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Strategy or disaster

Flood prevention related issues and actions in the Tisza River basin

Ferenc Schweitzer[1]

Abstract

Changes in land use of the lowland landscape along the Tisza River have largely been shaped by processes that took place after flood control and regulation measures of that river. As a result fluvial accumulation has either been eliminated or restricted to the flood plain. At present human settlements extend to some segments of the low flood plain threatened by flood hazard. The amended Vásárhelyi Scheme focuses on raising embankments and extension of flood plain. Floods called the attention to problems that have to be solved, such as the stability of levee slopes. To prevent slope slumps it would be reasonable to start studies on flood control embankments in order to reveal sections endangered by an extreme water pressure during floods.

Key words: geomorphology, flood hazards, flood plains, Tisza River Valley

Rising from the Northeastern Carpathians, Tisza River flows into the Danube after covering 946 km. The catchment of the Tisza (157,186 km^2) opens up toward the W and SW. Within its 700 km long section across the Alföld (Great Hungarian Plain), the water level remains below 100 m a.s.l. Along the middle and lower reaches in the plain its valley is asymmetric: geomorphologically it flows in a trough-shaped depression upon its low flood plain.

Tisza River emerged in the Late Pleistocene and initially it crossed the plain with its tributary Szamos (Someş) eastward from its present-day channel. Its terraces of Pleistocene age are to be found in the latter regions. The river had been attracted to its present-day position by the Holocene depressions located east and north of Nyírség, the recent depression of Jászság and by the Szolnok–Titel trench. Its meandering channel changed frequently until the completion of water regulation, which were performed according to the concept of Pál Vásárhelyi. The flatland is rich in microrelief forms as evidenced by the presence of cut-off meanders, double and triple channels (*Fig. 1*). Masses of water provided by floods stepping out on the left bank between Tiszadob and Tiszafüred, flowing across

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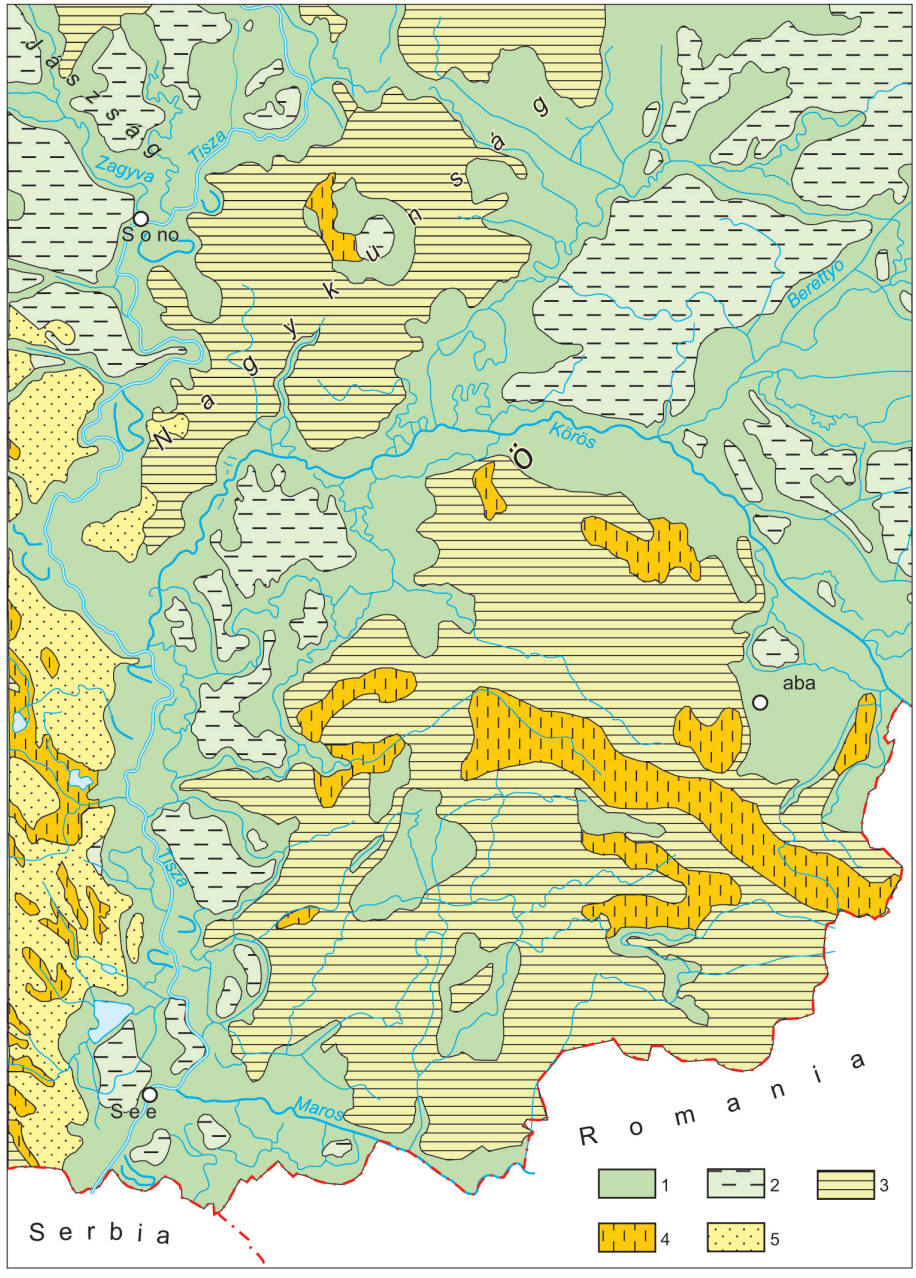


Fig 1. Relief types in the southeastern part of the Alföld. – 1 = low flood plain; 2 = low flood plain of poor drainage; 3 = flood-free lowland (high flood plain); 4 = low alluvial fan covered with infusion loess; 5 = slightly rolling sandy lowland

swamps and transported by the Hortobágy stream reached the Berettyó marsh situated 30–35 km away. The shallow (30–40 cm deep) water and the swamps once formed part of the extensive wetland within the Tisza drainage basin. Hortobágy stream flows north to south in a ca 10–12 km wide clayey channel, filled up with 8–10 m thick fluvial–alluvial sediments down to its tributary to Körösök. This minor valley used to be the track of the great floods; by now the area lying deepest within the Nagykunság and Hortobágy regions has been silted up.

Nowadays huge masses of water originating from heavy rainfalls in the mountain frame and surging up in the plain create emergency situation during high stages. They cause floods of long duration and make large areas waterlogged in the Tisza valley.

The settlements along the rivers of the Alföld were located in the so-called high flood plain, which had not been inundated even during the most devastating floods. The ancient Tisza and its tributaries had flooded huge areas in the plain, a considerable part of which was occupied by marshy areas and backswamps (*Fig. 2*).

The idea of the regulation of the Tisza River had been raised for the first time during the reign of King Matthias Corvinus, in the second half of the 15th century. It was he who issued the first decree that levees must be erected in order to protect the land. The basis of water regulation was created much later: the Habsburg Emperor Francis II emanated a law in 1807 encouraging the organisation of associations aimed at flood control and water regulation.

As a result of mapping of the Tisza between 1834–48 led by Sámuel Lányi it had become obvious that high water endangered 854 settlements in 18 counties, among them even some of those, which were located on the high flood plain and hitherto had not been inundated. It was a token of the low flood plain being silted up.

As a consequence of forest clearance, rough grazing and land cultivation along the river and probably enhanced by mining and quarrying activities within the drainage basin, runoff had increased and together with the risen high water levels they posed a serious threat for human settlements. To protect the towns and villages, linear infrastructure and agricultural land the Tisza Valley Association was organised in 1846 under the guidance of Pál Vásárhelyi. It also pursued planning, co-ordination and implementation of activities on flood control and water regulation.

Construction of a system of embankments along the Danube and Tisza rivers and tributaries also involved the construction of artificial channels, cutting off meanders and reclamation of swampy areas through the operation of drainage canals. These measures have been and still are considered one of the most radical contemporary interventions in the natural conditions of Europe. These measures were taken for the solution of tasks set by the socio-economic demands of the time.

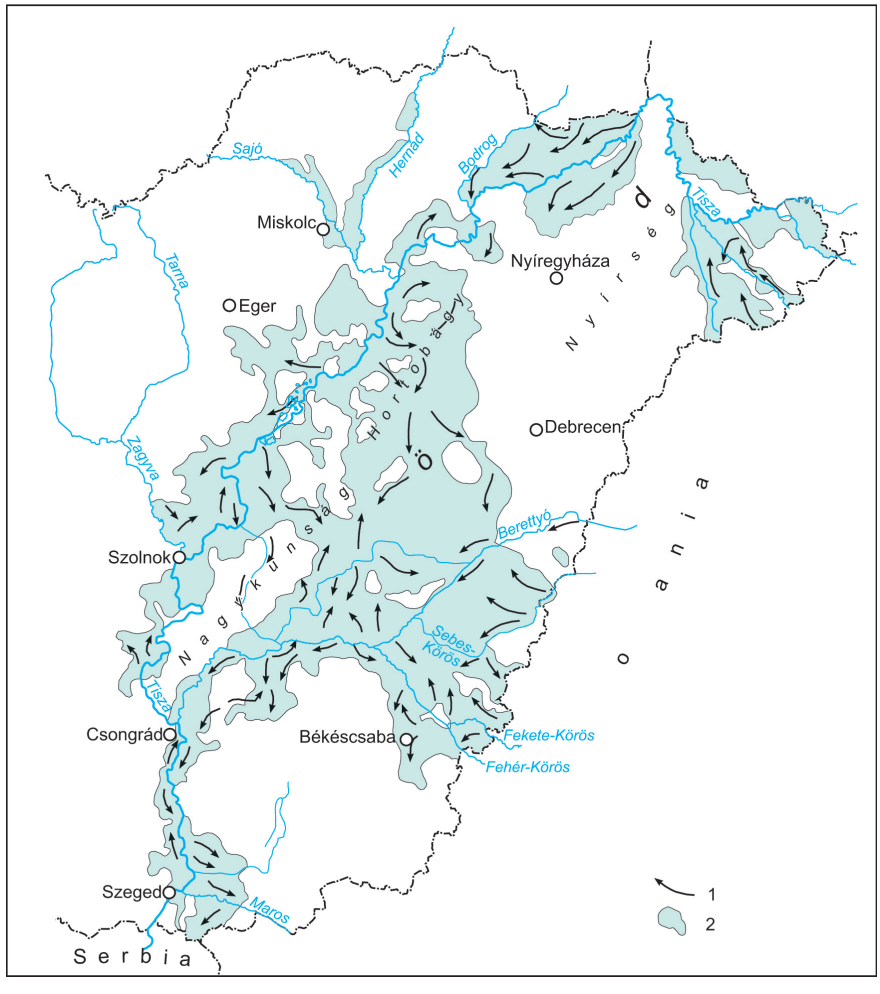


Fig. 2. Waterlogged areas in the Tisza valley prior to water regulation (Ihrig, D. 1952). – 1 = outlet of water from the river channel and direction of currents; 2 = inundated areas

As it is well known, initiation of water regulation along the Tisza was the merit of Count István Széchenyi and implemented partly according to the plans elaborated by Vásárhelyi. These activities were based on the hydrological law of Vásárhelyi, the validity of which for the middle stretches of great rivers had been recognised internationally. For instance, flood control and water regulation of the Middle Rhine and Mississippi valleys were executed on its basis.

What was the main point of this law? Vásárhelyi's attention was drawn by the facts that during mean water the Tisza is in equilibrium and does not

build sandbars. He had come to the conclusion that effective measures on regulation are only feasible if:

a) the river is shortened by cutting through the braided channels (meanders),

b) floods provide a rapid drainage (travel time) similar to that of mean water which means that between channel width and depth of floods there should be an identical ratio as between those of mean water.

Taking into account the above considerations, Vásárhelyi calculated the average distance between the embankments, and found it to be 750 m (changing between 500 and 1900 m depending on local factors). This caused serious commotion among the concerned public because close embankments could involve higher levels of floods with a growing hazard of the failure of dikes. This uncertainty and panic mood had been the reason why the Italian engineer Pietro Paleocapa had been invited as an expert. It was he who proposed the system of flood protection applied for the Po River i.e. shaping of a wide flood bed to be inundated by the great floods and of inner dikes along the river to hold back the lower summer floods.

However this system has a defect of its own: due to silting up of the flood bed by high waters year after year, the levels of floods rise as well. Nowadays the Po filled up its flood bed to an extent that low water of the river flows higher than the roofs of the houses in Ferrara.

From this short historical review it becomes clear that the optimum extension of the flood bed between dikes and levees has been a controversial issue since the time of Vásárhelyi and Paleocapa. So was the number of meanders to be cut through. Vásárhelyi planned 102 meanders to cut off, whereas Paleocapa found it necessary to shorten the channel by 15 meanders. Thus the river had been shortened (from 1420 to 977 km) whereas the stream gradient increased and the character of beds of low and medium discharge slightly shifted toward the upper reaches. Rivers leaving mountain and hill regions suddenly acquire lower section character owing to an abrupt fall in stream gradient. In natural conditions sediment load of watercourses accumulates in alluvial fans (in a way the Nyírség or the Maros fan emerged) but it has recently been enforced to deposit in relatively narrow flood beds between the levees.

The Tisza and tributaries have always been rich in sediment load. Even the most ancient settlements situated on high flood plains were inundated sometimes because the low flood plain in their surroundings had been silted up.

Natural sediment transport probably has grown with the progressing urbanisation and during 150 years of flood control the process of silting up and relief evolution of flood beds with the emergence of point bars accelerated.

The updating of maps along the Tisza started in 1974 but later it was postponed. Preparation works called attention to the process of silting up (Sass, J. 1981). Nevertheless, filling up of the flood bed and formation of point

bars had been neglected up to the turn of the millennium. It might sound absurd, because Vásárhelyi's concept was a controversial issue, just on the basis of this problem. Though some experts did take into account the rise of high water stages on the flood plain pressed by the embankments, the rate of sedimentation was underestimated. Nowadays this has led to a situation when the embankments need to be raised regularly and if the present conditions are going to survive, this problem is here to stay (*Fig. 3*).

According to the measurements and joint mapping activities of the Geographical Research Institute HAS and KÖTIVIZIG, the flood bed of the Tisza river at Szolnok has been silted up in a thickness of 200–240 cm since the water regulation measures. During the same period the flood plain of the Körösök has raised by 160–180 cm. The 5, 10 and 13 cm thick sediment layers accumulated by the floods of the past years or decades are clearly discernible (*Figs 4* and *5*). Based on VITUKI (1983) data each flood of the Tisza between 1976 and 1983 left an average 30 cm thickness of deposits, in spite of the mitigating effect of the Kisköre water reservoir. During the great flood of spring 2000, 14 cm thick sediment was deposited upward Szolnok.

This process will lead to the situation when flood waves occur higher than the level of the low flood plain prior to flood control measures, which used to be inundated regularly. E.g. now the Tisza does not flow along the deepest line of the valley but upon a silted up flood bed so once it steps out to the flood plain, the return of its water to its elevated channel is made impossible. It seems the same is happening to the Tisza and its larger tributaries as it has occurred to the Huang He in China or to Po River and its environs in Italy (*Fig. 6*).

