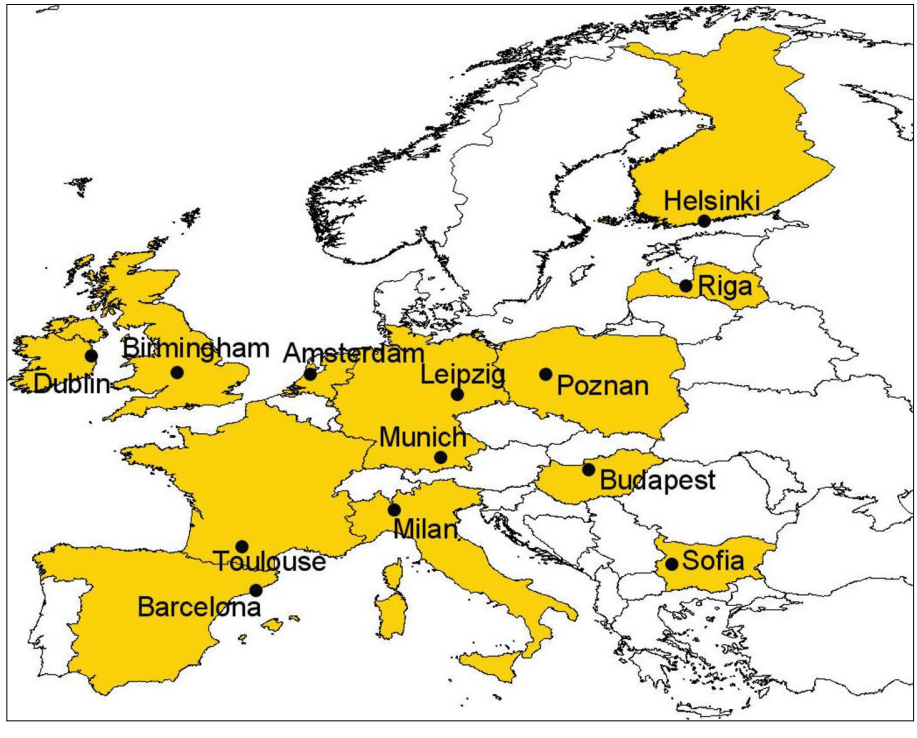

Figure 1. Participants of ACRE project

The project is based on empirical research carried out in the partner cities. These empirical studies in the framework of ACRE project could be subdivided into three stages. In the first stage a quantitative questionnaire survey (200 questionnaires in each metropolitan region) was carried out to investigate the opinion of highly skilled graduates and workers in creative and knowledge-intensive industries about their living and working conditions and to explore the role that both 'hard' and 'soft' location factors play in decisions taken by workers and graduates to live in a particular location in the region. In the second stage qualitative in-depth interviews (25 interviews in each city) were conducted with leaders, managers of firms to understand the drivers behind the decisions of the managers of selected knowledge-intensive and creative sub-sectors to settle at a certain location in the metropolitan region and to estimate the relative importance of the location factors that played a role in their decision making process. The third stage also comprises in-depth interviewing of international migrants actively working in the creative knowledge sector (25 interviews in each city). The object of this phase of the survey was to recognise and to investigate the drivers behind the decisions of expats to settle at a certain location and at the same time to estimate the relative importance of the location factors that played a role in their decision.

Based on the empirical survey and interviews comparative analyses will be provided on the metropolitan level of Europe. The present paper summarises the most relevant results of local analyses carried out in the Budapest Metropolitan Region (BMR).

The role of creative economy in Budapest

The economic output of the Budapest Metropolitan Region has always been dominant within Hungary. Nowadays the BMR is the economically most advanced region of the country. In 2004 44.5% of the GDP was produced in the Central Hungarian Region and 35% in Budapest itself. In terms of output and employment the top five branches are: chemical industry, machinery, food processing, woodworking and publishing. Within services the financial sector has been developing most intensely, other innovative economic branches in Budapest are info-communication technologies, life sciences (medicine production, biotechnology and nanotechnology), creative industries and cultural economy (Egedy, Z.–Kovács, Z. 2008).

According to the definition of ACRE consortium on creative economy at the end of 2004 there were 264 thousand active economic organisations in Hungary operating in the field of *creative industries* and *knowledge-intensive industries*, which made up 36.4% of the active economic organisations registered in the country. Within the creative knowledge sector the proportion of creative

industries was 57% with 150,331 organisations, whereas the knowledge-intensive industries represented 43%. Within the knowledge-intensive industries the weight of law and other business services was outstanding with 70,115 active economic organisations (62% of the firms within the sector).

It is also important to analyse the relative weight of economic organisations of the creative knowledge sector within the local economy. Firms in the creative knowledge sector make up 44% of the active economic organisations registered in the BMR and 46.1% in Budapest proper. Within the creative knowledge sector the weight of BMR is outstanding in the fields of ICT (53.6%), R&D and higher education (52.4%). According to *Table 1.* BMR and Budapest play an outstanding role in Hungary both with respect to employment and revenues; with 39.1% of all employees working and 53.2% of the revenues realised here in 2004. As a general trend it can be stated that the weight of BMR in the creative knowledge sector is even higher. The greatest extremes could be found in finances, only 27.4% of firms in this branch are located in the BMR, nevertheless 66.5% of employees are working here, and 91% of total revenues are realised here.

Table 1. The importance of BMR in the creative knowledge sector in Hungary (%)

Industries	Enterprises	Employees	Revenues
Creative industries	43.3	44.8	62.3
ICT	53.6	46.7	43.1
Finances	27.4	66.5	91.2
Law and business	41.9	53.0	66.6
R&D, higher education	52.4	48.7	77.5
Creative knowledge sector	*42.3*	*49.0*	*58.4*
Total	35.0	39.1	53.2

Examining the agglomeration zone we can also discover significant differences as far as the distribution of creative firms is concerned. Within the agglomeration the relative weight of firms operating in the creative knowledge sector is the highest in the north-western sector of Buda (41.8%), and the lowest in the south-eastern sector of Pest (30.2%). The highest proportions of creative firms are registered in the settlements of the north-western sector (Csobánka 52.1%, Nagykovácsi 49.9%, Telki 48.1% and Budakeszi 47.9%), on the other hand the lowest figures can be found in the south and south-east (Alsónémedi 23.3%, Ócsa 23.4%).