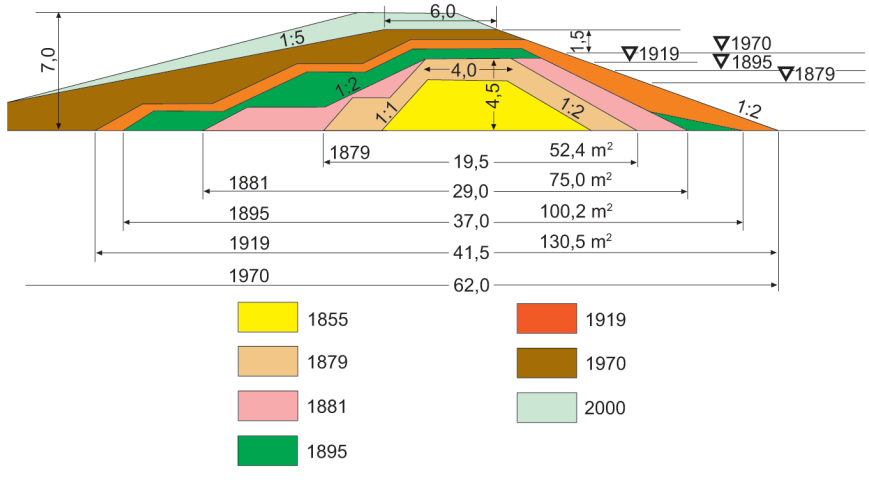


Fig. 3. Rising of the embankment along Tisza (Schweitzer, F. 2000)

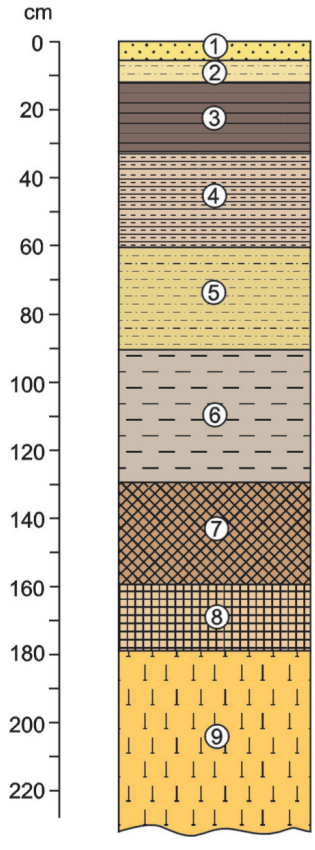


Fig. 4. Profile of the flood bed sediment sequence along the Körös River in Takácszug. – 1 = grey micaceous sand; 2 = grey silty sand; 3 = dark brown clay; 4 = stratified silty clay; 5 = grey silty fine sand; 6 = grey fine sandy silt; 7 = greyish-brown hydromorphous soil; 8 = hydromorphous soil formed prior to flood control measures; 9 = infusion loess (Schweitzer, F. 1999)

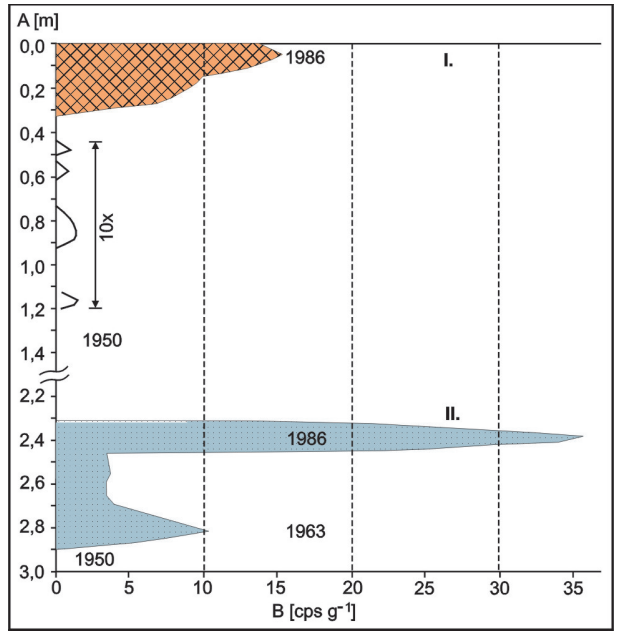


Fig. 5. ^{137}C distribution in the sediments of (floodway) point bar (I.) and Marótzugi-Holt-Tisza (abandoned meander, II.), after Braun, M.–Dezső, Z.–Hadady, Gy. 2001. – A = depth; B = ^{137}Cs activity concentration; 10x = tenfold magnification

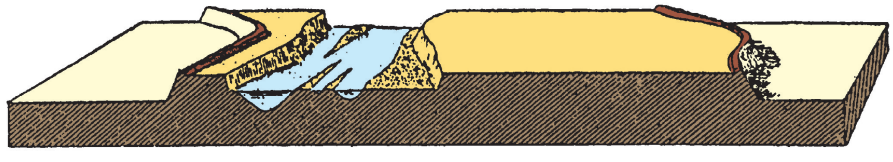


Fig. 6. Bloc-diagram showing silting up of the channel of Huang He, China (after Cholnoky, J. 1900). The initial height of the embankment was 14 m and the flood bed was filled up to 11.5 m. The distance between the dikes was ca 11 km (Schweitzer, F.–Nagy, I.–Alföldi, L.)

An extreme rate of silting up of flood beds is described in the book written by Jenő Cholnoky entitled 'The land of dragons' (1900, p. 293) in relation with the Huang-he at Kaifeng. He writes: "I approached the big river from the large settlements stretching at the mountain foothills and reached it on 13th January. The height of the embankments is14 m but the river filled up the channel so that they are only 2.5 m higher above the flood bed. Terrible situation! No wonder that the failures of the dikes along the Huang He are so devastating!" (

It is widely acknowledged that in 1999 and 2000 dike failures could be prevented along several sections of the Tisza and its tributaries in the Great Plain only with the involvement of enormous material expenditures and human effort. However, in 2001 in the Bereg environs a dike failure occurred at Tarpa (*Fig. 7*). On the map compiled by Ihrig, D. (1952, *Fig. 2*) the most critical places and the extent of the waterlogged area can be seen.

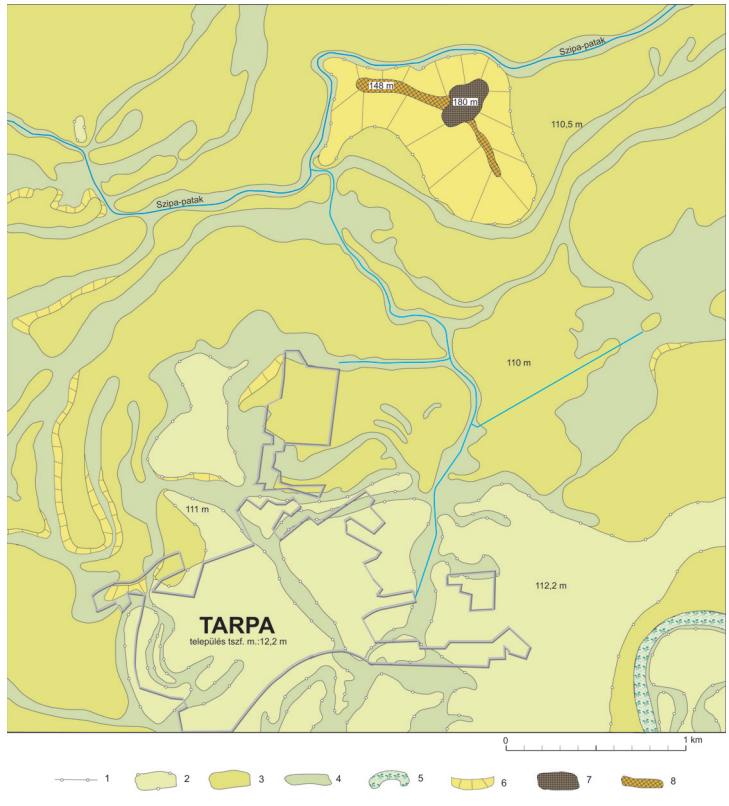


Fig. 7. Geomorphological sketch of the environs of Tarpa (comp. by Balogh, J. 2001). – 1 = rim of the high flood plain; 2 = high flood plain; 4 = filled up former meander; 5 = cut-off meander, waterlogged; 6 = slope, undistinguished; 7 = higher summit level between 160–180 m; 8 = lower summit level between 140–150 m

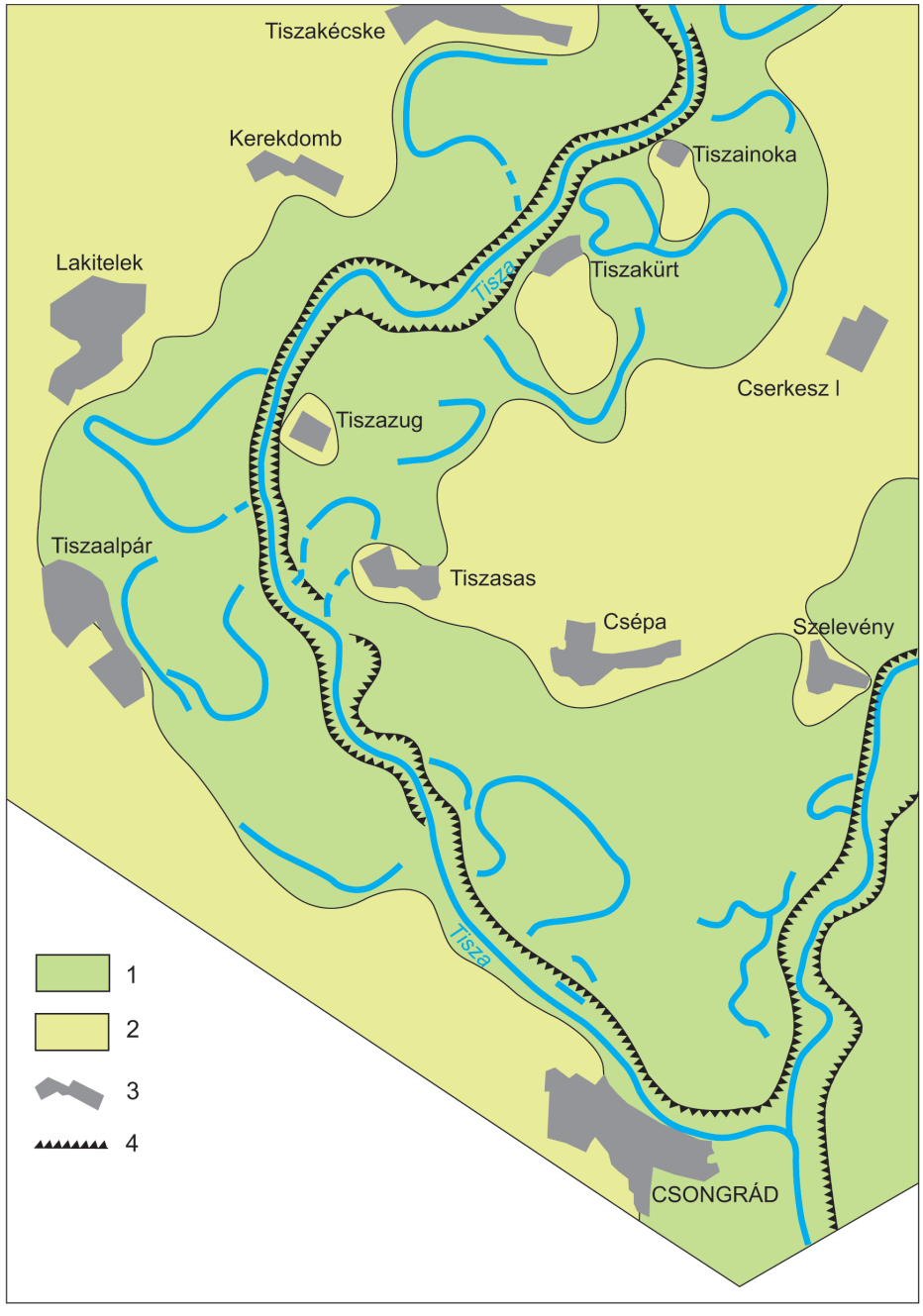
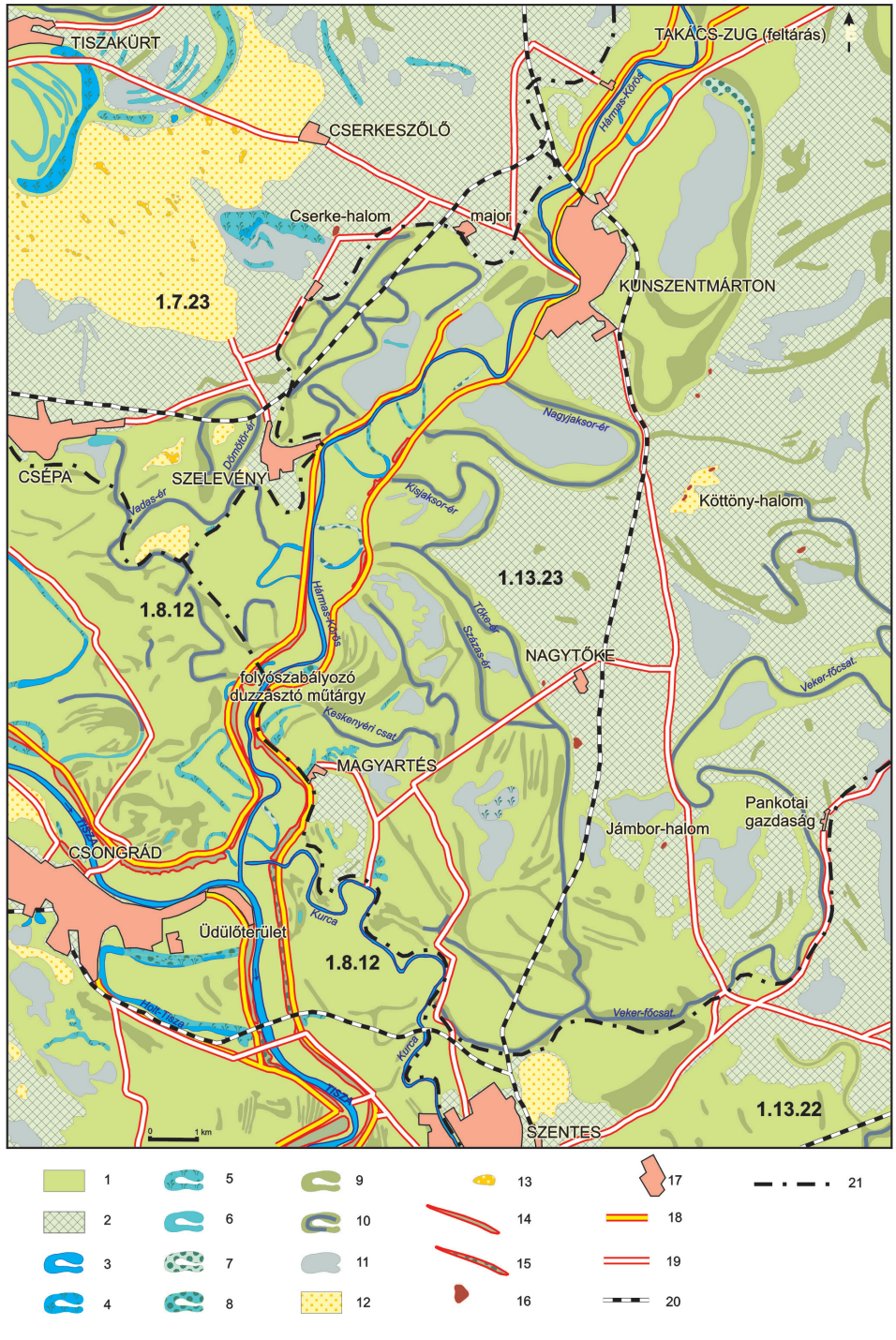


Fig. 8. Geomorphological sketch of the section between Tiszakécske and Csongrád. – 1 = low flood plain; 2 = high flood plain; 3 = settlement; 4 = embankment


TISZAKÜRT
TAKÁCS-ZUG (feltárás)
CSERKESZŐLŐ
Hármas-Körös
Cserke-halom
major
KUNSZENTMÁRTON
1.7.23
Nagyjaksor-ér
Dombkor-ér
CSÉPA
SZELEVÉNY
Vadas-ér
Kisjaksor-ér
Köttöny-halom
1.13.23
1.8.12
Hármas-Körös
Tőke-ér
Százas-ér
NAGYTŐKE
folyószabályozó
duzzasztó műtárgy
Veker-főcsat.
Keskenyéri csat.
MAGYARTÉS
Pankotai
gazdaság
Jámbor-halom
CSONGRÁD
Kurca
Üdülőterület
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No chance must be given to what occurred repeatedly in the 20th century (1919, 1925, 1940, 1948, 1970, 1974, 1998, 1999, 2000) that the high water reached or overgrew the crest of dikes and levees. The latter were constructed for a probability of the occurrence of the highest floods once in 50 years. Owing to the silting up of the flood bed they are either to be raised time and again (which has been the practice so far) or it must be completed by another solution.

The opening of the flood bed in places where the emergency storage is allowed by geomorphologic, economic and social geographical conditions and by the infrastructure would contribute to the revival of quasi-natural conditions (Schweitzer, F. 2001, *figs 8* and *9*). The construction of detention reservoirs is considered part of the amended Vásárhelyi Scheme (Váradi, I.–Nagy, I. 2002, *Fig. 10*). Also this could provide solution for a nation-wide strategic problem because emergency situations threaten the security of life and property of nearly 1.5 million people. To counterbalance a permanent rise of flood levels dikes and levees must be enforced and raised periodically. As it was the case during the high water stages of the Tisza in 1999 and 2000, a system of more than one hundred years' age is slowly improved at the price of incredible human effort and material means. The question however is if the whole system is able to meet the security requirements during the forthcoming centuries.

Large hydrological schemes must be supported with huge investments and they are to serve for long duration; their substitution is highly expensive and time consuming. Along the Körösök a very narrow (50–70 m wide) flood bed was left during water regulation in the late 1800's (Alföldi, L. 1999). It continues into the 150–200 m wide flood bed on the Transylvanian part of the valley. This funnel-shaped configuration has resulted in a bottleneck and led to frequent dike failures, threatening with piping and extension of waterlogged areas during each flood. To prevent this hazard either flood beds should be broadened along the Hungarian section or the dikes must be relocated (*Fig. 8*).

←

Fig. 9. Geomorphological map of the outlet of Körösök to the Tisza (comp. by Balogh, J. 2001). – 1 = low flood plain; 2 = high flood plain; 3 = cut-off meander, intermittently waterlogged; 4 = cut-off meander, permanently waterlogged, with reed-sedge vegetation; 5 = cut-off meander, intermittently waterlogged, with reed-sedge vegetation; 6 = filled up former meander, intermittently waterlogged; 7 = filled up former meander in flood-plain gallery forest; 8 = filled up former meander in flood-plain gallery forest, intermittently waterlogged; 9 = filled up former meander cultivated as cropland; 10 = = filled up former meander, drained; 11 = alkaline, waterlogged flat; 12 = wind blown sand; 13 = sand dune. Man-made landforms: 14 = row of pits on the flood bed (for dike construction); 15 = row of pits for dike construction with gallery forest coverage; 16 = kurgan; 17 = flood levee; 18 = highway; 19 = railway; 20 = settlement; 21 = boundary of natural microregion; 1.7.23 = Tiszazug; 1.8.12 = South Tisza Valley; 1.12.22 = Csongrád plain; 1.13.23 = Körösszög

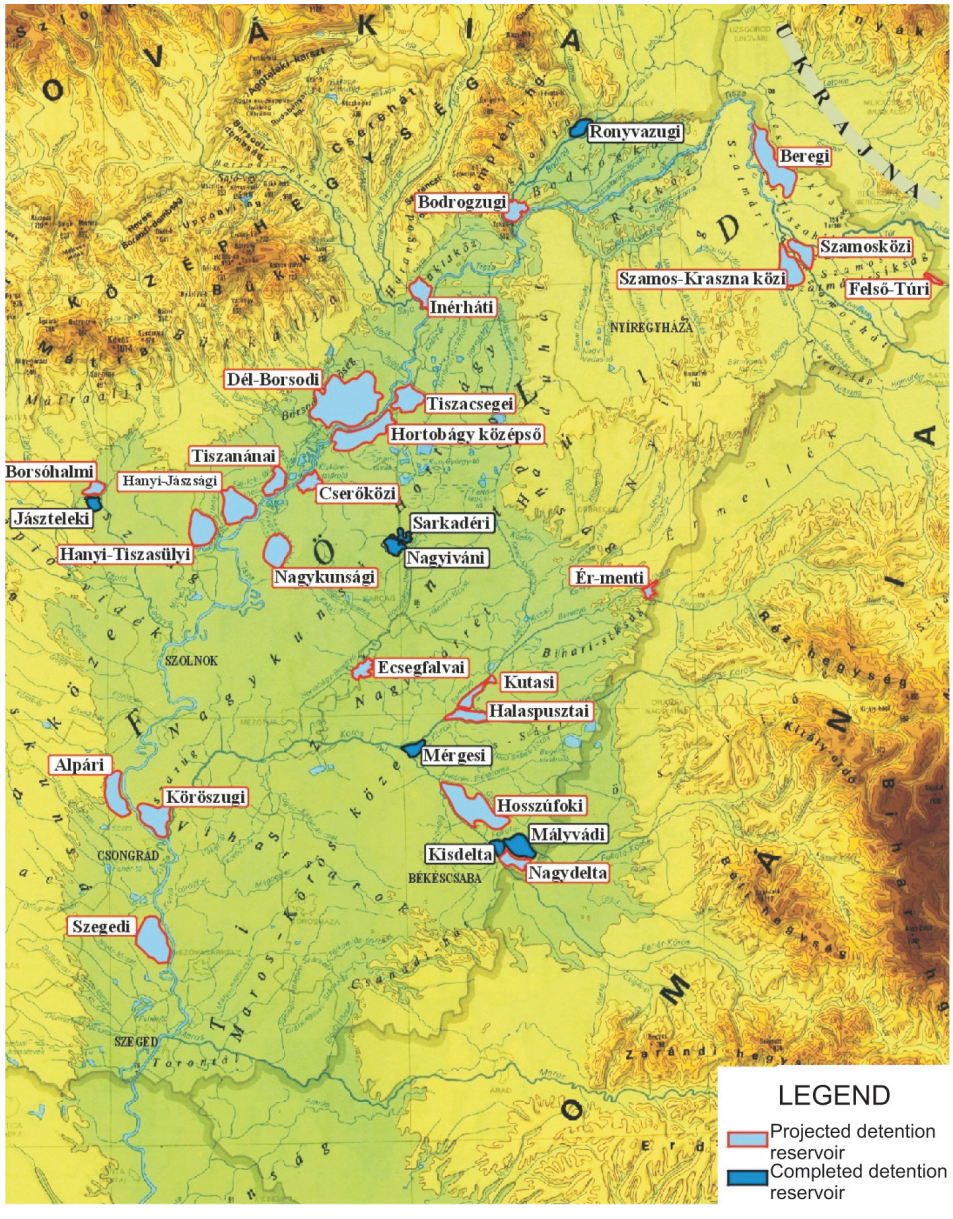

Fig. 10. Detention reservoirs in the Tisza Valley according to the amended Vásárhelyi Scheme (Váradi, I.–Nagy, I. 2002)

Further development of the Vásárhelyi Scheme (2002) is aimed at the lowland storage of water transported by floods (*Fig. 10*) Another opportunity is the enlargement of flood beds up to the geomorphological levels of the high flood plains (*figs 8* and *9*). This solution would contribute to the safe flood control and improve the biological habitability of the landscape if on the protected side (low flood plain) reservoirs of integrated use (accommodating abandoned channels) were constructed. These storage facilities as organic part of the natural environment (e.g. Bodrogzug, Köröszug, Tiszanána, Cserőköz) would play the ecological role of the swamps of past centuries. The realisation of similar schemes is the responsibility of academic research. The temporal perspective of these investigations is some hundred years. 150 years ago Pál Vásárhelyi outlined a nearly perfect scheme meeting the contemporary demands, yet leaving behind quite a number of problems to be solved in the near future. In the first step a number of questions must be answered by scientific research which have been outlined by the author in an earlier study (Schweitzer, F. 2000):

– Studies on the evolution of the Tisza valley over the past ca ten thousand years with mapping of buried and current channels and their intersections, since the latter pose a piping water hazard;

– Exploration and measurements of the rate of silting up of the flood bed, a survey of changes having taken place since flood control and water regulation measures; measurements on pollutants transported from the catchment area to the flood bed and accumulated there; clearing out if sediment accumulation is uniform over the different parts of the flood bed and if there is a proven relationship between the distance from the dike and the rate of sedimentation;

– Mechanism of the evolution of point bars and natural levees and their relationship with the silting-up process over the flood bed;

– Investigations into historical changes of forest coverage of the mountainous sections of the drainage basin of the Tisza and its tributaries;

– Mapping and evaluation of the configuration of high flood plain (high bank) and levees; study on the opportunities to extend flood bed, in some places elimination of embankments, function of which could be taken over by high banks in the future; or (as an alternative) construction of levees in more distant areas, investigations into the storage capacity of the extended flood bed;

– Geoecological-geomorphological investigations over the flood plain and flood bed aimed at the rapid conduit of floods and at an adequate storage of excess waters;

– Adequate treatment of the vegetation spreading over the flood bed. The gradient of the channel along the middle reaches of Tisza is 3 cm per one km and the current of water is slowed down by the emerging thick shrub;

– Economic and social geographical studies.

In the Tisza Valley the length of embankments of primary and secondary categories is 1320 km, to this 119 km high bank section is added making up 1439 km as the total length of flood levees. In the course of the river regulation measures the length of the Tisza was reduced from 1420 km to 977 km. At present the 600 km long Hungarian section of the river is flanked by 1085 km long embankment.

If raising of crests of dikes is to enjoy priority, it will have to be executed in the future more frequently than previously, owing to the intense silting up of the flood bed.

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The global problem of land degradation and desertification

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Abstract

It's a well known fact that land(scape) degradation is an ensemble of negative processes extending over immense areas. The methodologies of physical and social geography are the best tools for the investigation of land degradation processes, due to the complex nature of these processes. It is well known that environmental factors contribute to land degradation processes. Socio-economic factors and the role of human society is equally important, and in some cases, even more important, than natural factors. Degradation processes within subhumid, semi-arid and arid areas are defined as desertification processes to draw attention to the specific dangerous situation in these areas. Hungary signed the Convention on Desertification, as increasing aridity is a real national danger, especially on the Danube-Tisza interfluve. There are areas in Hungary corresponding to desertification definitions. Thus, desertification research is an important challenge for Hungarian geography.

Key words: water erosion, land degradation, desertificaton, Danube–Tisza interfluve

Introduction

The degradation of the Earth's surface (i.e. land degradation) is one of the most severe problems of our times. The concept of land degradation originates from soil degradation and it is often used as a synonym for soil degradation. It is evident that if soil is degraded it has huge impacts on both the land and landscape, because soil degradation prevents or impedes plant growth. Land and soil are not identical notions, but they are often used interchangeably. To avoid this confusion, I propose to use the term 'landscape degradation.' Landscape degradation means much more than just the degradation of the uppermost layer of the Earth's crust. It means the decline of all landscape forming factors and of their synthesis, which is called landscape in physical geography and landscape ecology. Landscape ecology and physical geography deal with various aspects of landscape development (Tóth, A.–Szalai, Z. 2007). However, despite its importance, few scientific papers in Hungary report degradation processes.

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Soil degradation processes

Soil degradation processes are grouped in different ways by various authors. A more practical classification is presented below (EEA Environmental Assessment Report 2003).

(1) Soil sealing. It is not by accident that soil sealing is given first place amongst soil degradation processes. Soil sealing is the result of construction activities (including roads, railways and buildings). Due to soil sealing, the soil does not function properly, as it has no contact with the atmosphere and is devoid of vegetation. On the sealed soil surface, water runs off without being filtered, with increased velocity and volume. The highest share of sealed soil surface (16–20%) is in Belgium, The Netherlands and Denmark. The share of sealed soil has been continuously growing within the EU. reaching an average value of 8–9% in 2000.

(2) Soil erosion *(Photo 1).* In Europe water erosion is more important than wind erosion, but wind erosion also causes huge damage. As an example of the importance of wind erosion in the World we should remember that the establishment of the US Soil Conservation Service took place primarily because of the sand storms of the 1930s. Soil erosion risk and the damage caused by erosion are also very remarkable in Hungary (Jakab, G.–Szalai, Z. 2005).

Photo 1. Gully erosion near Bergville, South Africa

Photo 2. Saline spot on the Danube-Tisza Interfluve, near Apajpuszta

(3) Soil contamination can originate from both diffuse and local sources. Contamination from the atmosphere, from running water or from the soil belong to the first group. These processes may cause acidification, eutrophication and other severe damage. The direct application of chemicals (fertilizers, pesticides and sewage sludge), sometimes also containing heavy metals, are also diffuse sources. Local contamination sources can be of diverse origins and are usually connected with industrial activity.

(4) Salinization. Near-surface salt accumulation is present in several European countries, including Hungary. The most important areas affected by seashore, inland and secondary salinization due to irrigation are in the Mediterranean countries, Hungary and several countries of the former Soviet Union *(Photo 2).*

(5) Soil compaction is the result of the activity of soil cultivating machines. Subsoil compaction is an extremely damaging and is difficult to rectify.

The first World assessment of soil degradation is GLASOD (Global Assessment of Soil Degradation, Oldeman, L.R. et al. 1991), which assesses the following degradation processes:

– The extension of various forms of soil degradation
  - water erosion

- wind erosion
- chemical degradation
- physical degradation.

– The rate of degradation
  - Light
  - Moderate
  - Strong
  - Extreme.

– The causes of degradation (deforestation, overgrazing, improper farming, overexploitation, contamination).

According to Oldeman, L.R. et al. (1991) 3.7% of the Earth's surface is affected by physical and chemical degradation and 12% by water and wind erosion (*Tables 1* and *2*). Especially high is the proportion of physical and chemical degradation in Europe and in Central America and the share of the areas affected by soil erosion is also the highest here. Studying these tables, it is evident that soil degradation is a major problem in Europe.

The concept of land degradation

As mentioned above, land degradation means much more than the degradation of the land/soil. Because of the complex nature of land degradation processes it is essentially a geographical subject matter. In this paper, land degradation will be discussed from the perspective of physical geography. However, land degradation can result from both physico-geographical and socio-economic causes. An evident example is overpopulation of humans and animals launching well-known degradation processes. The investigation of land degradation processes together with land use change studies represent the most up-to date and innovative research trends in modern geography.

According to Barrow, C.J. (1991) it is impossible to give a precise definition of land degradation. It may be defined "as the loss of utility or the reduction, loss or change of features or organisms which cannot be replaced" (Barrow, C.J. 1991). The land is degraded when "it suffers a loss of intrinsic qualities or a decline in its capabilities" (Blaikie, P.–Brookfield, H. 1987). The UNEP (1992) definition emphasized the reduction of the potential of natural resources as a result of processes acting in the landscape. Johnson, D.L.–Lewis, L.A. (1995) underlined the role of human interventions in land degradation and focused on the reduction of biological production and/or utility of an area. Distilling the essence of these cited definitions, it is evident that there are common elements in them. Hence, even thought it is difficult to give a precise definition acceptable to all disciplines, the concept of land degradation is fairly clear. It means the reduction or loss of biological productivity

Table 1. Global extent of chemical and physical soil degradation, by region (OLDEMAN, L.R. et al. 1991)

Region	Chemically degraded area				Physically degraded area			Total degraded area	Total degraded land as % of total land used
	Loss of nutrients	Salinization	Pollution	Acidification	Compaction, sealing and crusting	Water-logging	Loss of organic matter		
	(million hectares)								
Africa	45	15	+	1	18	1	–	81	4,8
Asia	15	53	2	4	10	+	2	86	3,0
South America	68	2	–	–	4	4	–	78	5,1
Central America	4	2	+	–	+	5	–	12	6,0
North America	–	+	+	+	1	–	–	1	+
Europe	3	4	19	+	33	1	2	62	7,7
Australia	+	1	–	–	2	–	–	3	–
World	136	77	21	6	68	11	4	323	3,7

The „+" sign means negligible, the „–" sign means none reported.

Table 2 Global extent of soil degradation due to erosion, by region (OLDEMAN, L.R. et al. 1991)

Region	Area eroded by water erosion				Area eroded by wind erosion				Total area eroded	Total area seriously eroded	Total area seriously eroded as a % of total land used
	Light	Moderate	Strong and extreme	Total	Light	Moderate	Strong and extreme	Total			
Africa	58	67	102	227	88	89	9	186	413	267	16
Asia	124	242	73	441	132	75	15	222	663	405	15
South America	46	65	12	123	26	16	–	42	165	93	6
Central America	1	22	23	46	246	4	1	251	51	50	25
North America	14	46	–	60	3	31	1	35	95	78	7
Europe	21	81	12	114	3	38	1	42	156	132	17
Oceania	79	3	222	83	16	–	27	46	99	3	3
World	343	526	223	1094	269	254	26	548	1642	1029	12

and negative effects on the functioning of the land and related ecosystems (Hudson, P.F.–Alcántara–Ayala, I. 2006). Functioning of the land involves the interaction of environmental factors and connections between landscape components, such as hillslopes and floodplains. These definitions and explanations show very clearly that land degradation is much more complex than soil degradation.

Land degradation processes can have both natural and human (anthropogenic) origins. It is obvious that since the appearance of human beings on the Earth the importance of anthropogenic processes is enormous and has grown exponentially with time. Among natural processes, climate change is extremely significant, considering that the rapid rate of climate change today is largely a human-induced process. However, most authors who have tried to define land degradation restrict it to human-induced processes. In this sense, landscape development always involves degradation processes of natural origin, but these processes will then be compensated by the regenerating capacity of the landscape (Bádonyi, K. 2001). This approach excludes the influence of natural processes, such as natural climate change, natural catastrophes or geologic soil erosion.

Global processes like global climate change, land use and land cover change, together with population increase, accelerate and increase land degradation. Especially, Third World countries suffer from degradation processes. In these countries overexploitation of natural resources in environmentally-sensitive areas also contribute to the acceleration of degradation processes. The effect of global warming on already degraded land also increases the intensity of degradation.

According to Menshing, H.G.–Seuffert, O. (2001) it is very important that no irreversible damage occurs in the landscape due to improper land use. This is actually the application of the principles of sustainable development (i.e. the regenerating capacity and potential of the landscape should remain under the circumstances of any kind of land use or landscape use).

As mentioned before, soil and land degradation are often used interchangeably (e.g. Imeson, A. C.–Emmer, I. 1992). Consequently, the salient processes of soil degradation and land degradation are identical (i.e. various processes of physical and chemical degradation belong to them). It is extremely important whether these processes are understood as landscape degradation or soil degradation processes.

Some 38% of the agricultural area of the Earth can be considered as degraded *(Fig. 1).* Most of the areas in question are in the Third World (the share of degraded territories in Africa is 65%, in Central America 74% and in South America 45%). The proportion of degraded pasture and forests is much smaller (21 and 18%, respectively). Considering only used land (agricultural area, permanent pasture and forests; *Table 3*) the proportion of degraded area is 23% and that of strongly degraded land is 14%.

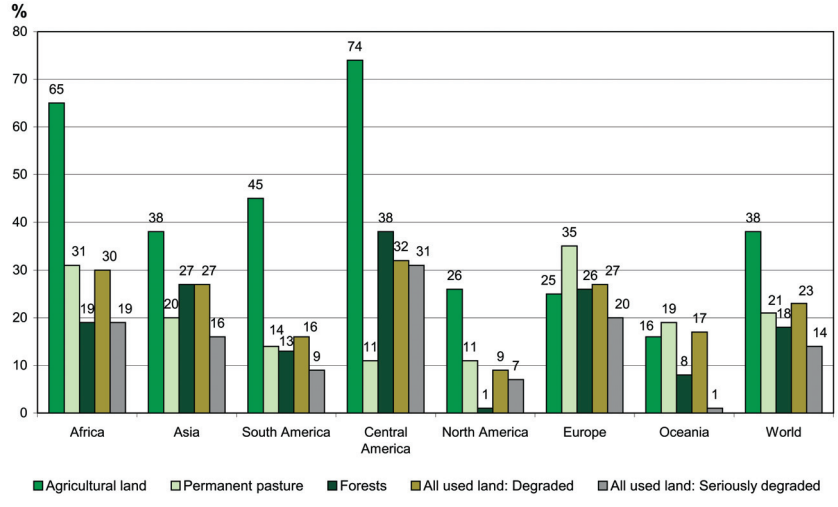

Fig. 1. Estimates of soil degradation in the world, by region and land use (after FAO 1990, Oldeman, L.R. *et al.* 1991 and Scherr, S.J. 1999).