Also essential geographical differences can be detected within Budapest. Districts of the Buda side show up higher proportions with regards to the relative share of creative firms (12th District 55.3%, 1st District 54.2%, 2nd District 54.0% whereas the number and share of creative knowledge sector is generally lower in the south-eastern districts of the Pest side *(Fig. 2).*

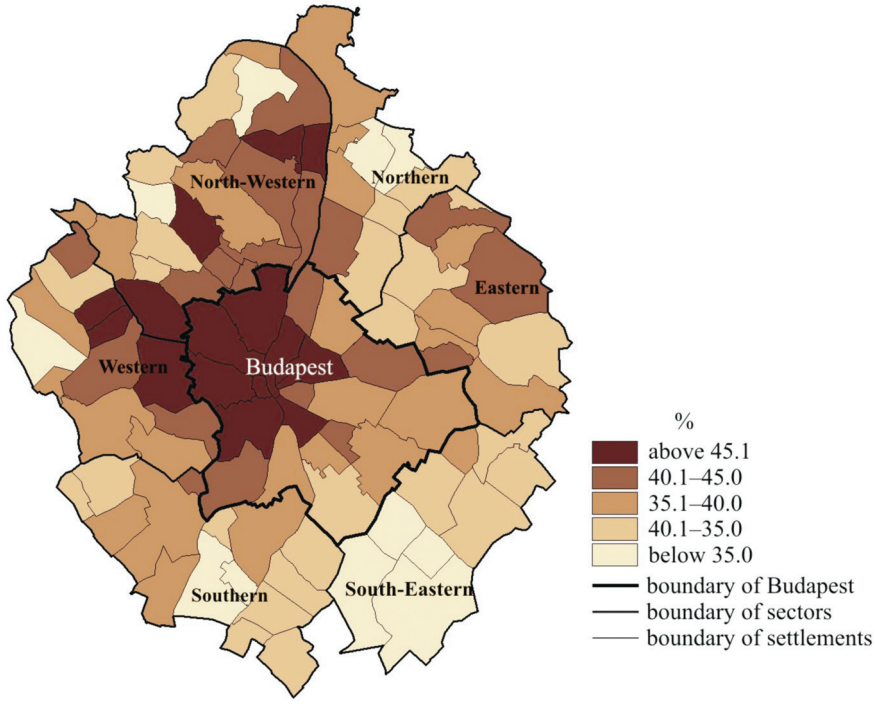

Figure 2. The ratio of creative and knowledge-intensive enterprises in the BMR. *Source:* CSO Hungary, 2004

Budapest as a living space for creative employees

Data of the 2001 national census reveal the main features of spatial distribution of labour force in the creative knowledge sector in Hungary and in the Budapest Metropolitan Region. To the most important group of occupations, where the role of BMR is outstanding, belongs the category 'market research, advertising and marketing'. Two-thirds of the 14 thousand employees working in this field in Hungary live in the BMR and 73% of them work here *(Fig. 3).*

BMR has equally high shares in art (9,000 employees) and performing arts (6,000 employees), 72% and 68% of people working in these sectors in Hungary live and work in the BMR *(Figs 5* and *6).* There were 3,000 journalists and editors in the publishing sector in Hungary in 2001, 74% of them lived in the BMR. In addition to these occupations the share of BMR is also high in the electronic media (Radio and TV). We should also note that in all sectors of the creative industries a major part (from 57% to 68%) of the high rank managers and professionals live and work in the BMR.

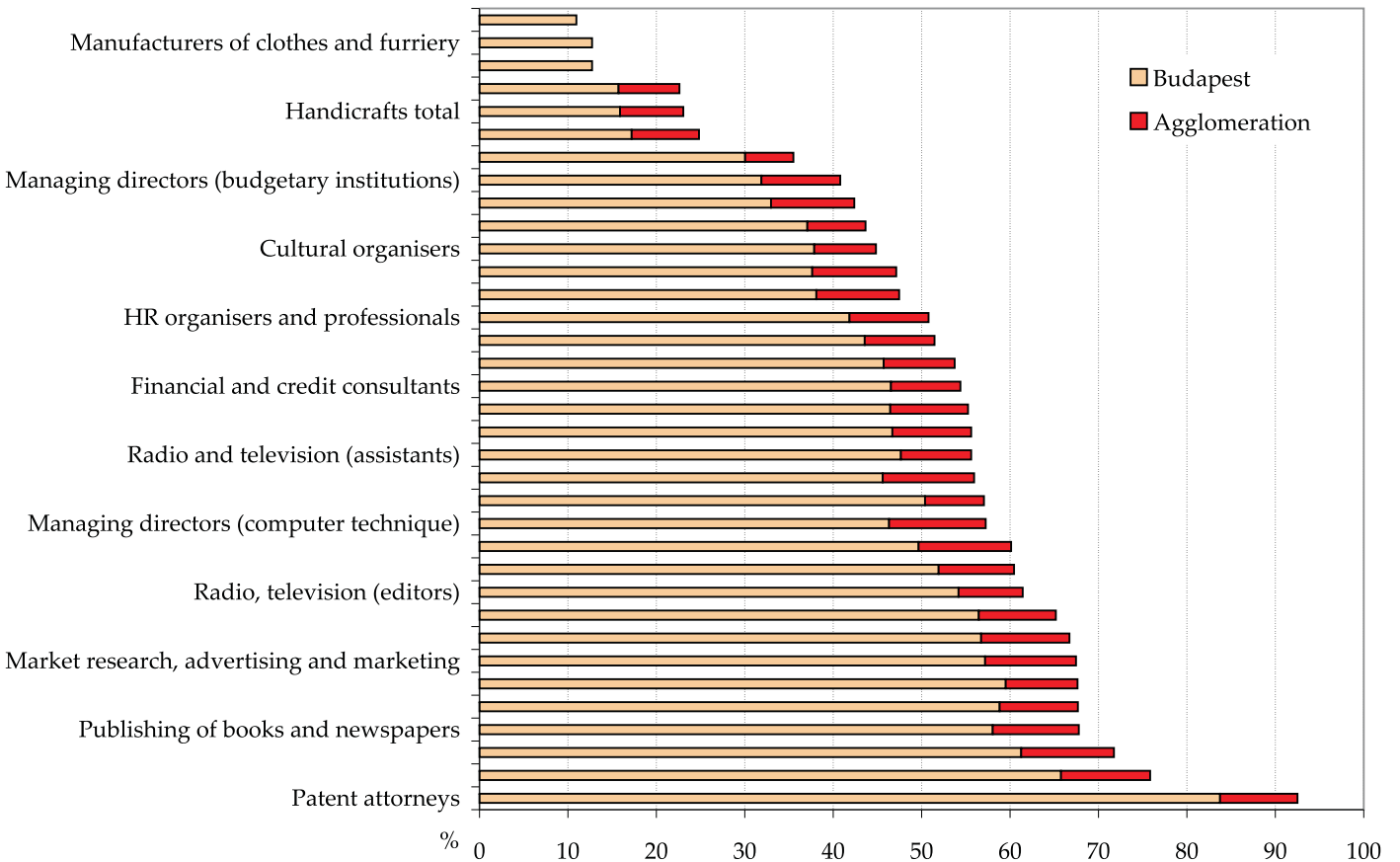

Figure 3. Ratio of creative employees living in the BMR. *Source:* CSO Hungary, Census 2001

Budapest in view of creative professionals

After our results became evaluated it had become clearly established that in the course of the analyses of the hard, soft and personal factors distinction has to be made between the macro (global) and micro (local) levels. Macro level is meant to be the general motivations of the interviewee to come and stay in Budapest and/or BMR whereas micro level encompass factors having been decisive for the choice of the place of residence and site selection within the metropolitan region.