Table 3. Global estimates of soil degradation, by region and land use (sources: FAO 1990, Oldeman, L.R. et al. 1991 and Scherr, S.J. 1999)

Region	Agricultural land			Permanent pasture			Forests		
	Total	Degraded	%	Total	Degraded	%	Total	Degraded	%
	(million hectares)			(million hectares)			(million hectares)		
Africa	187	121	65	793	243	31	683	130	19
Asia	536	206	38	978	197	20	1273	344	27
South America	142	64	45	478	68	14	896	112	13
Central America	38	28	74	94	10	11	66	25	38
North America	236	63	26	274	29	11	621	4	1
Europe	287	72	25	156	54	35	353	92	26
Oceania	49	8	16	439	4	19	156	12	8
World	1475	562	38	3212	685	21	4048	719	18

Region	All used land				
	Total agricultural land, pasture and forests	Degraded	%	Seriously degraded	%
	(million hectares)			(million hectares)	
Africa	1663	494	30	321	19
Asia	2787	747	27	453	16
South America	1516	244	16	139	9
Central America	198	63	32	61	31
North America	1131	96	9	79	7
Europe	796	218	27	158	20
Oceania	644	104	17	6	1
World	8735	1966	23	1216	14

Desertification processes

Desertification processes represent a special group of land degradation processes. According to the United Nations Intergovernmental Convention to Combat Desertification "Desertification means land degradation in arid, semi-arid and dry sub-humid areas resulting from various factors including climate variation and human activities" (UNCOD 1977). The term 'desertification' has emotional connotations and therefore its use is preferred to the term "land degradation." It must be emphasized, however, that desertification has a different meaning than "desertation" (i.e. the formation of deserts).

The concept of desertification is much older than UNCOD. It dates back to the 1920s (Bovill, D.W. 1921, cited by Herrmann, S.M.–Hutchinson, C.F. 2005) when the extension of the West African Sahara into the Sahel zone was first observed. The term 'desertification' was first used by Aubreville, A. (1949) to describe the change of productive land into a desert (Herrmann, S.M.–Hutchinson, C.F. 2005). According to this first definition, the term desertification is always connected with human activities (i.e. with land mismanagement). The Nairobi UNCOD Conference (United Nations Conference on Desertification) in 1977 came about following extremely arid periods in Sahelian Africa.

Climate change as a consequence of the greenhouse effect is a major global process. As it is the main factor influencing desertification processes, the global importance of desertification will increase and it is and it will be the most important group of land degradation processes in those regions of the world where there the climate is arid, semi-arid or dry subhumid.

The atmospheric conditions of arid, semi-arid and subhumid climates are those that create large water deficits, that is, where potential evapotranspiration (ETP) is much greater than precipitation (P). These conditions are evaluated by various indices. One of these is the FAO-UNESCO (1977) bioclimatic index: P/ETP. The threshold values of the bioclimatic zones are given below:

- Arid zone:0.03 <P/ETP <0.20
- Semi-arid zone: 0.20 <P/ETP <0.50
- Subhumid zone: 0.50 <P/ETP <0.75

Whereas desertification occurs under the climate conditions given in the definition, desertification processes are also evident in other climate zones (e.g. associated with salinization). On the other hand, there are examples where drought did not lead to desertification under arid climatic conditions, because of proper land management. Desertification is the result of a combination of drought with land mismanagement (Le Houérou, H.N. 1996). Desertification processes affect 42 million km^2 (33% of the Earth's land surface, Eswaran, H.–Reich, P. 1998), effecting some 1 billion people.

FAO/UNEP (1984) proposed a system of criteria for the evaluation of desertification status *(Table 4).* The matrix contains data on plant cover, water

Table 4. FAO's matrix. Example of the criteria for the evaluation of desertification status proposed by FAO/UNEP (1984)

Variable	Class limits			
	Slight	Moderate	Severe	Very severe
Plant cover				
Perennial plant cover	>50	50–20	20–5	<5
Grassland condition (%)	>75	50–75	20–50	<25
Actual productivity (% potential)	85–100	65–85	25–65	<25
Water erosion				
Surface status (% area)	Gravel and stones <10	Stones and boulders 10–25	Boulders and rocks 25–50	Boulders and rock outcrops >50
Type of erosion[a]				
Exposed subsoil (% area)	<10	10–25	25–50	>50
Gully area (%)	<10	10–25	25–50	>50
Soil thickness (cm)	>90	90–50	50–10	<10
Soil loss				
Original soil depth <1 m	25	25–50	50–75	>75
Original soil depth >1 m	30	30–60	60–90	>90
Actual productivity (% potential)	85–100	65–85	25–65	<25
Wind erosion[b]				
Area covered by hummocks (%)	<5	5–15	15–30	>30
Surface gravel percent cover	<15	15–30	30–50	>50
Salinization				
Morphology[c]				
Soil electrical conductivity (mmhos/cm)	<4	4–8	8–16	>16
Exchangeable sodium (%)	<5	5–20	20–45	>45
Crop yield (% potential)	85–100	65–85	20–65	>45
Affected areas (%)	<5	5–20	20–50	>50

[a] Slight: slight to moderate in sheet erosion and rills. Moderate: moderate to severe in sheet erosion and rills. Severe: severe in sheet erosion, rills and gully erosion. Very severe: very severe in sheet erosion, rills and gully erosion.
[b] Includes several of the same characteristics used for water erosion.
[c] Slight: no salts. Moderate: salt spots. Severe: salt spots and filaments. Very severe: crystalline efflorescences and salt crusts (solonchak).

and wind erosion and salinization. Verón, S.R. et al. (2006) criticized the matrix from several perspectives, particularly the subjective nature of the data.

Desertification processes also affect Hungary, therefore Hungary is a signatory of the Desertification Convention. It is interesting that even Iceland belongs to the countries suffering from desertification problems and research activities on the topic are remarkably advanced (Arnalds, O. 1997; Arnalds, O.–Kimble, J. 2001).

The original concept of desertification from the 1920s and 1940s is slightly different from the UNCOD definition, which puts much more emphasis on the formation of deserts and considers desertification as a process leading to desert development. According to Menshing, H.G.–Seuffert, O. (2001) we can describe a landscape desertified only if geoecological characteristics of a landscape have already reached the representative values of the desert or these values will be reached within a certain period of time. Authors supporting this concept of desertification concentrate first of all on marginal and zones surrounding deserts, which are especially sensitive to desertification, as in the Sahara–Sahel marginal belt. There is continuous debate on the definition and understanding of desertification (Bádonyi, K. 2001). All concepts agree upon the fact that desertification means severe degradation problems of territories with water deficits and ongoing aridification.

The main triggering factor of desertification is usually the removal of natural vegetation by human society. This includes all forms of vegetation, not only forests, but also shrubs, weeds and grasses. Vegetation removal leads to climatic changes in the atmospheric boundary layer and increases aridification. Consequently, surfaces indurate, sometimes accompanied by crusting, and infiltration rates decrease.

Soil crusting and the lack of vegetation then exacerbates the destructive effects of both water and wind erosion. Soil erosion removes the upper soil layers, which are usually rich in humus and nutrients, so reducing the feasibility of both vegetation re-establishment and agricultural land uses. Thus, landscape potential diminishes. The chance of reclaiming and regenerating vegetation in arid areas is less feasible if the climate is variable, especially if extreme events like extreme changes of moisture conditions are frequent (e.g. long periods of drought and catastrophic high intensity rainfall events).

Reclaiming degraded, or desertified land is an important issue in combating these processes (Mitchell, D.J. et al. 1998). Prevention, if at all possible, may even be more important than reclaiming already damaged land. Just one example of prevention against runoff and soil erosion is conservation agriculture or minimum tillage (Bádonyi, K.–Madarász, B. 2004).

Desertification is first of all related to specific climatic conditions and vegetation destruction and consequent soil erosion. All physico-geographical (environmental) factors contribute to desertification, at least as modifying

agents. Relief, physical and chemical soil properties and soil parent material play important roles in the speed, rate and extent of desertification.

Desertification rate depends also on initial soil moisture content and human interventions, and the latter can be a positive interference. The course and consequences of the process are clear, from the initial status (i.e. subhumid, semi-arid or arid conditions) proceeding sequentially through the stages (e.g. if the area in question had a subhumid climate, then undergoing transformation to semi-arid and then arid conditions. As a consequence of ongoing aridification the area may become hyperarid. In terms of vegetation, steppe will turn into savanna, followed by thorny savanna and then into semi-desert, reaching the ultimate stage of a desert.

Conclusions

Land (landscape) degradation is an ensemble of negative processes extending over immense areas. The methodologies of physical and social geography are the best tools for the investigation of land degradation processes, due to the complex nature of these processes. It is well known that environmental factors contribute to land degradation processes. Socio-economic factors and the role of human society is equally important, and in some cases, even more important, than natural factors.

Land degradation was first appreciated by soil science as where the possibilities of agricultural use on degraded land are restricted or prevented because of soil degradation. Various forms of soil degradation are striking phenomena themselves, with saline areas being a good example. If the degraded area is not used for agricultural production, then the degradation of natural vegetation can also be striking. Land(scape) degradation processes are also present in Hungary, offering a major challenge to Hungarian geography.

Degradation processes within subhumid, semi-arid and arid areas are defined as desertification processes to draw attention to the specific dangerous situation in these areas. The poorest regions of the Earth belong to here, totalling 40% of the Earth's surface. These regions are continuously struggling with famine. There is debate about the definition of desertification. Should the threshold values of the P/ETP index be taken literally, in which case the term desertification does not refer to desert formation? Or should the definition relate to the possibility of desert formation? Or it should it be restricted to those territories where the result of desertification will or may really lead to desert conditions? Hungary signed the Convention on Desertification, as increasing aridity is a real national danger, especially on the Danube-Tisza interfluve. There are areas in Hungary corresponding to desertification definitions. Thus, desertification research is an important challenge for Hungarian geography.

Because of the complexity of the processes, future desertification research should concentrate on revealing all environmental and landscape ecological aspects of the problem, aimed at presenting a full ecological synthesis of the landscape. Based on this synthesis, precise and practical suggestions should be developed on how to arrest land degradation, or how to redirect it towards positive directions, that is towards landscape reclamation and rehabilitation.

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Competitiveness of the Hungarian regions

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Abstract

The present paper explores the competitiveness of the Hungarian counties (NUTS III) and regions (NUTS II) in two dimensions: in national scale and in European comparison. Competitiveness has been expressed by three interrelated economic parameters: a) *per capita* GDP; b) labor productivity; and c) employment rate.

The paper concludes that regions in Hungary have reached three different stages of economic development. A) Budapest Metropolitan Region (BMR) is a foremost growth pole of the country. It is a real knowledge based and innovation generating economic region. B) North-western Hungary is in the stage of investment led development having a knowledge user economy without generating it locally. C) Northern and Eastern Hungary is in neo-Fordist stage of economic development, where economic restructuring just started; under-employment and rural crisis are widespread, with an exception of some larger cities. In EU accession countries, BMR is a most competitive region, second only to Prague Agglomeration, whereas Eastern and Northern regions of Hungary have a weak position economically.

Keywords: competitiveness, regional inequalities, comparison of EU regions

Introduction

During the last few years both research and economic policy making have shown an eager interest for regional competitiveness. "Competitiveness" has become the magic world for explaining or planning economic success for micro-economic (enterprise) and macro-economic (national) levels since long, although there have been hot debates about the content and measurement methods and one could not easily apply them while analyzing regional competitiveness. Even the definition of "region" is problematic; and, certainly, regional competitiveness is not a simple sum of competitiveness of firms, located in a given region, or a fraction of national competitiveness.

Growing interest in Europe for regional – and urban – competitiveness may be explained by the strength of the sub-national territorial units in the EU cohesion policy. Mitigation of regional inequalities has been one of the most

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important goals of the policy of the Community from the very beginning. There is a general consensus, that regional leveling may be served best by the improvement of competitiveness of less developed regions. Nevertheless, a number of questions are still open. Even the notion of regional competitiveness has been denied by an important author (Krugman, P. 1994), whereas the goals and the conditions of the competitiveness and its measurement have had different (even divergent) explanations (Porter, M.E. 1998).

The problem is alive for Hungary, as well as for the other accession countries, after they entered into the European Union (EU). Although the country's economy was relatively open even within state socialist system[2], regions competed rather for state subsidies, than improved productivity or export capacity of their economy. This practice has changed only slowly during the transition period. Presently, Hungarian regions entered fully into the market competition, at least within the EU, and their competitiveness has become crucial.

This paper has three parts. In the first part an attempt is made to define the content and the measurement methods of regional competitiveness as it has been treated and used in our research. The second part describes the elements of competitiveness of the Hungarian regions. In the third part this competitiveness is summarized on country and EU levels, with an outlook for the future development.

Definition and measurement methods of regional competitiveness

During the last decades, competitiveness has become the panacea for backwardness, regional inequalities, for declining economic performances. Although the repetition of fashionable terms may have exaggeration, there is no doubt that – as a consequence of globalization – all sort of economic units, from an individual firm to transnational integrations of countries, compete with each other for markets, capital goods, innovations, qualified manpower etc. The ultimate goal may simply be economic growth, or rising profits or improvement of the general well-being of a given country, region, or city. Global competition has produced growing inequalities so far, since prerequisites for the success in this competition show strong geographical disparities. It has also produced a few spectacular catching-up successes e.g. in South Eastern and Eastern Asia. Consequently, in the spirit of neo-liberal economics, the advice for lagging countries, regions or marginal people voices: be competitive.

[2] In 1968, a profound economic reform abolished the central planning directives and introduced a number of market elements into the economy. Nevertheless, the overwhelming size of state ownership in economy, the state interventions in price formation and investment had made this market an imitated one Kornai, J. 1992).

Regional policies are intended to enhance regional competitiveness (e.g. by infrastructure development), whereas social policies are purposed to develop competitiveness of persons (e.g. by continuous education).

There is no general consensus about what regional competitiveness means. The European Commission interprets the term the following way: [Competitiveness means] the ability to produce goods and services which meet the test of international markets, while at the same time maintaining high and sustainable levels of income or, more generally, the ability (of regions) to generate, while being exposed to external competition, relatively high income and employment levels… (European Commission, 1999. p. 4). Lengyel, I. quotes the European Competitiveness Report (Lengyel, I. 2004 p. 326): "Competitiveness… is understood to mean a sustained rise in standard of living a nation and as low level of involuntary unemployment as possible." It is conspicuous how social solidarity is deeply embedded in European mentality. When "competitiveness" did replace "leveling" in regional policy, it suggested that the welfare state is over. Still, the definition of competitiveness contains welfare elements. The nostalgia for egalitarianism is especially strong in post-communist societies where sudden switch to the market economy made social security fragile (Horváth, G. 1999).

Some authors – Krugman, P. (1996) being their emblematic figure – refuse to adopt competitiveness (originally applied for firms, on micro-economic level) on national or regional scale. He argues that no analogy could be made between a nation (region) and a firm. Firstly: an unsuccessful firm will go out of business, what is never to happen with a country (or region). Secondly: success of a firm will often be at the expense of another one, whereas competition between countries might be mutually advantageous.

Porter, M.E. who has been the most frequently cited in writings about competitive advantages, suggests that the best measure of competitiveness is productivity. "The competitiveness, then, is measured by productivity" (Porter, M.E.–Ketels, C.H.M. 2003, p. 7 cited by Gardiner, B.–Martin, R.–Tyler, P. 2004). As it is assumed by the author of the present study, this view restricts competitiveness to the market of goods whereas there are firms (regions) competing for tourists, capital investments, for attracting foreign students to their universities, etc. It means that competitiveness cannot be measured by a single figure or factor; there are different goals to compete for.

Certainly, speaking about regional competitiveness is a sort of simplification. A region is not a competing unit – it is the firms located and institutions operating in the regions that take part directly in competition. There are unsuccessful firms in a prosperous region, as well as poor schools in a rich city. The term "competitive region" means that the region has a number of local factors favourable for successes of firms and institutions. There is a long list for such factors from developed infrastructure to skilled manpower, from

modern (at present knowledge-based) sectors to traditional and specific skills, from innovation capacity to flexible specialization etc. Competitiveness is not just an economic term, but it is a socio-cultural concept as well.

Competitiveness has a meaning of comparison. A competitive region should offer comparative advantages for its firms or institutions (or for its inhabitants). In order to make comparison, elements of competition should be quantified: competitiveness should be measured on regional level. It is not a simple task: one should select the directly measurable elements (many important social factors are not quantifiable, e.g. handicraft traditions), and even these measurable elements should have comparable data for all the territorial units and all the years in investigation. Evidently, a more detailed data set was made available for measuring regional competitiveness within Hungary, and a basic one for making international comparison. First we shall focus on analyzing the process of regional differentiation within the country; then we shall compare the competitiveness of Hungarian regions to the EU-15 regions.[3]

The territorial unit of our analysis will be the county, the sub-national territorial unit of public administration (NUTS-III). Hungary has 19 counties + Budapest; they have a long traditions (like voivodeships in Poland) and their territory has remained unchanged during the socialist period – the only exception among former communist countries. Hungary has 7 NUTS-II regions, mostly for the purpose of EU regional statistics, more recently, as territorial units for the 2007–2013 development planning – but these regions have neither elected government units, nor financial resources of their own. Presently, after many aborted programs of territorial reforms in public administration, these NUT-II regions are rather units for central budget redistribution, and their institutions (e.g. regional development agencies) are those delegated from the central government. The advantage of the use of counties instead of NUTS II regions is that their analysis provides a more detailed geographical picture of competitiveness.