Motivations to come to Budapest

Our investigations have shown that the resettlement of creatives as international migrants from abroad to Hungary and Budapest had been primarily determined by hard factors: the main trigger was the intention either to *undertake work* or to *pursue studies* in higher education. In this respect no particular difference could be identified between the members of the creative and knowledge-intensive groups.

Similar to the international migrants, Hungarian employees predominantly came to Budapest in order to undertake jobs. As a motivation factor of a nearly similar importance, another goal was to pursue studies in higher education (in colleges or universities). When founding a firm market conditions was the foremost consideration: Budapest represents an enormous economic potential relative to that of the whole country and this exert a great attraction upon the economic units. Creative firms settled in the BMR are primarily due to the *size of the market and of labour market*. A high number of entrepreneurships and a well trained manpower is not a negligible factor of site selection either. The moving in of the creative firms and settling down of the managers are mainly determined by hard factors as well. Another motivation factor already belongs to the soft ones: according to the unanimous opinion of the managers, *informal links* play a decisive part in Hungarian economy therefore enterprises might profit a lot from their presence in the capital. Moreover here they have an access to legal, financial, commercial, logistic *services* of high standard.

Summing up our achievements of the analyses performed on the macro level it can be stated that workers and graduates employed in creative economy, managers and enterprises, and transnational migrants arriving in Hungary and Budapest are attracted by the economic advantages offered by the BMR: employees favour *job opportunities* of broad range and undertake different kinds of labour as employers do for the same reason, notably by the *favourable labour market conditions*. For the latter the large market (enterprises, clients) is part of the strongest attractions. The second greatest attraction is the

use of *education and training*, being important because settling down is a general trend, so higher education of prominent quality raises the economic potential of the BMR. The third is the personal and soft factors changing by target groups when transnational migrants take decisions on an emotional basis (they followed their partner, or the metropolis appealed to them), while the managers tend to consider economic factors (e.g. informal links, availability of services). It can be stated that motivation and attraction factors on the macro level for the creative and knowledge-intensive professionals do not differ from those for the people employed in the other sectors of the economy.

Table 2. Role of factors in choosing the current dwelling place (whole sample, n=203)

Factors	Very important	Quite important	Somewhat important	Not important	Don't know	Missing
Cost of dwelling	33.5	40.5	11.0	6.0	3.5	5.5
Quality of surrounding neighbourhood	33.5	38.0	16.0	4.0	2.5	6.0
The neighbourhood atmosphere	28.0	39.5	19.5	5.5	3.0	4.5
Size of dwelling	23.5	48.0	13.5	6.5	3.5	5.0
Proximity to public transport	19.5	44.5	20.5	9.0	2.0	4.5

Why to stay and settle down in Budapest?

Based on the micro level analyses no differences could be recognised as to the factors decisive for the settling down of professionals working in creative vs knowledge-intensive sectors. The most important motivation factors are the *cost of dwelling*, the *size of the residence* and *proximity to public transport* as hard factors *(Table 2).* They are not only attracting but also retaining factors i.e. they are determinant for moving of the creatives to a certain neighbourhood but also for their staying there longer.

Following the above determinant hard factors several soft factors are to be considered before decision is made. Of them the *quality and atmosphere of the neighbourhood* is to be mentioned in the first place. In the scale of values this was mentioned by the employees as a factor examined just after dwelling and public transport. Proximity to the place of work was referred to as a pull factor by the creatives, whereas high traffic and noise pollution evaluated as a push factor. For a longer perspective *personal safety and public security*, access to commercial facilities and the quality of life offered by the neighbourhood that are primary retaining factors.

From the analyses of cross-tables on the choice of residence the conclusion can be drawn that young people tend to make their choice along the hard factors

(in pursuit of studies in Budapest, seeking for job), whereas soft factors (e.g. proximity to natural environment) appear as preference for the middle-age and older generations.

The employers and managers primarily consider hard factors in the course of site selection. The leading aspects are the *price of office*, the *size and infrastructure of office*, further the *accessibility i.e. connection both to traffic lines and public transport*. For certain creative firms the presence in Budapest is important because it is a prerequisite to applying for subsidies and allowances. An accentuated importance has the *place of residence* of the managerial strata (in inverse ratio to the size of the firm) which also emerges in the process of choosing the site of the firm's headquarters. Soft factors come to the fore in the second round, especially the office's neighbourhood: the managers of creative firms favour prestige aspects, whereas those of knowledge-intensive enterprises prefer the quiet and calm surroundings. Among the soft factors *informal links* and *good services* are equally attracting factors (macro level) and retaining factors (micro level) for the creative firms. There is no doubt that personal trajectories have some part to play in the decision making process concerning settlement: *family and friends* can play both of these roles.

Strengths and weaknesses of the Budapest Metropolitan Region

Summarising the results on the *strengths of Budapest* three groups of location factors were judged equally and very positively in each of the three target groups: a) Job offers and career opportunities; b) Cultural life and leisure, sport and entertainment opportunities; c) Services, retailing and shopping networks and gastronomy. The first group belongs to the hard factors, whereas the second and third categories can be evaluated as soft factors.

Apart from the above mentioned groups there are factors that have less importance but strengthen the position of Budapest. The capital is an undisputed leader in the country's higher education, and the level of training is highly appreciated among specialists from Hungary and abroad.

Job and career opportunities are strong attractions of the BMR. They are supported with favourable working conditions: by the Hungarian and foreign employees the enterprises and institutions as a rule provide more sophisticated working facilities than their counterparts in the countryside.

The issue of subsidies and allowances belong to the hard factors. It is well known that there exists an extensive social network in Hungary, i.e. a system of state subsidies and social allowances, involving high expenditures thus imposing a heavy burden upon the economic performance of the country, which extend beyond its capability. It is not accidental that the respondents (chiefly transnational migrants and managerial strata) based on financial

considerations of their own, highly appreciated this system of subsidies and allowances (Egedy, T. *et al.* 2009).

Residential environment is also to be mentioned among the soft factors; it means that most diverse quarters of high standards and quality are evaluated as the strong points of Budapest. This great variety of the neighbourhoods is ready to meet the demands of all social strata. Of the soft factors there are two advantages of the BMR: a fine geographical setting which is praised especially by the transnational migrants and managers and the cultural milieu typical of the city. The latter is closely related with a rich choice of cultural programmes *(Table 3).*

There are few hard and soft factors that should be mentioned among the *weaknesses of Budapest.* The former is the Hungarian system of taxation judged very negatively both by the employers and transnational migrants. Although there were attempts to reform the system in the recent years, these have proven to be unsuccessful or inefficient. Therefore Budapest is in a loser position in the economic competition because tax bands and high tax payments appear as push factors: they curb the inflow and settlement of professionals and firms. There are four further factors that weaken Budapest's position in the domestic and international competition of cities even though to a lesser extent than those two mentioned above. Of the hard factors high living costs should be referred to. All the three target groups expressed their view that price of living and especially everyday expenses are very high in comparison with the level of income. Other weak points of Budapest are the lack of tolerance and acceptance of diversity and the missing openness. A surprisingly high level of intolerance (contrary to all expectations) in most places of the BMR was one of the findings of previous surveys. In relation with this issue employees hold that solidarity, social cohesion and equity are problematic, not only in the BMR but all over Hungary. A closely related question is that in the opinion of the respondents there is a very low level of the political culture in Hungary, and the situation is further corroborated by an overwhelming over-administration and bureaucracy.

Among the negative soft factors the indicators typical of big cities: pollution, uncleanness and noise are often referred to. High traffic and the noise generated add to the deterioration of quality of life. The uncleanness and neglected state of the districts, quarters and streets complained about by the respondents can be attributed to an inferior level of environmental consciousness among the local population. It is not surprising in this sense that almost half of the respondents from both investigated sectors voiced their stance about the deteriorating quality of life in Budapest over the past years (*Fig. 4).*

A bulk of hard and soft factors can be observed which exert a negative impact upon the quality of life and satisfaction of people in the BMR being also decisive for the further development of the Hungarian capital and its

Table 3. SWOT analysis of the Budapest Metropolitan Region based on the opinions of creative managers

Strengths	Weaknesses
Weight and role of BMR in the national economy Favourable positions in the creative knowledge sector Geographical location of Budapest Higher standard cultural services Supply on the office market Good job opportunities on the labour market	Situation of traffic and public transportation Lack of willingness for cooperation between firms Low level of collaboration between firms and universities, research and public institutions Slow and inadequate clustering process Lack of business strategies and strategic thinking of managers Passive behaviour of managers on the market Political climate and culture, problems of administrative and economic rules Quantity and quality of green spaces
Opportunities	**Threats**
High concentration of companies and enterprises Concentration of universities and colleges at Budapest Spectacular development of certain branches within the creative knowledge sector Attractiveness of BMR for the countryside manpower Great variety of neighbourhoods	Size, capability and openness of national economy System of education and higher education Hard competition between enterprises because of its high number in the BMR High specialisation of SMEs Inadequate concentration of human resources Price level of experienced and well-skilled labour Unbalanced role of subsidies in the development of different branches Danger of corruption regarding informal links Inadequate development of public services Price level on the office market Emerging social problems, tensions and intolerance

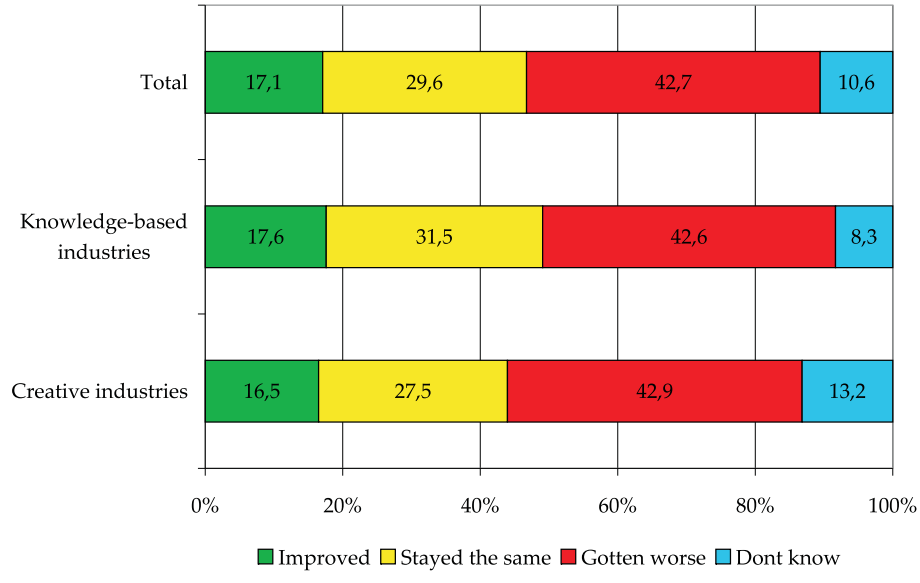

Figure 4. Perception of improvement or decline in the quality of life

international competitiveness in the long run *(Table 4)*. If proper measures are taken for the amelioration of the environmental factors, Budapest and the BMR could be successful in attracting firms and experts of the creative and knowledge-based sector to settle here. In the opposite case the city region might become a loser in the competition between the big cities and its place would occupy other metropolises with similar potentials from the region (Egedy, T.–Kovács, Z. 2009).

Table 4. Limiting factors within the BMR based on the opinion of creative professionals

Factors	Type of factor
Costs of living (prices, level of wages and salaries)	hard
Traffic and public transport	hard
Cleanness of the city and living environment	soft
Air and noise pollution	soft
Intolerance, aggressiveness	soft
Homelessness, poverty, social polarization	soft
Politics, political culture	soft
Quantity and quality of green space	hard
Living standards, quality of life	soft
Public security	soft
State of building stock and public places	hard

Conclusions

After 2000 the Budapest Metropolitan Region managed to keep its leading position in the economic development and modernisation of the country in most respects. It serves as gateway for innovation and modern technologies, and national centre of most creative activities. The BMR has an outstanding role in the creative knowledge sector of Hungary and in all the branches of the sector the role of Budapest is predominant. BMR is over-represented in terms of the number and ratio of these firms, as well as the employees in firms of creative and knowledge-intensive industries and the revenues generated by this sector. The development of these industries in provincial cities now is somewhat lagging behind that of the capital but their gradual close up is indicative of positive shifts and promising for the future.

Summarising the results on location factors it can be stated, that highly qualified people employed in the creative knowledge sector in the Budapest Metropolitan Region in the course of decisions about their place of residence tend to take into account both hard and soft factors, but in general the hard ones are more influential. According to the opinions expressed by managers no rules of general validity can be established concerning site selection of the enterprises within the area of the BMR, because there are significant differences between the creative and knowledge-intensive sub-sectors and branches, depending on the size and age of the studied firms. As a general conclusion it can be stated that the settlement and site selection of the firms is affected by hard factors predominantly and soft factors currently play only a marginal role in attracting enterprises and managers towards Budapest. Based on our interviews it became clear that hard factors play an important role rather in attracting creative transnational migrants to the city, while soft factors are decisive in the decision about staying in the metropolitan region in the long run.