Competitiveness will be expressed by three interrelated economic parameters of the region:

- per capita GDP;
- labour productivity;
- employment rate.

These indices fit in the EU definition for competitiveness, quoted above. This is a simplified approach about competitiveness, but its elements have appropriate data and make the substantial comparison of different territorial units possible. For a more sophisticated model of competitiveness (the Pyramide model) see Lengyel, I. 2004.

[3] The use of EU-15 average in comparison is justified by the fact that most of the data refer to 2001; and the catching up to the average of the EU-15 has been the target of the economic policy since 1990.

Competitiveness of Hungarian counties I: Basic elements

Per capita GDP is a most suitable parameter to characterize economic output and growth, the performance of a given county. In Hungary, the GDP has been recorded on county level since 1996. The last data available at the time of our research were from 2001. Thus, these five years were compared; incidentally, these five years represent a distinct period in our post-communist economic history.[4] The GDP was calculated on purchasing power parity (PPP).

All of the counties produced growth between 1996 and 2001. Growth was especially dynamic in a group of seven counties (including BMR). They produced a clear catching up with the EU (see *Table 1, Fig. 1*), their growth being much faster than the EU-15 average. Even slowest counties have produced the EU average (even though they were not able to improve disadvantageous position). These seven counties form an explicit geographical cluster: six of them are located along the Budapest–Vienna and Budapest–Balaton axes. Budapest experienced the most spectacular growth: the capital city is the only international metropolis of the country. The city has proven to be a strong attraction

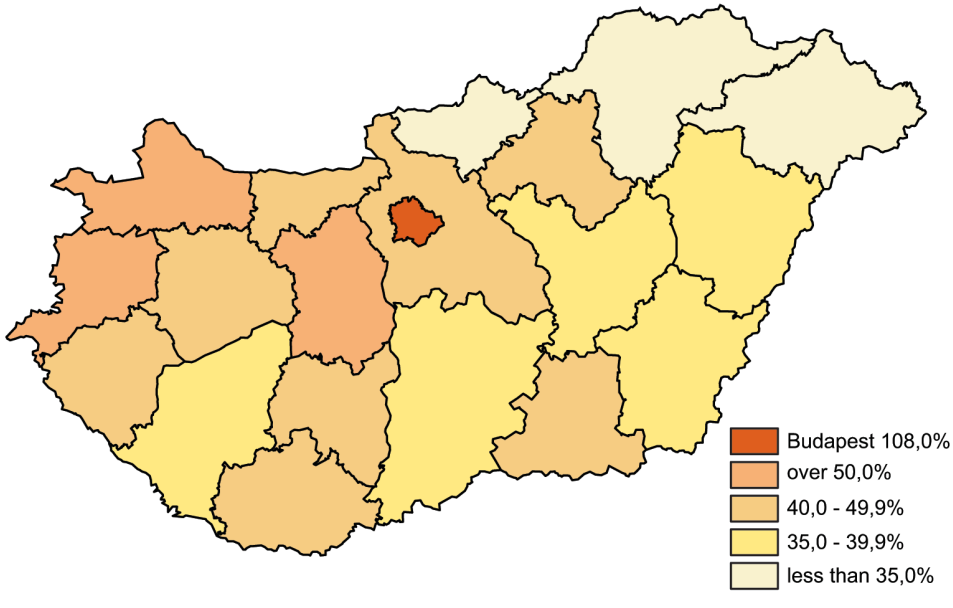

Fig. 1. Per capita GDP as percentage of EU–15 average (2001)

[4] 1990–1993 was a period of rapid collapse of the state economy (with a 30% drop in GDP); 1993–1995 were the years of overall privatization and a substantial economic restructuring, whereas in 1996 a spectacular growth started, having slowed down after 2001.

Table 1. Per capita GDP by counties and NUTS II regions compared to the average of EU–15

County, **region**	1996	2001	Changes 2001/1996
City of Budapest	86	108	+22
Pest	34	44	+10
Central Hungary	**68**	**84**	**+16**
Fejér	48	54	+6
Komárom-Esztergom	42	49	+7
Veszprém	38	44	+6
Central Transdanubia	**43**	**49**	**+6**
Győr-Moson-Sopron	52	63	+11
Vas	51	53	+2
Zala	44	45	+1
Western Transdanubia	**49**	**55**	**+6**
Baranya	36	40	+4
Somogy	35	36	+1
Tolna	42	44	+2
Southern Transdanubia	**37**	**40**	**+3**
Borsod-Abaúj-Zemplén	33	34	+1
Heves	34	40	+6
Nógrád	27	30	+3
Northern Hungary	**32**	**35**	**+3**
Hajdú-Bihar	36	39	+3
Jász-Nagykun-Szolnok	35	37	+2
Szabolcs-Szatmár-Bereg	28	30	+2
Northern Great Plain	**33**	**35**	**+2**
Bács-Kiskun	35	36	+1
Békés	36	35	-1
Csongrád	43	43	0
Southern Great Plain	**38**	**38**	**0**
Hungary	**47**	**53**	**+6**

Source: Lengyel I. (2003, 311 p.).

for transnational corporations, and it has had a leading role in R&D and high level business services since long. Per capita GDP made up 86% of the EU-15 average in 1996 and it rose to 108% by 2001. The second most developed county produced but 63% of the EU-15 average. Consequently, Budapest and a few developed counties have played an outstanding role in economic growth of Hungary. The less developed counties showed a distinct geographical clustering, too: with two exceptions all they are located either in Northern Hungary (in a region what suffered most from the decline of the traditional heavy industry) or on the Alföld (Eastern Hungary), a traditional rural area. The East/West divide of the country survived and became more accentuated. The poorest counties reach but 30% of the EU-15 average in per capita GDP.

The six-year period of the rapid growth examined saw increasing regional inequalities. Some developed counties grew faster, while backward

areas kept falling behind. Budapest is out of comparison: the BMR represents another category than the rest of the country. As far as the counties are concerned: the most developed one has a per capita GDP 2.8 times higher than the less developed one in 2001 (there was a 2.6-fold difference in 1996). The gap is widening between the most developed and handicapped counties; moreover, due to EU membership a further growth of disparities is expected. Most probably, the developed counties will be able to benefit from EU structural or cohesion fund resources more than less developed ones will. (Enyedi Gy. 2004). Also, less developed rural counties in East Hungary will suffer strongly from market competition within EU, because of their poor economic performance. Rural policy after the systemic change has been full of improvizations, it has had more welfare character instead of economic rationality and has tried to satisfy the alternating interest of different pressure groups. „Regional levelling" has been a favourite slogan of different political parties in the period of political campaigns; but no government could diminish regional differences in standard of living while the gap is widening in competitiveness.

Productivity, the economic output calculated for a working hour, or the GDP per active population represents another important element of competitiveness. Active population means those persons between age of 15 and 64 years who are employed, sole proprietors, cooperative members, entrepreneurs or (in case of agriculture) helping family members. It is worthwhile to distinguish between the output (GDP) per total population and per active earners. High productivity is a fundamental element of competitiveness and a long-term growth. One could produce growth in the case of low productivity and a massive employment of cheap labour (this is the case in developing countries and this was the case at the time of hasty "socialist" industrialization during the 1950s and 1960s). This sort of development supposes low-standard technology and traditional economic structure – both an absolute handicap in present-day European competition. In Hungary, the productivity has improved quite impressively, due to rapid economic restructuring and technology transfer, and a drop in employment rate.

Not surprisingly, regional inequalities have a similar spatial pattern than that of per capita GDP, but they are less polarized (*Fig. 2*). In 2001, the productivity value (i.e. GDP/ active population) in the eminent county was 1.7 times higher than in the least effective one (in 1996 there was a 1.5-fold difference). Over the period in concern productivity improved by 31% in Hungary, led by the most developed counties (BMR: 48%, Győr-Moson-Sopron County: 46%) thus the gap was widening between the leading counties and the rest of the country. At the same time, in this "rest of the country" some levelling trends could be detected: there were counties in Western Hungary where progress had slowed down, while some backward areas were able to improve their position in ranking.

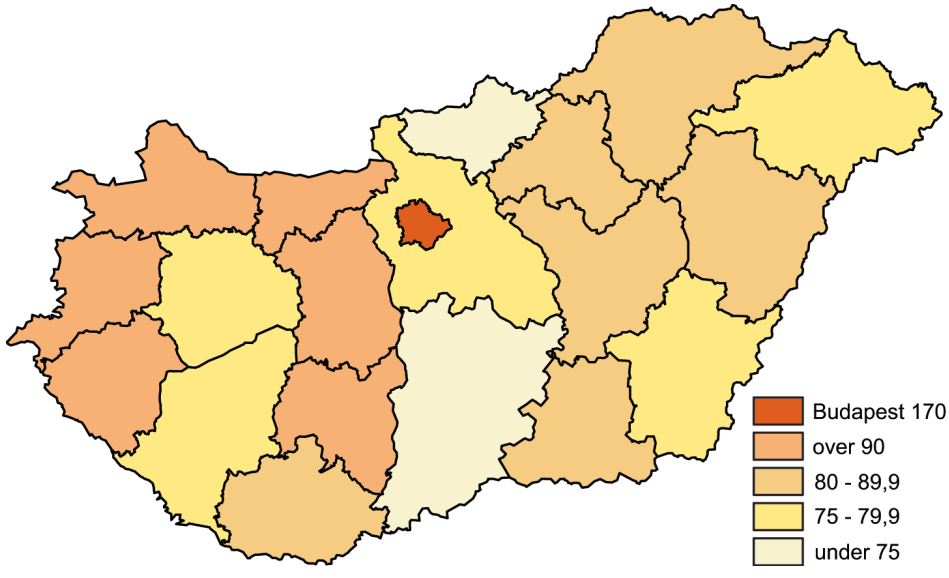

Fig. 2. Geographical differences in productivity (GDP/active population), 2001. (Country average = 100)

Finally, *employment rate* is the third basic element of regional productivity. Central Statistical Office has calculated the employment rate on the 15–64 years age group. Employment rate in Hungary is one of the lowest in Europe. Unemployment rate is not particularly high – around 6%, which remained stable during the past years – but there are many people in active age being outside of the labour market. Besides general tendencies – e.g. aging population, growing number of university students – it is the exceptional fast economic restructuring and privatization in post-socialist Hungary that may explain this situation. Employees of the collapsing state owned heavy industry and mining were offered early retirement, because they had no chance (over 40) to be retrained or to find new employment. So many people escaped unemployment by disability retirement. Although middle aged males have had poor state of health, indeed, massive disability retirement used to be an – officially never declared – form of social aid. In the less developed counties, the share of disability pensioners of the active age (under 64) population is over 10%, whereas in Western Hungary is around 5%.

Another explaining factor of under-employment is the way of land re-privatization in agriculture in the early 1990s. It was a rather complicated process with the final outcome of an excessively fragmented pattern of land ownership. A part of the old-new owners (most of them left agriculture during the decades of the state socialist system) simply let their land to rent by

larger farms and they subsist on the rent, without having any registered occupation. Finally, in certain sectors illegal and non-registered employment is also important, either in the widespread black economy in general, or in the most developed north-western region in particular, where there is an extensive commuting of workers from Slovakia.[5]

Employment rate has improved in every county between 1996 and 2002, but in most of them it had been a slow process. Regional inequalities have been rather stable as less developed counties did not succeed to enlarge job opportunities. The impressive per capita GDP growth was due to the improved productivity – good news to the economists – but it was not accompanied by a tangible enlargement of employment – bad news for social policy. Despite the decline in the number of the total population, Hungarian labour economy has not yet recovered from the consequences of over-employment in the state socialist system and of the collapse of the state economic sector during the transitional crisis.

The geographical pattern is as usual: the north-west of Hungary excels in high employment rates (56–57% of the active age group), whereas the north-east represents another extreme (40–42 %, *Fig. 3*).

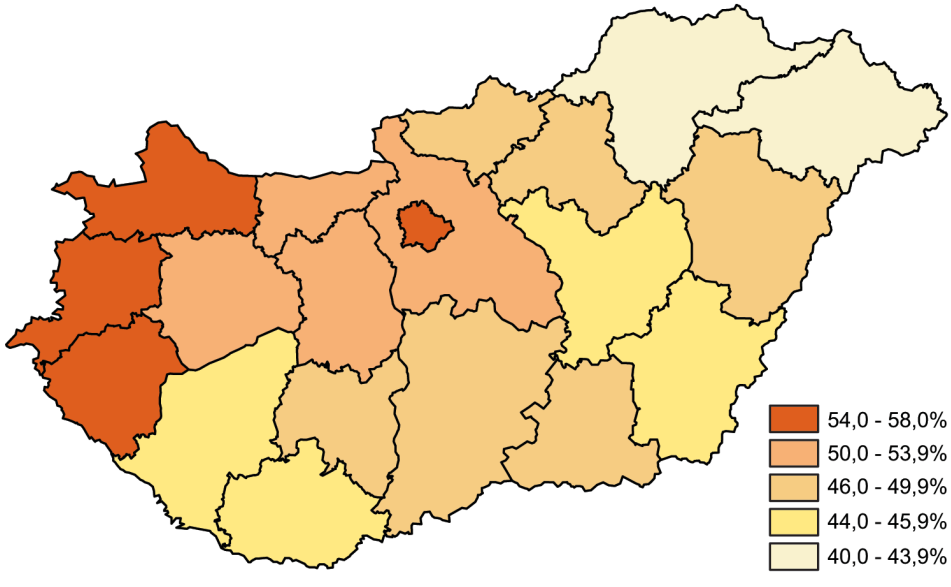

Fig. 3. Employment rate (employed population in percentage of active age i.e. 16–64 – year population) 2002

[5] Building industry is the largest employer of the „black" manpower: to a great extent they are immigrants – first of all from Romania – without working permit. Commuters from Slovakia are legal, but they are not registered in Hungarian population statistics, thus they are not calculated in employment rate either.

Competitiveness of Hungarian counties II: Influencing Factors

Lengyel, I. (2003) in his excellent monography presents a detailed analysis about different factors that influence regional competitiveness. He explains that the findings of the analysis of key factors – namely that the remarkably improving economic performance of Hungary is practically due to 4–5 counties out of the 20[6] – "have an ex-post character, they measure competitiveness, but they do not explain which are the factors to define the level of and changes in competitiveness" (Lengyel, I. 2003 p. 329). Also he analyzed five other factors suitable to explain the regional differences in competitiveness. Based on his analysis *four* influencing factors are to be discussed. They are as follows: (1) *Capital investment attraction* both from abroad and other regions. In Hungary, foreign capital investment has played a decisive role in economic restructuring. Two-thirds of these investments was directed to the BMR.[7] These investments are present in the high-tech, R&D, banking and in high level business sectors etc. In north-west Hungary, manufacturing industry was the main target for foreign direct investment (FDI). In the less developed regions foreign capital was mostly invested in public utilities (electricity, gas, sewage supply). These sectors have no multiplying effect on local economy, thus they do not stimulate economic growth. (2) *Infrastructure and human resources*. With regard to competitiveness infrastructure has a very broad meaning: accessibility of motorways in physical sense and Internet availability in terms of information are perhaps the most important features. Bulk of FDI has flowed to establishments located along the Budapest–Vienna motorway. The network of international motorways is focused on Budapest, they offer a fast connection to Northern Italy (via Croatia) and to the West Balkans, but they have not yet reached the Ukranian border. There is a low PC supply and inadequate Internet accessibility in the households of the contry, with Budapest being the only exception. Internet fees are too high for being afforded by an average household. The concentration of modern infrastructure is even higher in the BMR than that of economic activity. Concerning human resources, our interest is reduced on measurable elements, mostly on education and age structure. The quality of human resources is very much influenced by "soft" features like traditions, business culture, work ethics etc. which are essential factors in more detailed regional studies – but they are not quantifiable the same way as economic or demographic factors. As far as the level of education is concerned, its geographical pattern does not follow the well known north-west/north-east dichotomy. The position of Budapest is absolutely privileged: one quarter of the population over 25 years has a degree of higher education: the

[6] 19 counties and the BMR.

[7] In reality, this share is smaller, but no data available concerning outsourcing by TNCs located in Budapest (including geographical distribution of the outsourced activities).

second highest value is its half (12.5%) in Csongrád County located in the less developed southern part of the Alföld. Budapest has a post-industrial, metropolitan economic structure with a large labour market for highly qualified persons. There are no important differences in the level of education between the counties: economy of the most developed ones (in term of per capita GDP) is based on manufacturing industry with a relatively low demand on cadres with finished higher education; at the same time, less developed regions east of the Tisza river traditionally have good schools and universities. Because of the low geographical mobility human resources are under-utilized in Eastern Hungary – perhaps providing reserve for the future development.