Since workers and highly qualified representatives of the creative knowledge sector as it was revealed by our survey were more satisfied with the soft factors of the city than with the hard ones, in Budapest it would be essential to improve the hard location factors in the near future.

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LITERATURE

Hungarian Geographical Bulletin 58 (4) (2009) pp. 295–296

Baranyi, B. and Fodor, I. eds.: The role of environmental industry in the regional reindustrialization in Hungary. Hungarian Academy of Sciences, Centre for Regional Studies, Debrecen–Pécs, 2009, 229 p.

During the past 35 years, deindustrialization has been one of the most significant structural changes in the economy of developed countries. Traditional industrial sectors – like mining, iron and steel industry, textile industry etc. – did disappear entirely from the European and North American economy, either because of their relocation into "cheaper" countries or by import substitution. The consequences are well known: drop in industrial employment and GDP output, and the dominance of the service and R&D sectors (70–75% of employment). This structural change was accompanied by a serious social crisis in the traditional industrial regions, what required a new type of economic and regional policy. In the developed economies the response was reindustrialization: parallel with the decline of traditional industries, a new, innovative, knowledge-based industrial sector grew. This industry needed less but highly qualified manpower, and was located in developed regions, in most cases in metropolitan regions, where the R&D sector, the production and financial services were concentrated.

This process had specific features in Hungary, as well as in the other East Central European countries. The deindustrialization process started 10 years later, it was squeezed in time, and accompanied with the transition crisis. Reindustrialization started later, to a considerable extent it was led by plant (sometimes R&D sector) relocations from more developed countries, and contributed to the sharply growing regional inequalities in the country. Consequently, we could formulate one of the critical questions of the contemporary Hungarian regional policy in the following way: what type of reindustrialization process should be promoted, which *a)* could be introduced in the less developed regions, too; *b)* could utilize local manpower and local infrastructure; *c)* has a clear growing potential and *d)* has a long perspective within the country, it is not menaced by frequent relocations. The authors of this book supposed that environmental industry could play such a role in the Hungarian reindustrialization process. The publication was based on an interdisciplinary research carried out in the Centre for Regional Studies, HAS and sponsored by the Ministry of Environment and Water Management.

The 13 papers present different aspects of the environmental industry, taking into consideration the key problems in Hungary, i.e. the consequences of climate change or the favourable conditions for the development of a biomass-based renewable energy production. The first two papers give a broad framework of the role of reindustrialization and environmental management in the Central European regional economics (Gy. Horváth; G. Lux). The state owned industry collapsed vehemently after the system change in 1990, but a reindustrialization started soon and the industrial employment reached pre-transition level in the most advanced i.e. Czech, Slovene, Slovak economies. Some sort of industry is a prerequisite for any type of economic development as even the dominating tertiary sector (including R&D, business services, transport) should be promoted to a great extent by the need of industry.

I. Fodor and A. Suvák present a useful summary of definitions of the environmental industry and the characteristics of global production and market of environmental goods. The market is clearly dominated by the largest economies of the world, with a few exceptions. In such a situation, it will not be easy to insert the small Hungarian economy into the innovative and knowledge based sector of the environmental industry, although the author of another paper (L. Oláh) is rather optimistic.

Most of the more analytical papers deal with rural/agricultural regions, partly dealing with environmental problems (including possible consequences of climate change on agricultural production) partly analyzing their alternative energy capacities. Just one paper presents the role of environmental industry in urban sustainability (that by G. Czeglédi tackling the case of Budapest). The scale of the problem would merit broader interest and more papers. Finally one can read a few case studies dealing with the application of environmental industry in regional development schemes in North Eastern Hungary.

There is an almost general consensus about the necessity of environmental management for a sustainable global future. It is frequently supposed that this management will be inevitably conflicting with pure economic interests: it requires the diminishment of economic output and need heavy investments without any net economic return. This interesting book presents an economically more attractive side of the environmental management: the growing importance of the environmental industry in regional development.

György Enyedi

CHRONICLE

Hungarian Geographical Bulletin 58 (4) (2009) pp. 297–309

Symposium on "The 100-year-old concept of Ice Age"

Pécs, October 1–3, 2009

The third and at the same time closing volume of the series „*Die Alpen im Eiszeitalter*" was published in 1909. The authors of this book, Albrecht Penck and Eduard Brückner laid the foundations of alpine ice age chronology and its division, which are still current in our days. To honour this centenary, an international conference was organized at the Department of Physical Geography, Institute of Geography of the University of Pécs. The scientific conference had basically two aims: first, to pay homage to the researchers Albrecht Penck and Eduard Brückner; second, to provide an opportunity for the researchers of the geomorphological discipline to share their recent achievements with each other including those interested in the new scientific results related to the ice ages. The conference attracted nearly 70 participants who delivered 50 lectures given in 5 sections devoted to different topics. On the first day, the public could listen to lectures of the plenary session, numerous posters were introduced, and professor emeritus Ferenc Schweitzer received greetings by his colleagues on the occasion of his 70th birthday. On the second day, the participants outlined their new results at the section meetings called "Geomorphology", "Geology and Palaeontology", as well as "The Impact of the Ice Age on Society". For the third day a professional field trip was organised.

The conference was opened by Zoltán Dövényi, head of the Institute of Geography. In his speech he presented a detailed report on Penck and Brückner's professional career. After that professor József Tóth congratulated professor Schweitzer on his 70th birthday, and handed over the presentation copy of the volume of studies dedicated to the person fêted. The professor was also congratulated by Mária Szabó, director of the Institute of Geography and Earth Sciences of the Eötvös Loránd University; by Antal Lehmann, retired AP, formerly director of the Duna–Dráva National Park; by Éva Kis, senior research worker of the FKI; by Gábor Varga, senior AP of the Institute of Geography in Pécs, as well as by József Eck, investment director of RHK Ltd.

The plenary session started with a lecture delivered by József Szabó entitled "The history of the research on ice ages – how old is the ice age actually?". As the exploration of the ice age(s) reaches back at least two hundred years, he summarized the results attained during the 100 years subsequent to the great work being the basic motivation of the conference. In his lecture called "The Pleistocene roots in the Miocene", László Kordos summarized the triggers of the great environmental changes in the Pleistocene, which reach back to the Miocene; he also gave an account of the role and results of Miklós Kretzoi and his students related to the division and investigation of the ice ages. Ferenc Schweitzer gave a lecture entitled "The opportunities of the formation of ice ages in the Late Neogene", in which he highlighted the importance of plate tectonics in their development, and also introduced the traces of the great climatic changes of the Late Neogene, being detectable in the Carpathian basin and its environment.

Group of participants listening to poster presentation, among them (left to right) József Szeberényi, Szabolcs Ákos Fábián, Ferenc Schweitzer, Bálint Berta and Zoltán Dövényi

Professor Schweitzer with representatives of the first generation of his disciples, now tutors at the Institute of Geography of the University of Pécs

Professor Schweitzer in action at Beremend limestone quarry

Mini field symposium on Pleistocene biostratigraphy at Kozármisleny section

In the poster section, young researchers and students were given the opportunity to briefly present their results in varied topics:

– Krisztina Babák: Relationship between the Quaternary changes of the floodplain of Körös and flood prevention;

– Viktória Bors and Alexandra Giber: Petrographic analysis of the stone blocks bigger than 20 cm in the South Pest Plain;

– Mónika Ginzer: National parks with remnants of ice ages as attractive tourism destinations;

– Judit Gyüre, Péter Kovács and Klára Stefán: Cultural infrastructure in Europe and Hungary related to ice ages;

– Gergely Jakab, Balázs Madarász, Ádám Kertész and Levente Ronczyk: The role of Pleistocene deposits in the current geomorphic evolution;

– Mladjen Jovanović, Ulrich Hambach, Tivadar Gaudényi and Slobodan Marković: Stratigraphy of the loess-paleosol sequences of the Middle Pleistocene in Voivodina;

– Annamária Kurilla and Tamás Vati: Scientific content of the animated cartoons aimed at the younger generation;

– Tamás Lassu: Recent geomorphic evolution of the eastern margin of the Pécs Basin;

– Hedvig Prokos and Gábor Varga: Morphology of the Séd Valley at Szekszárd;

– Bertalan Radvánszky: Modelling of climate changes in the drainage area of the Tisza;

– Tamás Vati: Representation of the ice age in the textbooks of geography in primary and secondary schools.

The first day was closed by a welcome party organized in the Hotel Laterum, where Ferenc Schweitzer was decorated for his efforts made for the Faculty of Sciences (University of Pécs) by the dean, István Geresdi.

On the second day, the scientific lectures were given within the framework of three section meetings. The section called "***Geomorphology***" was opened by Titusz Bugya, who presented the geoinformatic methods used for the identification of the alluvial terraces. Szabolcs Czigány and Ervin Pirkhoffer described the flash floods taking place at the end of the Pleistocene, and playing role in the geomorphic evolution of the north-western part of the USA. Szabolcs Ákos Fábián and Anita Horváth gave a lecture about the difficulties in dating of the periglacial permafrost phenomena – primarily that of the OSL dating problems of the sand wedges – and about the novel results. Péter Gadányi spoke about the Pleistocene changes of the volcanic surface features in Iceland. Noémi Lívia Görcs analyzed the Quaternary tectonic movements in the valley of the Baranya Channel. András Hegedűs and János Vágó characterized the derasional surface features of the Bükkalja based on complex morphological investigations. Tímea Kiss, György Sipos and Katalin Györgyövics examined the morphometric parameters of the sand forms to be found in the sample territory of Inner Somogy, with a special regard to the age of the surface features. István Péter Kovács presented the Somló's morphometric analysis on GIS basis, and demonstrated the main differences between the young and old derasional valleys. Dénes Lóczy presented an overview of the new scientific results related to the movements of ice. Krisztina Sebe and Dénes Laczik introduced the Pleistocene deflation traces detectable in the Mecsekalja, on the basis of the occurrence of ventifacts. György Sipos, Tímea Kiss, Zsolt Horváth and Levente Koroknai demonstrated the paleohydrological conditions of the Pleistocene and Holocene channels in the Lower Tisza Region. József Szeberényi presented the terrace levels of the Danube and its minor tributaries in the area of Kismaros–Verőce. Márton Veress gave a lecture about the impact of ice on karstification in the various sample areas of high mountains. Zoltán Zentai reported about the survey of the periglacial permafrost phenomena in Vas County.

As the opening lecture of the section meeting called "***Geology and Paleontology***", János Balogh talked about the identification of the Blake paleomagnetic event in the Hungarian loess stratotypes. József Dezső and János Ország reconstructed a Miocene karst development sequence from the pore deposits of the Cave of Abaliget, which – with a significant sedimentation gap – is superimposed by the Pleistocene deposit formation. Tivadar Gaudényi and Mladjen Jovanović examined the paleoenvironmental conclusions drawn from the molluscs fauna of the last glacial on the loess plateau at Titel. Erzsébet Horváth analyzed the application of the MS-curves, as well as the relation between other (OSL, TL, ^{14}C) methods of dating, in connection with the climate changes detectable in the loesses. Lajos Tamás Katona, László Kordos, István Linkai, Árpád Magyari and János Kovács introduced the detailed paleontological description of the mammoths of Csaják (*Mammuthus primigenius*) and the already existing data of the isotopic dating. In her lecture, Éva Kis analyzed the visible levels of Middle European loess stratotypes from several points of view. János Kovács talked about the possibilities of global correlation between paleosols, which represent numerous new research topics and pose problems for the experts. Csaba Víg gave a lecture about the granulite gravels to be found in the gravel succession of the southern part of the Pest Plain, as well as represented its possible places of origin.

Within the section meeting "***The Impact of the Ice Age on Society***" Balázs Bradák demonstrated a possible modern interpretation of the ice age theories. Péter Gyenizse and György Lovász analyzed the impact of the Pleistocene and Holocene deposits and processes of human settlement in south-east Transdanubia. László Gyuricza investigated the role of the surface features in tourism, and characterized them according to tourism product types. András Hervai presented landscape reconstruction of the ice age. Ádám Kertész talked about the potential geomorphologic processes of the global climate change and the Holocene interglacial, and also emphasized the rising frequency of extreme events. László Nagyváradi the ancient floods of the Danube and its influent streams analyzed within the frameworks of an international project (NSF). Vilmos Pozsár demonstrated the conditions of Pleistocene glaciation over the continents beyond Europe. Levente Ronczyk gave a lecture about the anthropogeomorphic surfaces of Pécs, highlighting the importance of anthropogenic filled-up surfaces.

On the last day of the conference, a professional field trip took place. The participants visited the fauna site at Kozármisleny, which was introduced by Gábor Varga and Bertalan Radvánszky. The findings revealed during the building of the subsidiary road of the highway M6/M60 are the representatives of the typical Late Pleistocene cold steppe fauna. Szabolcs Ákos Fábián talked about the formation problems of the Pécs Basin from the point of view of neotectonics, loess-stratigraphy and outlined the evolution of the valley- and drainage network. While on the bus trip, Vilmos Pozsár introduced the physical geography of the Villány Hills and its environment, emphasizing the definite structural morphology. In the limestone quarry of Beremend, Ferenc Schweitzer demonstrated the role of joint-filling deposits (red clays and reddish soils) played in the reconstruction of paleoenvironment. György Varga spoke about the possible chronological subdivision and stratigraphic problems of old loesses and loess-like deposits.

The professional lectures given during the three days of the conference have proven unambiguously that the research on the Pleistocene and the ice ages still has several open questions, and also drew the attention to the outstanding scientific achievements of the Hungarian experts, even in international comparison.