The geography of aging has its own spatial pattern, which does not follow the traditional west/east divide. The aging index (i.e. percentage population over 64 or elder of that under 14) is far the highest in Budapest; at the same time the outer zone of the BMR has the second youngest population in the country (*Fig. 4*). It means that Budapest follows the demographic pattern of the cities in developed countries: suburbs house young and middle aged families with children, whereas the city centre is settled by young professionals without children and by elderly people. The presence of a large group of young, educated, partly multinational professionals is an important asset of the city's booming economy. At the same time, most of the aged population live among fragile life conditions, because of the devaluation of the retirement pensions since the 1990s. During the communist era, aged persons had no opportunity

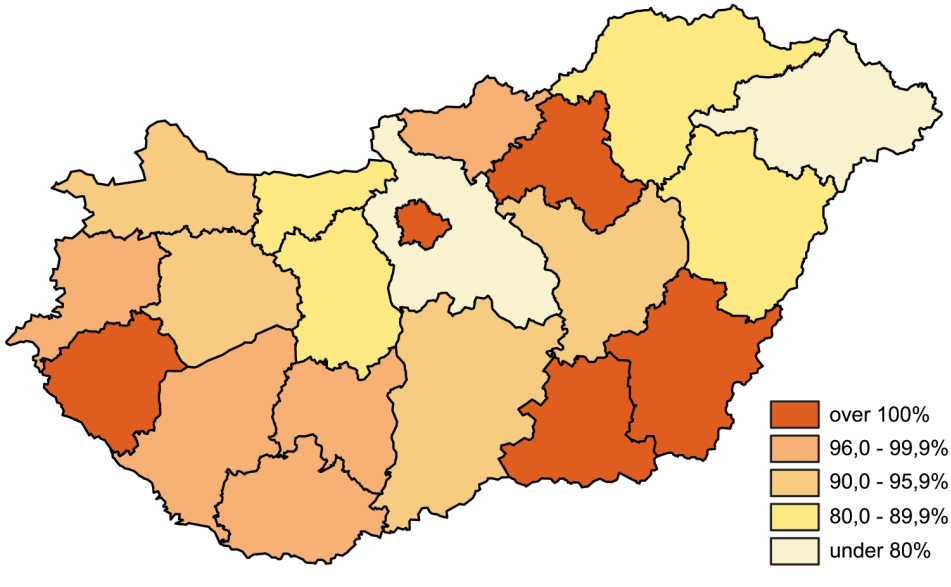

Fig. 4. The aging index, 2002

to save for their after-retirement life and now in many cases high age means poverty and marginality, a drop-out from the middle class. Aging is present in some less developed counties as well, but rather in the south and not in the east of the country. Less developed counties have a relatively sizable rural population, what is aged in most cases because of the earlier out-migration of young population. The north- east (comprising the most backward rural areas) shows a young age structure, because of the relatively high proportion of Roma population. Romas traditionally have a higher fertility rate, than the Hungarian population, and their life expentancy is lower. (3) *Research and development* It is not surprising that this sector, the primary factor to promote innovations and competitiveness in a knowledge-based economy, is concentrated in Budapest. Two thirds of the employees of the R&D sector work in the capital city: the otherwise developed north-eastern counties have a rather low research potential. In 2002, almost 90% of the patents registered abroad were produced in Budapest research institutions and laboratories. Outside Budapest, there are few developed R&D "islands" mostly related to the best universities (at Debrecen and Szeged). These R&D centres have but a limited impact upon the development of their regions: the universities have no full faculties of technologies, and Hungarian enterprises which operate in these less developed regions are not innovation oriented. One of the drawbacks of the Hungarian R&D sector is that the major part of its scarce financing[8] comes from the state budget. Hungarian enterprises have business policy for a short perspective: TNCs which dominate the economic scene have their research units abroad – with the exception of some favourable cases. In sum: BMR is the only sizable centre of R&D in the country. (4) *Small and medium sized enterprises* (SMS). There are only few Hungarian TNCs, e.g. MOL, the petroleum company, or OTP Bank. They have built up a Central European network, but most of the enterprises in Hungarian ownership belong to the category of small and medium sized ones.[9] Their financial capital and export activities are concentrated at Budapest; otherwise the geographical distribution has a rather uniform pattern. SMEs operate mostly in local markets, they do not contribute tangibly to the competitiveness of their region. Nevertheless, their role in employment is quite important: in the less developed counties they provide jobs for a combined 60–70% of the workforce in the production and production services sectors. Hungarian economy has a dual character: the rapid penetration of TNCs modernized the Hungarian economy rapidly. They produce over 70% of export, but their decision-making centres are evidently outside of Hungary, and their employment capacity is relatively low. At the same time the SME sector being dominated by Hungarian capital is less innovative, and its long-term prospects

[8] Expenditures for R&D amounted to a mere 1.3% of the GDP in 2002.

[9] Because of the geographical proximity, Austrian and German SMEs also operate in Hungary.

in the present structure are ambiguous, even though they have a considerable weight in employment, especially in the less developed regions. Although the relationship between these two sectors – due to the expanding outsourcing of TNCs – is strengthening, they are still but loosely linked.

Summary

(1) *Competitiveness within the European Union*. There is a certain gap within the European Union between former members and accession countries. On country level, Portugal, the less competitive country in EU–15 is headed only by Cyprus; Malta and Slovenia are on the same level as Portugal. They are followed by the Czech Republic and Hungary. Closing the gap seems to be a difficult and long term task, especially if taking into consideration that new member countries could reach just the fragment of financial sources that were earlier available for the Mediterranean half-periphery. On NUTS 2 level, Budapest Metropolitan Area is on the top of the accession countries, together with Prague, Cyprus and Bratislava. All the other Hungarian NUTS 2 regions are among the average of the accession countries except North-west Hungary (8th among regions of the new member states). Even though there has always been a concern about regional inequalities within Hungary, these differences are not striking in European comparison. Competitiveness of the BMR is close to the EU average, North-west Hungary has a relatively favourable position among new member countries, but all the other Hungarian regions have a weak competitiveness.

(2) *Competitiveness within Hungary*. Geographical differences in competitiveness were analyzed earlier. Very probably they show more than higher or lower degrees of competitiveness. Actually, *three different stages of development* are present in Hungary (Enyedi Gy. 2000; Lengyel, I. 2003). A) BMR is a prominent growth pole for the country. It is developing into a real knowledge-based and innovation generating economic region: there is an important R&D sector including research units of TNCs; a number of regional (Central European, in some case European) company headquarters are located here; high level business services are widespread. B) North-western counties are in the stage of investment led development; their economy uses knowledge without generating it locally. There are a number of newly developed plants in manufacturing and high-tech industry, invested mostly by TNCs, but they are not yet firmly rooted into local economy. Further development – i.e. switch into the knowledge producing phase depends on how outsourcing will be able to integrate new investments into regional economy, and how the weak R&D sector will be strengthened. Central and South-west Transdanubian counties have the same character, in an incipient, less developed form. A and B types are more or less integrated into the European urban/economic networks in various respects

(financial, transport, production, social values etc). Budapest and its region had presented a higher stage of urban/economic development during the whole period of modern urbanization than the rest of the country. C) Northern and Eastern Hungary comprising 12 counties altogether form the "third" Hungary located east of the Danube. They are in *neo-Fordist* stage of economic development, when economic restructuring just started and there is a certain hope that newly attracted investments in manufacturing industry would be able to solve the problem of under-employment and the rural crisis. Evidently, this huge area – half of the country's territory – is not homogeneous; larger university towns – Debrecen, Miskolc, Szeged – form a couple of islands of modernity. They have a limited spill-over effect upon their regions: they rather produce knowledge that will be used in the more advanced regions (*Fig. 5*).

(3) *Competitiveness of regions: future trends.* Geographical differences in economic competitiveness of Hungarian regions have been shaped for long and within the state boundaries of the country. In 1972, Research Institute of Central Planning Board calculated the per capita GDP by counties. The geographical distribution of the most and less developed counties – and the difference between them – practically was the same than 30 years later. (The only important difference was due to the decline of the mining and heavy industry in Northern Hungary.) Whenever a new economic or technological stage

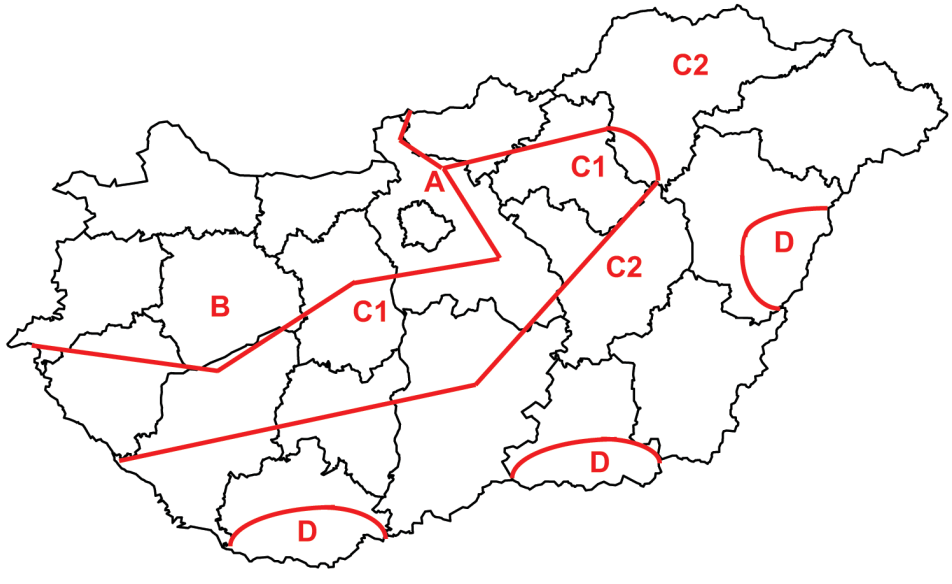

Fig. 5. Stages of regional development. – A = knowledge-based stage; B = investment led stage; A + B = integrated into global networks; C1 = signs of catching up; C2 = neo-Fordist stage, local economy; D = modern „islands", transborderties

of development started to spread from the European core area towards the semi-periphery, it was always Budapest urban region the first and North-west Hungary the second of the regions to adapt innovation and to extend it to the rest of the country. After 1989, international influence became much stronger, as a consequence of the dissolution of the state socialist system and that of the advancement of globalization: but the geographical picture has not changed. As it is assumed by the author, EU membership of Hungary may change this long lasting tendency for two reasons. a) Hungarian regions became a part of the united European market, thus they are forced to compete with all the European regions, without the slightest possibility for state protectionism. Hungary shall learn in the near future, how competitive advantages *within* the country may be converted onto European scale. Most probably, competitiveness of Budapest is not in danger what may further strengthen the advantage of the capital city region. b) In a longer run, transboundary cooperation may lead to the formation of international regions. This may affect the whole regional structure of the country substantially for out of the 19 counties 15 have state border. The relatively small country (93,000 km^2 – the size of Portugal) has seven neighboring states. Five of them – Austria, Romania, Slovakia, Slovenia and Romania – are EU members, and Croatia will hopefully join the Union in the near future. There are potentially good opportunities for the formation of transnational regions (a closer integration, than the present day Euroregions) what may put less developed Northern and Eastern Hungarian counties into a more favourable position than they have today. Cities in Eastern Hungary could acquire gateway functions towards South Eastern Europe which may speed up their post-industrial development.

Hungarian economy was hit rather seriously by the present global economic crisis. Budget deficit and foreign indebtedness allow but a limited opportunity for government financial intervention to stimulate market demands. The high share of TNCs in industrial and financial sectors means that fundamental decisions on the level of enterprises are taken abroad. At the time of writing of this paper, nobody could tell how long this crisis is to last, how and when the recovery will begin. Maybe the content of competitiveness shall be modified and neo-liberal economic policy revised. Most probably, the crisis will enhance regional inequalities as the recovery will start in the most advanced regions and we can expect a longer crisis in backward regions.

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Geopolitics of pipelines and Eastern Europe with especial regard to Hungary

Károly Kocsis[1]–Tibor Tiner[2]

Abstract

The energy strategy of East Central European countries have joined to EU in 2004 is differentiated. It can be stated that majority of these countries have already energy policy and strategy to secure their own energy supply. All of them are making fluent efforts to be independent from considerable part of the Russian oil and gas import in the near or farer future. To avoid negative effects of the future's unforeseen gas wars and unfriendly actions originated from Russia or Ukraine, the new member states of the European Union have worked out more scenarios and projects for the future. Additionally, they have also declared targets to increase the rate of renewable energy in their domestic energy production. Opposite to it Hungary is still stuck into powerful energy economies that drive to international energy-security politics. The county has just switched sides when turned off from US initiations and gave preference to Russian connections. Furthermore there are no visible indication of a coherent national energy security strategy. It is not surprising that the country is not taken into account when decisions are made, neither to the extent is should. It shoud be priority to take pending political decisions and form a real national strategy.

Key words: energy policy, gas pipelines, East Central Europe

The global energy sector is under a continuous tension since the end of the 20th century, which is a result of the rapid growth of global energy consumption, of the skyrocketing of energy prices and the strong competition for the energy resources. So it is understandable, that the security of supply of energy, being the engine of economic development, is an extremely important issue, first of all for the importing countries. This is especially true for the EU-member countries, which are only able to cover a minor part of their energy consumption by own production *(Table 1).* The present-day tense situation results from the risks of great imbalances between energy demand and supply. Additional problems are the territorial concentration of the major hydrocarbon reserves and the political uncertainty in some of these energy producing regions

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Table 1. World Crude Oil and Natural Gas Production and Consumption (2006)

Continents, regions	Crude Oil Million tons		Natural Gas Billion cubic metres	
	Production	Consumption	Production	Consumption
North America	454.9	1055.1	713	724.7
Central & South America	533.6	375.2	194.9	185.6
Europe	251.9	771.0	309	551.8
Former USSR	607.3	193.9	832.8	681.8
Middle East	1240.2	329.0	345.4	324.9
Africa	499.8	142.1	197.3	86.9
Asia & Oceania	394.5	1186.8	375	432.2
World Total	***3984.2***	***4053.1***	***2967.4***	***2987.9***
EU-27	119.8	731.6	213.3	532.1

Source: www.eia.doe.gov

Table 2. World Proved Crude Oil and Natural Gas Reserves (January 1, 2009)

Continents, regions, *countries*	Crude Oil		Natural Gas	
	Billion barrels	Million tons	Trillion cubic feet	Billion cubic metres
North America	209,910	28,754.8	308,794	42,300.5
Central & South America	122,687	16,806.4	266,541	36,512.5
Europe	13,657	1,870.8	169,086	23,162.5
Former USSR	98,886	13,546.0	1993,800	273,123.3
Middle East	745,998	102,191.5	2591,653	355,021.0
Africa	117,064	16,036.2	494,078	67,681.9
Asia & Oceania	34,006	4,658.4	430,412	58,960.5
World Total	***1,342,207***	***183,864.0***	***6254,364***	***856,762.2***
EU-27	6,321	865.9	84,296	11,547.4
Norway	*6,680*	915.1	*81,680*	11,189.0
Russian Federation	*60,000*	8219.2	*1,680,000*	230,137.0
Kazakhstan	*30,000*	4,109.6	*85,000*	11,643.8
Azerbaijan	*7,000*	958.9	*30,000*	4,109.6
Turkmenistan	*0,600*	82.2	*94,000*	12,876.7
Iran	*136,150*	18,650.7	*991,600*	135,835.6
Iraq	*115,000*	15,753.4	*111,940*	15,334.2
Kuwait	*104,000*	14,246.6	*63,360*	8,679.5
Qatar	*15,210*	2,083.6	*891,945*	122,184.2
Saudi Arabia	*266,710*	36,535.6	*258,470*	35,406.8
United Arab Emirates	*97,800*	13,397.3	*214,400*	29,369.9
Algeria	*12,200*	1,671.2	*159,000*	21,780.8

Source: www.eia.doe.gov

(Fig. 1, 2). The Golf States and Russia possess the 62.9% of the proved oil and 73.3% of the proved natural gas reserves of the world *(Table 2).* At the same time the majority of the energy import concentrates to Europe and North America (e.g. 59% of the crude oil import, 85.5% of the natural gas import in

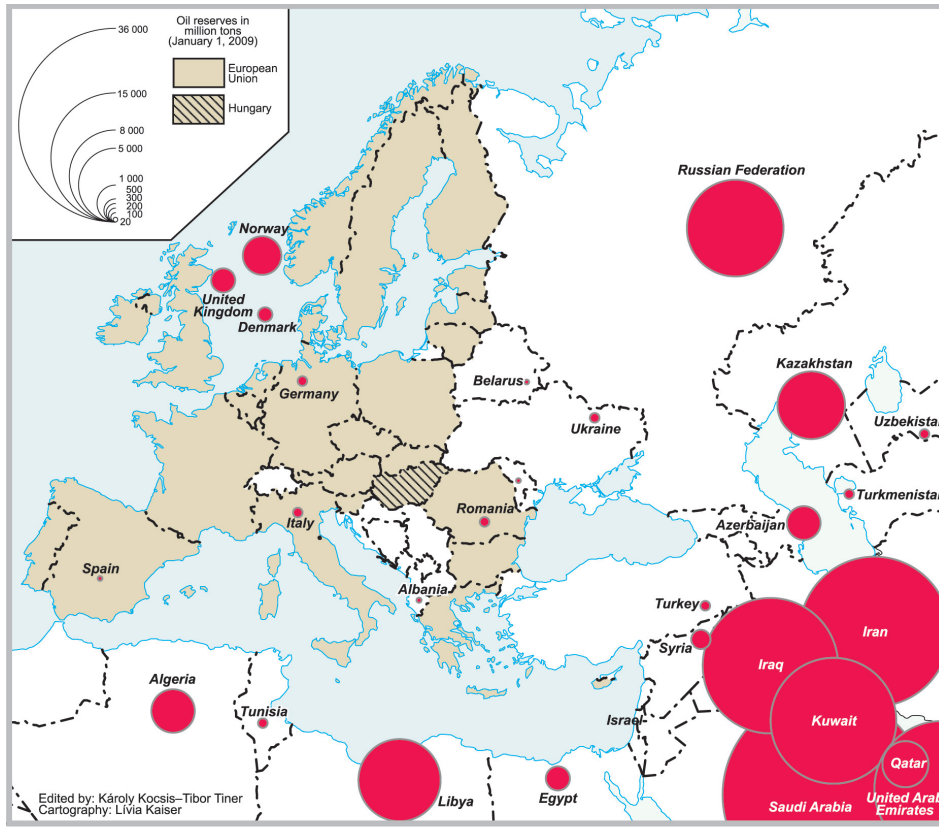

Fig. 1. Oil reserves in Europe (January 1, 2009, million tons)

2005). The largest European oil and gas consumers (and importers) are in the west (Germany, France, UK, Italy, Spain, Benelux states) surrounded from afar by their largest suppliers (Russia, Norway, Algeria, Lybia, Golf states) *(Fig. 3, 4).* The territorial imbalance between the energy exporters and importers upgraded the role of the transit countries, who during the last years, the time of the inflating energy prices often came into conflicts, price-disputes with the producers (e.g. Russia's disputes with Ukraine in 2006, 2009, with Belarus in 2007). These conflicts resulting temporary breakdown in the energy supply drew attention the importance of the security of energy supply, the security of the energy markets and the need of the diversification of supply routes. In this Eurasian geopolitical context of the energetic issue the East European countries play a special role as an important transit area between Russia, Middle East and Western Europe.