Szabolcs Ákos Fábián – Bertalan Radvánszky

Workshop on migration to V4 countries

Supported by the Visegrad Fund and organised by three academic institutions of Budapest: the hosting Strategic and Defense Studies Center of Zrinyi Miklós National Defense University (ZMNDU), Institute of Geography of Eötvös Loránd University (FI ELTE) and Geographical Research Institute (GRI) HAS, an international workshop entitled *Migration Challenge to the Visegrad Countries from Eastern Europe* was held on October 19, 2009. The meeting was particularly timely as following the change of regimes in CEE countries having occurred twenty years ago, two distinct periods could be identified. The 1990s were years of institutionalization of migration and refugee affairs based on laying the legal foundations, whereas the first decade of the 21th century brought EU membership for V4 countries and their subsequent accession to the Schengen zone, with all the consequences.

Migration is typically an interdisciplinary subject and when demographers, geographers, lawyers, statisticians, police persons and representatives of state administration or political science get together, each of them has a genuine approach of his/her own to entertain the partners. This time it was M. Lesińska (Centre of Migration Research, University of Warsaw) who outlined the binding *EU targets*:

- To shape an internal labour market;
- To achieve limited migration from third countries;
- To form welfare system for new members;
- To establish migration policy;
- To draw soft and hard borders.

A persistent problem with migration is the *reliability of data*. M. Rédei (FI ELTE, Budapest) mentioned the official number of foreign citizens staying in Hungary in early 2008 (altogether ca 180 thousand, including 40% Romanian and somewhat less than 10% Ukrainian citizens /90% of the latter are ethnic Hungarians/, thousands of Slovakian and Polish citizens etc.) Red card is shown to negatively selected foreigners (mainly unskilled persons), whereas red carpet is spread out to the positively selected people. K. Mezentsev (Taras Shevchenko University, Kyiv) listed the official figure of the Ukrainian citizens staying abroad (72 thousand), added the western estimations ranging between 1 and 7 millions, and those of his own (1.5 to 2 millions). Real dimensions can be assessed through transfers by Ukrainians to the homeland estimated at 3 billion USD annually, roughly the sum total of the wages and salaries in Ukraine. The following speaker, V. Anderson (University of Odesa) cited the expertise carried out at Canon Law Institute, Washington: 8 billion USD was transferred home by 5 million Ukrainian labour migrants (GDP in Ukraine is around 30 billion USD). D. Karácsonyi (GRI HAS, Budapest, lecturing jointly with Á. Kincses Hungarian Central Statistical Office, Budapest) referred to the difference between the last Soviet census (1989) and the first Ukrainian all-national one (2001) accounting for a 4 million people in minus, 1 million of which they evaluated as migration loss. L. Jeney (Corvinus University, Budapest) mentioned that 40% of the Ukrainian migrants to V4 countries headed for the Czech Republic.

Anybody may ask: what do *migration challenges* actually mean? According to A. Szabó (ZMNDU) international migration is a natural phenomenon of globalisation which poses a serious threat to security and he presented maps showing the primary itineraries of human trafficking: leading from Ukraine, Romania and ex-Yugoslavia via Bratislava–Czechia to Germany; via Vienna to Germany and via Hungary–Slovenia to Italy. A Stummer from the National Bureau of Investigation (Budapest) added routes of illegal migration with a special reference to those via Turkey and the Balkans.

The administrative and service centre of the Office of the UN High Commissioner for Refugees in Budapest

The *new chronology of migration* started just twenty years ago, and the workshop recalled the history of these two decades sometimes full of dramatic events. In Hungary the new style began on January 1 1990 very much under the pressure of the massive influx of Hungarians from Transylvania, citizens of Romania (M. Rédei). In the following years there emerged institutions dealing with migration and refuge affairs, aliens policing act was adopted in 1993 (at the time of Yugoslav War), act on asylum seeking was passed in 1997. The start of EU accession negotiations in 1998 differentiated between the relation to the citizens of member states and to nationals of third countries. The EU accession of the V4, Slovenia and of three Baltic countries (May 2004) has led to 1.4 million labour migrants from the region. The amalgamation of Hungary into the Schengen zone (December 2007) was also essential and followed by organisational reforms i.e. passing of control from the border guard to the Ministry of Internal Affairs (January 2008). But the scenario varied from country to country within CEE.

The above statement was demonstrated by M. Lesińska on the *example* of the Poles' flow into the EU and of Polish-Ukrainian relations. Labour migration to the west of Europe had a relatively long tradition (1960s through 80s) in Poland and it became accentuated by the political turn in the country and its accession to the EU. UK, Ireland and Sweden have been the primary destinations due to their policy of adoption of unrestricted flow of labour migrants from member states. For the Ukrainians migration to Poland was visa free up to 2003 then it fell under visa regime (2003–2007) until Schengen borders were established. Work permission regime was adopted simultaneously and employers had to

issue a declaration on the intent to hire a foreigner furnished with his/her data. A black market of permit issue emerged immediately. In 2008 there were 300 thousand migrants from Ukraine; in the same year 3 thousand work permits were issued officially. The current aphorism is: legal presence with illegal labour.

A huge area of the Balkans and East Europe can easily be called *Absurdistan* as regards illegal migration. Macedonians *en mass* have been trying to obtain Bulgarian citizenship since 2007, and then to escape to the west (A. Stummer). A ca four million population of Moldova have dwindled virtually due to the outflow primarily of males seeking labour in CIS and EU countries. The latter itinerary leads across Romania and Hungary, with Moldavians usually hiding in containers. Numerous young ethnic Moldavians (Ukrainian nationals) living in Budjak, Odesa oblast make attempt to receive high education in Chişinau for language reasons then to get to Romania. By contrast, many people commute from Transnistria (Transdnestr) to Odesa and environs with high demand on unskilled workforce (V. Anderson). Most of them have all kinds of documents, i.e. Russian, Moldavian, Ukrainian passports. But perhaps the most shocking slide was shown by V. Benc (Slovak Foreign Policy Association, Prešov) about the highly massive five-zone screening system on the 90 km long Slovakian–Ukrainian border to contain illegal migration. With closing the local markets the number of pending petit traders predominantly selling cigarettes dropped considerably both in Poland and Slovakia.

Epilogue. One week after this workshop on migration I had an occasion to listen to a lecture by Z. Boross (National Bureau of Investigation) on illegal migration. Beside the stories about Vietnamese and Somali workers escaping from the construction works of the forthcoming European football championship heard during a recent official visit to Kyiv, he made an attempt to press out some useful information from the Ukrainian colleagues about illegal migration. The highly ranked official said: "If I furnished you with them I would commit high treason and you might easily become a spy." These were the words of consolation offered instead of active collaboration.