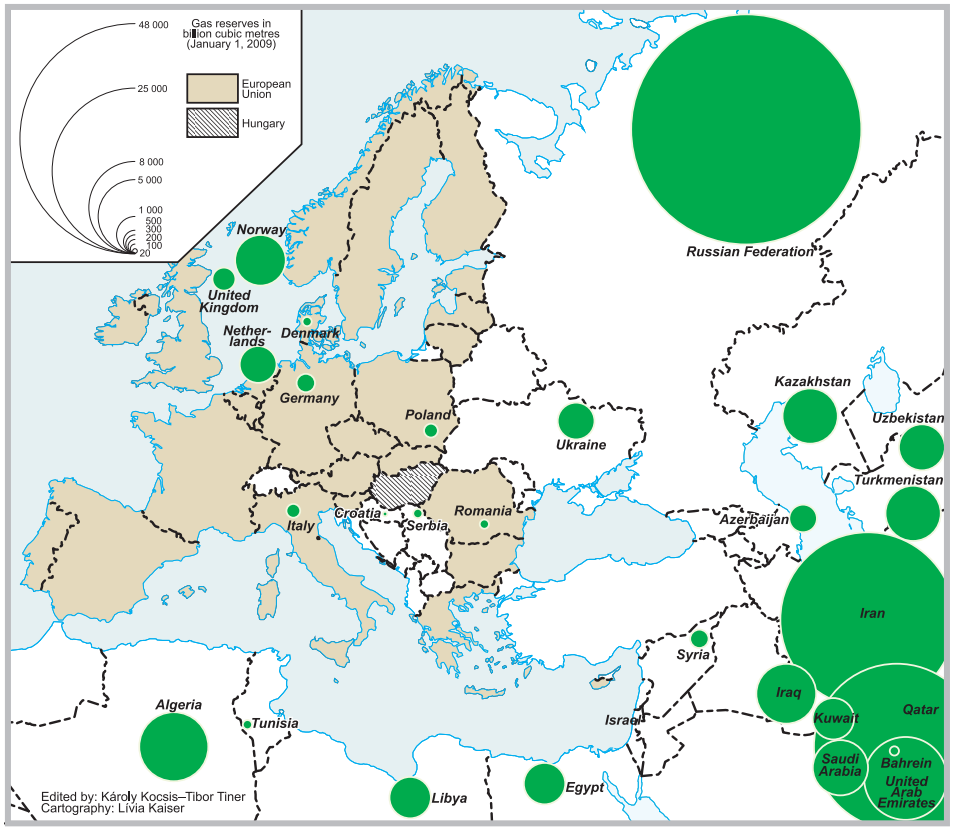

Fig. 2. Gas reserves in Europe (January 1, 2009, billion m^3)

Some geopolitical characteristics of the energy supply in Europe

During the last quarter century the production and consumption of crude oil and the production of natural gas nearly stabilized, in parallel with the sharp decline of the coal production and consumption. Due to the fact, that the natural gas is the cleanest, most nature-friendly energy source (similar to the nuclear energy) and its application entails any social problems, its share in the European energy balance is continuously increasing. Between 1980 and 2005 the gas consumption of the EU-27 increased by 88.4% and for the period of 2005–2030 a growth of 24% (from 537 bcm to 666 bcm) is forecasted. At the same time the EU's gas production will decrease by 30% until 2030 (Esnault, B. et al. 2007). These facts underline the dynamically increasing import dependency of the EU-27 (52.3%), which is in the case of coal 39.6%, 82.2% of crude oil and

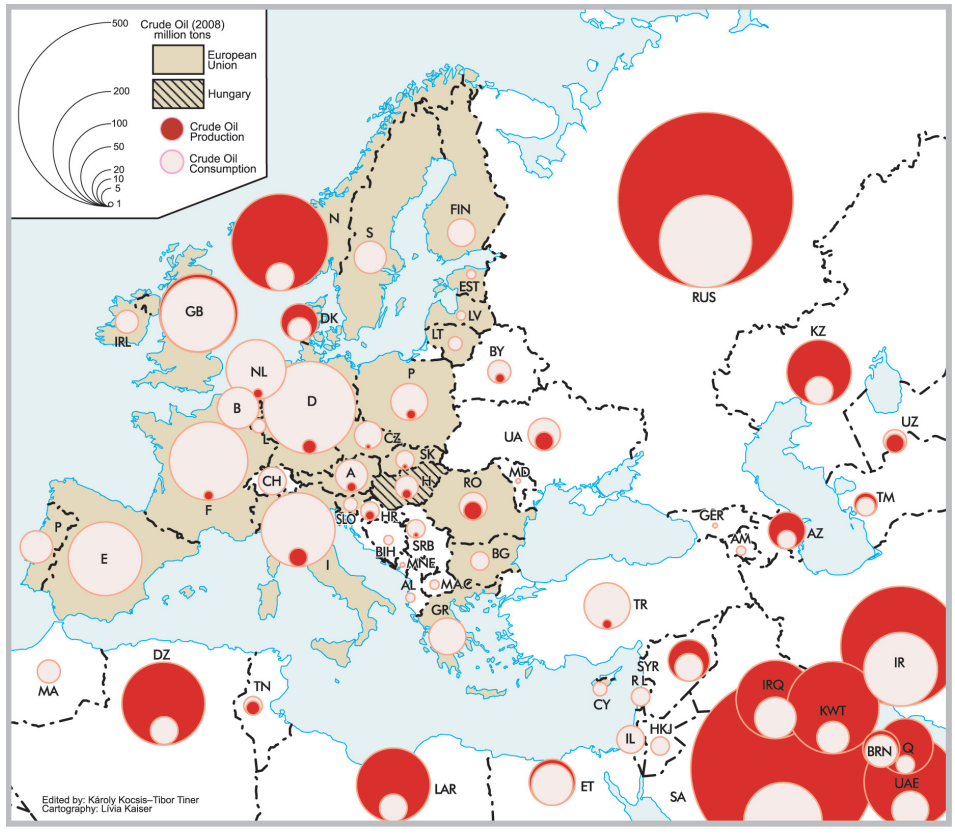

Fig. 3. Crude oil production and consumption in Europe (2008)

57.7% of natural gas (2005) *(Table 3).* This external dependency of the EU is expected to reach by 2030 66% (coal), 90% (oil) and 80% (gas) (Geopolitics… 2007). The dependency of import of hydrocarbons is especially high in the Visegrád Group. Due to their historic (COMECON[3]) past and geographic location their oil and gas import is almost exclusively controlled by the Russian Federation. The first international oil and gas pipelines supplying the V4 countries with Soviet (mostly Russian) fuels were built during the 1960s (Druzhba-Friendship oil pipeline 1964, Brotherhood gas pipeline 1967) *(Fig. 5).*

During the Socialist-Soviet period the oil and gas supply was stable and based on long term agreements, also with Western Europe (since 1968!) in spite of political disagreements. Following the collapse of the communist alliance sys-

[3] COMECON (Council for Mutual Economic Assistance) was an economic organization of the socialist states led (and controlled) by the USSR, between 1949 and 1991.

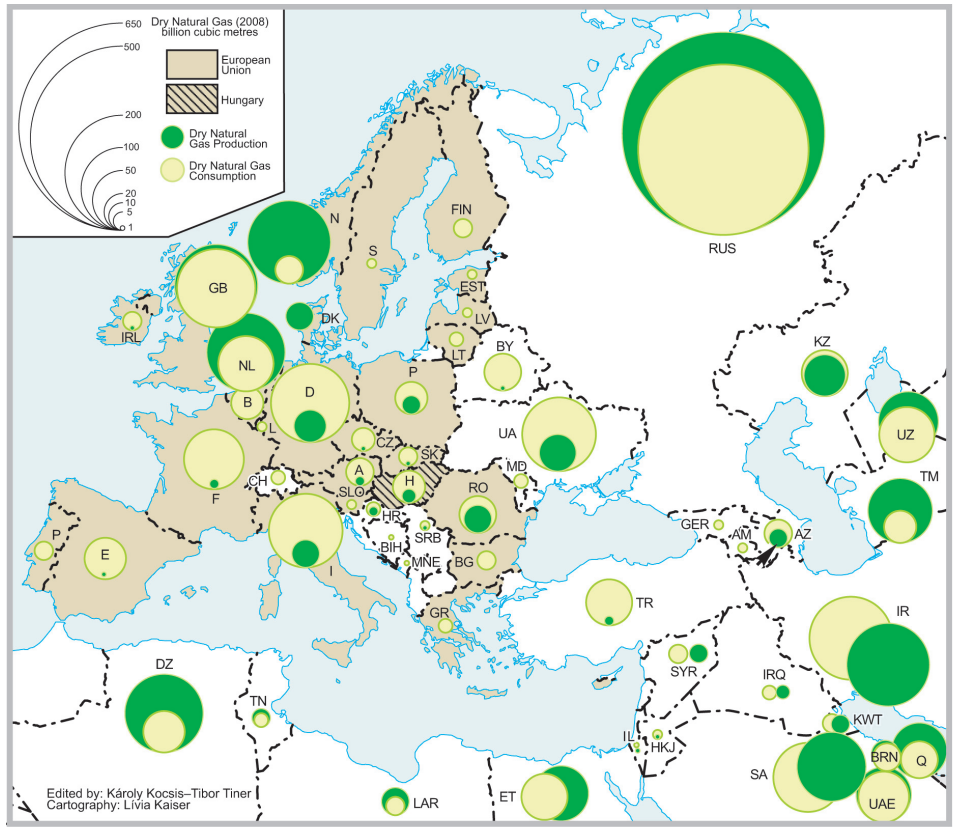

Fig. 4. Natural gas production and consumption in Europe (2008)

Table 3. Fuel Import Dependency of EU-27 and of the Visegrád Group (2005, 2030 in %)

	All fuels		Coal	Oil	Gas
	2005	2030	2005	2005	2005
EU-27	**52.3**	**64.2**	**39.6**	**82.2**	**57.7**
Czechia	27.4	50.3	-17.4	97.4	97.8
Hungary	62.9	63.9	43.4	79.2	81.1
Poland	18.0	44.7	-22.6	96.0	69.7
Slovakia	64.6	69.6	88.5	81.9	97.2

Remark: Negative numbers indicate that the country is a net exporter.
Source: EU Energy in Figures, Pocket Book 2007 (http://ec.europa.eu/dgs/energy), Mantzos, L.–Capros, P. 2006.

tem and of the USSR – in spite of the surviving energy interdependencies – the previous stability of international energy supply in the post-Communist countries gradually came to an end. The deeply changed international situation in

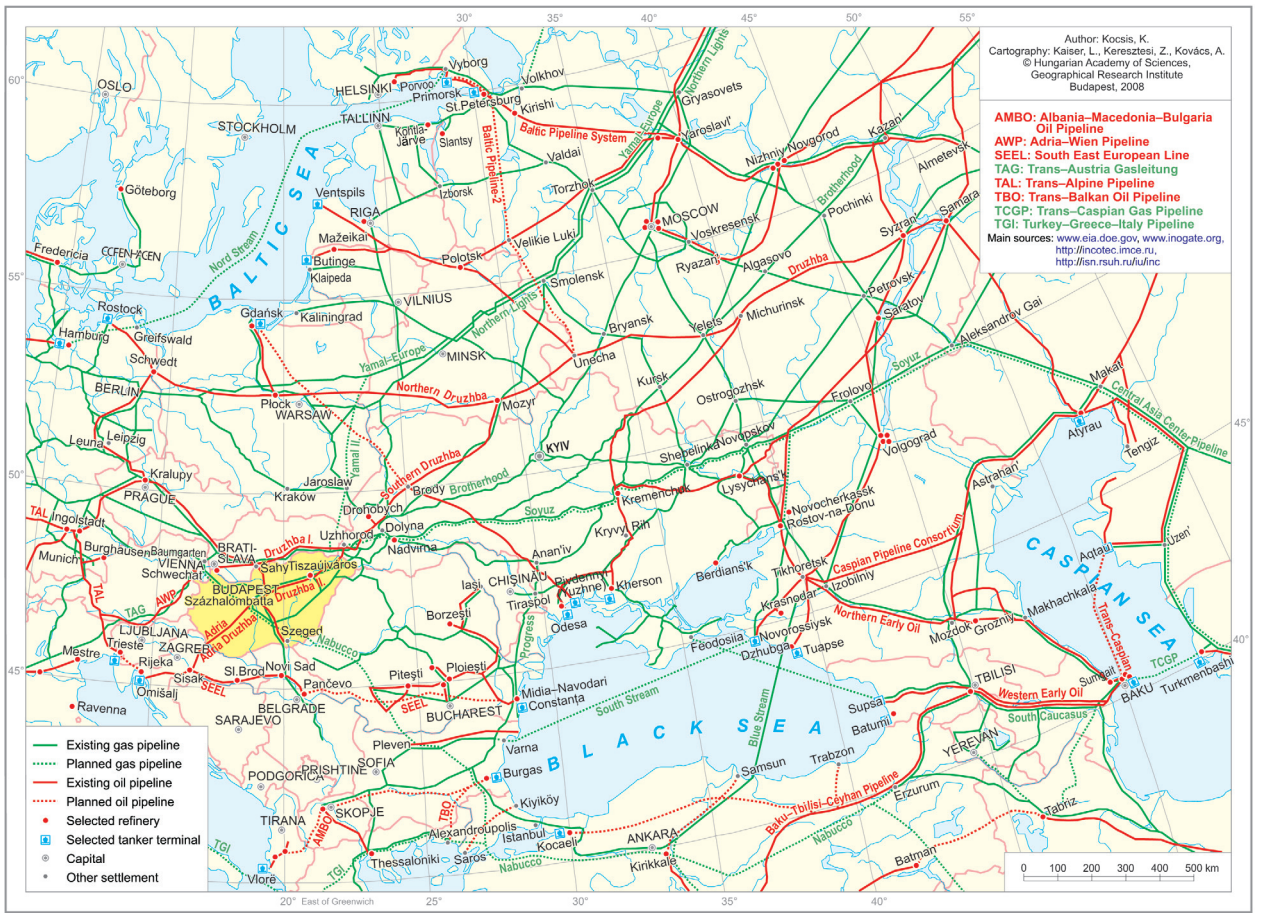

Fig. 5. Major gas and oil pipelines in Eastern Europe (2009)

the eastern half of Europe (enlargement of the EU, establishment of pro-Western and pro-Russian economic organizations[4] in the former Soviet space) heavily transformed the economic equilibrum of international energy (export-import) systems and increased the importance of their geopolitic aspects. During the second half of 1990s started the efforts at diversification of energy supply routes and bypassing of transit states with new pipeline construction projects.

The dominant actors of the recent west Eurasian geopolitical games on energetics, of the new pipeline projects are the Russian Federation and the EU (and the USA). The EU-27 largely depends on Russian gas and oil imports (45.1% and 29.9% in 2005), so does Russia depend on European markets *(Table 4.).* The European oil and gas exports represent about 2/3 of total Russian exports (Esnault, B. et al. 2007). Accordingly the main economic goal of Russia to remain reliable energy supplier for Europe, to decrease dependence from the traditional transit countries (first of all from Ukraine and Belarus) and to preserve its dominant position on EU's gas and oil markets. The latter is connected with the reviving political ambitions of the Kremlin to use energy supply as geopolitical weapon to restore past international political position of Russia.