László Bassa

IAG/AIG Regional Conference on Geomorphology "Landslides, Floods and Global Environmental Change in Mountain Regions"

Braşov, September 15–26, 2008

Between the International Conferences in Zaragoza (2005) and Melbourne (2009), the International Association of Geomorphologists (IAG/AIG) managed to organize extraordinarily numerous meetings: in Goiânia (Brazil, 2006), in Kota Kinabalu (Sabah, Malaysia, 2007) and in Braşov (Romania, 2008). At the Romanian meeting, the broad international participation was accompanied by the presence of all IAG/AIG officers – from President to Webmaster. The chief organizer was Prof Dan Bălteanu and his colleagues from the Institute of Geography, Romanian Academy of Sciences in Bucharest. Support was provided by the Romanian National Council of Scientific Research of Higher Education (CNCSIS). The summer school for young geomorphologists (where a Hungarian youth also took part) was financed by the Romanian Ministry of Education, Research and Youth and the National Authority for Scientific Research (ANCS).

Participants of the IAG/AIG Regional Conference visiting the open air ethnographical museum in Bran

The venue was well selected next to the centre of the old town, in the building of the Faculty of Silviculture and Forest Engineering of the Transilvania University. The participants appreciated that registration, accomodation and field trip costs were kept affordably low.

The scientific programme was fairly comprehensive for a regional conference. Oral and poster presentations included topics from the fields of landslide mapping, history, and susceptibility assessment, flood risk assessment, river geomorphology and sediment dynamics, techniques in natural hazards investigations and environmental change. Most of the plenary papers by the internationally best known experts (D. Bălteanu, M. Fort, M. Crozier, I. Alcántara Ayala and F. Audemard) dealt with the problems of landslides from New Zealand to Venezuela. Added to this programme, several Working Groups (Geomorphological Hazards, Geomorphology and Society, Human Impact on the Landscape and the Carpatho-Balkan-Dinaric Regional Working Group) had paper sessions and business meetings.

The cultural events with local food and music, the one-day trip to Poiana Braşov (led by B. Mihai) and the post-conference field trips aquainting us with the problems of landslides and floods in the Fagaraş Mountains (led by V. Surdeanu and P. Urdea) and in Sighişoara and the Curvature Carpathians (led by M. Micu) were equally a success.

We are grateful for the organizers who made this conference a memorable event for all participants.

Dénes Lóczy

Homage to Ferenc Schweitzer on his 70th birthday

Professor Schweitzer, who has been working in the Geographical Research Institute of the Hungarian Academy of Sciences (GRI HAS) for 45 years, started his academic career in the institution then led by Márton Pécsi. In the field of physical geography he was mainly influenced by the heritage of Lajos Lóczy and Jenő Cholnoky. At the same time he was supported by and has maintained close contacts with the senior contemporary representatives of geomorphology (Zoltán Borsy, Zoltán Pinczés), karst morphology (László Jakucs), and of related sciences such as paleontology (Miklós Kretzoi, Dénes Jánossy), archeology (László Vértes, Miklós Gábori), geology (György Wein), hydrogeology (Mihály Erdélyi), and hydrology (László Alföldi).

Having joined the team led by professor Pécsi, F. Schweitzer became immediately involved in chronostratigraphical studies on Quaternary deposits, mainly on loess and loess-like sediments. Broad orientation, capability and diligence in data collection and sampling coupled with sharp-sightedness in field work, observations and mapping have been his strong points from the very beginning. Terrace morphological investigations with a special reference to the position of travertine horizons formed the topic of his Candidate of Sciences (CSc) thesis defended in 1983. These and subsequent fundamental studies have greatly contributed to the understanding of the geomorphic evolution in the Carpathian Basin during late Cenozoic and of the interpretation of the Plio-Pleistocene boundary; Schweitzer's DSc thesis (1993) was mainly based on them. More recently he became interested in climate and environmental cycles in the region during the past 12–10 million years starting with the subarid phase of late Miocene, with stages of desertification, and ice ages during the Pleistocene. Schweitzer's interest is not restricted to Planet Earth; the Mars Mission inspired his recent essay "Ventifacts on Mars".

Along with his involvement in classical problems of morphology, Schweitzer was active in applied research in physical geography. These activities started back to the 1970s with engineering geomorphological survey in general and mapping of surfaces affected by mass movements (collapses, slumps in loess and other landslides) in particular. They were epitomized in expertises and series of large-scale maps, and led eventually to the methodological issues of the morphological approach to environmental impact analysis of large projects such as the Paks Nuclear Power Plant (e.g. transit routes of migration of radionuclides emitted). Professor Schweitzer has acted as member of the expert committees on the safe disposal of radioactive wastes of PNPP and on the extension of the operation of the power station. His interest in fluvial geomorphology led him to important conclusions about natural levee formation and floodplain sedimentation and to practical aspects of these processes in flood control on the Tisza river where he is also among the advisors.

Two former PhD students Gábor Varga and Gizella Bátori with the master

Congratulations by Szabolcs Ákos Fábián, accompanied with profs József Tóth and Zoltán Dövényi

Ferenc Schweitzer became deputy director of the GRI HAS in 1994 and he has been serving in the capacity of director since 1997. He is a regular member of Szent István Academy of Sciences (2002), honorary member of the Hungarian Geographical Society (2001) and its vice president since 2009, honorary member of the Hungarian Karst- and Cave Research Society (2001), member of the Hungarian Geological Society. He held positions in commissions of the International Union of Quaternary Research (INQUA), Carpatho-Balkanian Geomorphological Association, and in those of the HAS (geography, geomorphology).

As participant of congresses and conferences of INQUA, IGU (International Geographical Union), IAG/AIG (International Association of Geomorphologists), Professor Schweitzer has travelled extensively. Apart from appearances across Europe he made professional trips in Central Asia, Siberia, and Alaska, Israel and Iran, India, China and Japan, Mexico and Brasilia, South Africa, Australia and Oceania. These journeys allowed comparative analyses e.g. between warm and cold loesses developed under various environmental conditions.

Ferenc Schweitzer had nearly 250 scientific contributions published in Hungarian and foreign languages.

His teaching activities began by the end of the 1980s as visiting lecturer in environmental and engineering geomorphology at a teachers' training college in the city of Pécs. Later his attractive personality and informality in personal contacts won the sympathy and affection of students at the University of Pécs, where a school from his disciples was created almost spontaneously. His title of dr. habil dates back to 1995. He has been tutor at a doctoral school since 1997 and numerous PhD theses were prepared under his guidance. For his birthday a volume of studies were edited by his former students, now researchers and university lecturers on their own, and most of the authors also belong to this circle (of "Schweitzer Hussars"). "From travertines to desert varnish" says the title which best reflects his life work. The about thirty laudations by a university rector, a former minister, academicians, colleagues and disciples cover forty pages, and somebody even wrote seven haikus and a limerick for him. On congratulations and celebrations you may read in another report of Chronicle in this issue of the Bulletin.

Éva Kis