Table 4. Origin of Crude Oil and Natural Gas Import of EU-27 (2005, in %)

	Crude Oil	Natural Gas
Russian Federation	29.9	45.1
Africa	18.1	28.3
Norway	15.5	24.1
Middle East	20.1	2.5
Caspian	6.8	0.0
Other regions	9.6	0.0
Total	*100.0*	*100.0*

Source: http://ec.europa.eu/dgs/energy

Pipeline projects to reduce Russian dependence

Since second half of 1990s USA pushed for construction of several pipelines (e.g. ***TCGP***: ***Trans Caspian Gas Pipeline***, 1996- or ***Trans Caspian*** oil pipe-

[4] GUAM (Organization for Democracy and Economic Development, 1997) established by Georgia, Ukraine, Azerbaijan and Moldova to counterbalance Russian influence. A common interest in efforts to resolve "frozen conflicts" in their territory (Abkhazia and South Ossetia in Georgia, Nagorno-Karabakh in Azerbaijan, Transnistria in Moldova) also unite these GUAM countries located in the buffer zone between Russia, the EU and NATO and blaming problems for the presence of Russian military forces. EURASEC (Eurasian Economic Community) proclaimed on October 10, 2000 by Russia, Belarus, Kazakhstan, Kyrgyzstan (and with the accession of Uzbekistan in 2006) was the union of customs and tariffs within CIS (Commonwealth of Independent States).

line) that would carry Caspian energy westward without transiting Russia. It would break Russia's monopoly on the region's energy transportation system. Moscow moved fast to construct its own Blue Stream submarine gas pipeline (2001–2005) from Russia to Turkey, which killed the USA and EU backed TCGP project (Geropoulos, K. 2007). At the same time with strong USA support the ***South Caucasus Pipeline*** (SCP) project (between Baku and Erzerum) was realised (2006), which allowed Azerbaijan and Georgia to resist Russian political and economic pressure *(Table 5).* This gas pipeline with the potential of being connected to the Turkmen and Kazakh producers via the planned TCGP would be in the future the supplier of the EU backed Nabucco and TGI pipelines. On the SCP and the Baku–Supsa, Tbilisi–Yerevan–Tabriz gas pipelines based the Ukrainian project of ***Supsa–Feodosiia*** submarine pipeline between Georgia and Ukraine (bypassing Russia), which could supply Caspian and Iranian gas to Ukraine and other European countries.

The ***Baku – Tbilisi – Ceyhan oil pipeline*** (BTC) was built during the period 2002 and 2006, between the Azerbaijani capital Baku and the Turkish Mediterranean port, Ceyhan and represents the second longest oil pipeline of the world (1,768 km). The establishment of the pipeline route was geopolitically and ecologically motivated (bypassing Russia, Iran, the unstable Middle East and the overcrowded Turkish straits, Bosphorus and Dardanelles) and served the increase of the economic independence of the GUAM-member Azerbaijan from Russia.

For December 2002 a new plan has been worked out regarding the ***extension*** of the Ukrainian ***Odesa–Brody oil pipeline*** (built 2001) to the Polish port of ***Gdańsk***. This would be the only route for transporting Caspian oil to Central Europe, to the Visegrád countries – bypassing Russia, via the GUAM states: Azerbaijan, Georgia, Ukraine (through Baku–Batumi–Odesa/Pivdennyi terminals). Although it is supported by the EU, this pipeline has only 9 million tons annual capacity, which is very modest comparing to larger projects in terms of commercial attractiveness. Moreover, Russia has successfully blocked oil transport from Kazakhstan to Ukrainian seaport Odesa. Kazakhstan declined to join this project, unless it is transformed to include Russia and committed additional massive oil volumes for export via Russia. On 10 October 2007 an agreement to form this pipeline consortium was signed by Poland, Lithuania, Ukraine, Georgia and Azerbaijan in Vilnius. Finally, in accodance with Russia's will the Kazakh oil (from the giant Tengiz filed) started to supply the Odeas-Brody pipeline via the CPC (Caspian Pipeline Consortium) in Russia. This project is highly important to make safe oil supply for East Central Europe, first of all for Poland and Lithuania.

On April 3, 2007 Romania, Serbia, Croatia, Slovenia and Italy signed an agreement about the construction of a 1,400 km long oil pipeline (***South East European Line***, SEEL) from the Romanian port ***Constanța*** to the Italian ***Trieste***.

Table 5. Major East European Pipelines (existing and planned)

Pipeline name	Fuel	From - to	Capacity (bcm gas or mt oil/year)	Start date	Existing or planned
Brotherhood	gas	Russia – Slovakia, Hungary	104.0	1967, 978, 1984, 1989	Existing
	gas	Russia – Finland	5.8	1973	Existing
Soyuz	gas	Russia – Ukraine	–	1978, 1983	Existing
	gas	Russia – Romania	14.3	1987	Existing
Yamal - Europe	gas	Russia – Poland, Germany	33.0	1999	Existing
Blue Stream	gas	Russia – Turkey (Izobilniy – Durusu)	16.0	2003	Existing
South Caucasus Pipeline	gas	Azerbaijan – Turkey (Baku – Erzurum)	16.0	2006	Existing
Nord Stream	gas	Russia – Germany (Vyborg – Greifswald)	2 x 27.5	2010	Planned
Nabucco	gas	Turkey – Austria (Erzurum – Baumgarten)	4.5–31.0	2013	Planned
TGI	gas	Turkey – Greece – Italy	11.5	2013	Planned
Druzhba	oil	Russia (Samara) – Poland, Germany, Slovakia, Czechia, Hungary	70.0	1964	Existing
Northern Early Oil	oil	Azerbaijan – Russia (Baku – Novorossiysk)	5.8	1997	Existing
South Stream	gas	Russia – Bulgaria - Italy (Novorossiysk – Varna -)	30.0	2013	Planned
Trans-Caspian Gas Pipeline	gas	Turkmenistan – Azerbaijan (Turkmenbashi – Baku)	30.0	?	Planned
Western Early Oil	oil	Azerbaijan – Georgia (Baku – Supsa)	5.8	1999	Existing
Baltic Pipeline System	oil	Russia (– Primorsk)	75.0	2001	Existing
Caspian Pipeline Consortium	oil	Kazakhstan – Russia (Tengiz – Novorossiysk)	28.2	2001	Existing
Odesa - Brody	oil	Ukraine (Pivdennyi – Brody)	9.0	2001	Existing
Baku – Tbilisi - Ceyhan	oil	Azerbaijan – Turkey (Baku – Ceyhan)	50.0	2005, 2006	Existing
Trans-Balkan Oil Pipeline	oil	Bulgaria – Greece (Burgas – Alexadroupolis)	15–23.0	2011	Planned
South East European Line	oil	Romania – Serbia – Italy (Constanța – Trieste)	40–60.0	2012	Planned
Baltic Pipeline System-2	oil	Russia (Unecha – Primorsk)	50–75.0	?	Planned

Remark: bcm = billion cubic metres, mt = million tons. *Source:* Esnault, B. *et al*. 2007.

This EU backed pipe with a planned capacity up to 90 million tons annually would reduce tanker transportation in the Turkish straits and Adriatic Sea and would be a competitor to the Russian dominated Burgas-Alexandroupolis pipeline transporting oil from the Black Sea, Caspian area to the largest markets of the EU. Most likely source of the oil could be the large Kazakh fields, from where the main transit routes (CPC) are under Russian control (Socor, V. 2006).

Since the "Orange Revolution" in Ukraine (2005), the changed, pro-Western (EU and NATO) attitudes of Ukrainian foreign policy resulted the increase of Russian natural gas and crude oil prices up to the international level. In January 2006 a real gas conflict was burst out between the two countries because following the unsuccessful talks about gas prices the Ukrainian Naftohaz company siphoned the main transit gas pipelines running via Ukraine from Russia to Central and Western Europe, which resulted the Russian shutdown of gas supply. This was not a unique phenomenon, Russia often shut down pipelines supplies during the time of political disputes (e.g. 2003 Latvia; 2006 Ukraine, Lithuania, Georgia, 2007 Azerbaijan), which enabled by the extremely close relationship between the Russian energy industry and the Kremlin.

Following the gas crisis the EU expressly endeavours to decrease strategic dependence (EU-25 43% in 2005) on Russian (Gazprom's) gas and to diversify energy supply (Hafner, M. 2006). The first step of this was to realize alternative, non-Russian controlled gas corridors to EU: the Nabucco and Turkey-Greece-Italy (TGI), for further diversification of export possibilities to the European markets, with bypassing Russia and Ukraine. Construction of the 3,300 km long ***Nabucco*** gas pipeline is expected to begin in 2009 and is planned to be finished in 2012. It would connect Baumgarten an der March, the largest natural gas hub in Austria with Erzerum in Turkey, the end of South Caucasus Pipeline. Once completed, it would allow transportation of natural gas from producers in the Caspian region such as Azerbaijan, Turkmenistan and Iran to EU and to the countries (Turkey, Bulgaria, Romania, Hungary) along its path. The recently announced ***TGI*** pipe would transfer Caspian gas from Turkey through Greece to Italy with an annual capacity of 11.5 bcm and completition date of 2012. Though it was an original Austrian conception to carry Iranian gas to Europe, the Nabucco project was delayed for years by USA opposition to development of Iran's gas fields. Western failure to engage with Turkmenistan deprived Nabucco of that possible source of gas for Europe. Washington had to insist that Azerbaijani gas alone (expected to flow in coming years to eastern Turkey) could support both Nabucco and the planned TGI pipeline simultaneously, an argument that led to more questions. Turkey's government, driven by short-term tactical and political considerations (often unrelated to energy policy as such), never came fully on board the Nabucco project. As a result of existing and planned „pro-Russian" and „pro-Western"

energetic corridors Turkey became a natural hub for Caspian and Iranian gas destined for Europe and the arena of rivalry between EU/US and Russia. This strategic transit country similarly to Ukraine is increasingly depends on Russian energetic supplies (60% of natural gas and 20% of oil imports). Due to the Russian influence, Turkey has already demonstrated cool attitude towards Ukraine's and Georgia's NATO aspiration and openly opposed NATO's naval deployments in Black Sea area (Tsereteli, M. 2005).

Pipeline projects to secure Russia's market positions

Between 1994–1999 was built the 4,196 km long ***Yamal-Europe pipeline*** (since 2005 with a capacity of 33 bcm) to supply Russian gas from the Yamal peninsula the North Central European market via Belarus, Poland and Germany.

The ***Baltic Pipeline System*** (BPS) transports Russian oil from the Timan – Pechora area, West Siberia and the Volga-Ural region to the oil terminal Primorsk at the Golf of Finland. The pipe built between 1997–2001 aims to bypass the continental transit countries (e.g. Belarus, Ukraine, V4) and supply the Western Europe by tankers via the Baltic Sea.

With similar Russian geopolitical motivations was planned (from 1997) and started to construct (from 2005) the ***Nord Stream*** (former names: North Transgas, North European Gas Pipeline) with a 1,196 km long Baltic Sea offshore section between the Russian Vyborg and the German Greifswald. The Nord Stream submarine pipeline as an alternative route of the Russian gas to West-Central Europe beside of the existing Yamal-Europe pipe have seen by opponents as geopolitical weapon against the continental energy transit countries (Belarus, Ukraine and V4). The Nord Stream seems to be a tool to exert Russian political influence on transit countries by threatening their gas supply without affecting gas exports to Western Europe (Baran, Z. 2007).

The disagreement over oil tariffs between Belarus and Russia at the beginning of January 2007 led to a disruption of oil supplies via Druzhba pipeline to Central Europe between January 8 and 11, 2007. Following this event the Russian government decided to construct an oil pipeline (***Baltic Pipeline System-2, BPS-2***) from the Druzhba pipe (from Unecha near the Belarus border) to the Baltic Sea port Primorsk, which annual throughout capacity is expected to increase up to 150 million tons. The BPS-2 reducing Russia's reliance from the transit state Belarus will redirect about half of the capacity of the Druzhba, the oldest and largest oil pipeline transporting Russian and Kazakh oil across Europe. This project will cause Belarus a possible loss of revenue of 3–400 million Euro annually (Resnicoff, M. 2007).

The ***Northern Early Oil*** (NEO) pipeline transports oil from the large Azeri-Chirag-Gunashli (ACG) fields in the Caspian Sea near Baku via Grozny

to the Russian port Novorossiysk since 1997 and folowing a break since 2005. With the launch of the EU-US backed BTC oil pipeline in 2005–2006 the utilization of NEO's capacity is reduced considerably (Zaslavsky, I. 2006).

It was a strategic mistake for the West and a big success for Russia, that the 1,510 km long ***Caspian Pipeline Consortium***'s (CPC) oil pipeline, planned to export annually 65 million tons of oil from Kazakhstan to Russia (Tengiz – Novorossiysk), was built also by American companies (e.g. Chevron) with government approval from the late 1990s to 2001. Currently operating at some 28.2 million tons of oil annually, this Russian controlled pipeline direct the majority of Kazakhstan's growing oil output and export to Russia, which fact ruined the Western-backed Trans Caspian oil pipeline project (Aqtau – Baku) and seriously damage the interests of the US government-backed BTC pipeline.

On May 25, 2007 Russia, Bulgaria and Greece signed a basic treaty to implement of the project ***Burgas – Alexandroupolis*** oil (previous name: Trans-Balkan Oil, TBO) pipeline during the period of 2008–2011. This 279 km long pipe is the first on the territory of EU to be 51% owned by Russian firms and aims to supply the western markets with Russian-Kazakh oil bypassing the overcrowded Turkish straits.

The Russian geopolitical goals of the construction of the 1,213 km long trans-Black Sea gas pipeline, ***Blue Stream*** (2005) was to block the plans (TCGP and Nabucco) of the EU to use the territory of Turkey to bring gas from the Caspian and the Middle East to Europe bypassing Russia. The absence of a real Western energy strategy in Western-Central Asian region was demonstrated by the ENI, Italy's state-controlled energy holding company, which was partner of the Russian Gazprom at the building of the Blue Stream, loaning the technology and financing for the submarine pipeline (Socor, V. 2007).

Russia evidently again trying to preempt Nabucco and TGI pipeleines to preserve its European market dominance. Following the Western opposition to Gazprom's involvement in Nabucco, Russia announced in June 2007 the Russian-Italian project ***South Stream*** (900 km long submarine pipeline from Russian Novorossiysk to Bulgarian Varna) bypassing both the Caucasian countries and Ukraine. From Varna the southwestern route of the South Stream would run through Greece to South Italy, the northwestern route would continue via Romania, Hungary and Slovenia to North Italy.

Beside of this Russia in the frame of its anti-Nabucco campaign in May-June 2007 signed agreements with ***Kazakhstan, Turkmenistan and Uzbekistan*** (with the main gas supplier of the planned Nabucco) to construct new Russia-bound gas export pipelines, which seriously damage the EU-plans about non-Russian controlled pipelines from the Caspian region. According to these plans vital for the Gazprom and Russia among others a gas pipeline would establish from the Russian Aleksandrov Gai (crossing of Soyuz and Central

Asia Center Pipelines) to Ukrainian Novopskov, in the same corridor, which is used for the Soyuz (1983) gas pipeline. With an annual 28 bcm capacity, this gas pipeline could serve as a link in the system through which gas is transported from Central Asia to Europe. The pipeline expansion between Uzhhorod and Novopskov would strengthen the role of Ukraine as transit country for natural gas to Central and Western Europe.

Due to these agreements Kazakhstan, Turkmenistan and Uzbekistan almost completely depended on Russian-controlled export pipelines. This situation made possible for the Russian Gazprom to purchase gas at a rate of about 45–65 USD/1,000 cubic metres (Dec., 2006) from these Central Asian countries and sell that gas to Western Europe for around 230 USD (Baran, Z. 2007). To keep out Turkmenistan from the West (and to retain as a reliable gas supplier) Gazprom agreed to rise the price of Turkmen gas from 100 USD/1,000 cubic metres in December 2007 to 130–150 USD in 2008, which could result the increase in gas prices also in Ukraine and in V4.

In 2007 Russia's strategy for Caspian energy resources and transport routes was almost completely successful. The main goals of this strategy were the following: encircling the EU by gas pipelines (Nord Stream, South Stream) bypassing problematic transit countries; buying the majority of the East Caspian gas as cheap as possibly and selling as expensively as possible; bringing Kazakh oil and Turkmen gas to the West through Russian controlled pipes; making Russia's ties with the Caspian as strong as possible; discouraging or killing competing EU/US backed projects (e.g. TCGP, Nabucco, TGI) and ensuring the West that Russia is reliable energy supplier (Karbuz, S. 2007).

Recent developments

The Nabucco Project

For the spring of 2009 new challenges has been emerged for supporters of Nabucco projects to cope with. According to original plans the pipeline is scheduled to start operating in 2013, but it is doubtful that it will be built. Continued and current hesitation by the private sector to finance this project, not to mention the brief war between Russia and Georgia for South Ossetia in August 2008, means that Nabucco has to face an uncertain future.

It's also a real problem, that Nabucco faces many further obstacles, among which are the planned rival South Stream pipeline, supported by Russia's giant company Gazprom. The European Commission insists that Nabucco is not an attempt to find alternatives to Russian supplies, but a necessary additional channel. This position is confirmed heavily by ÖMV Austrian gas and oil company, interested in the project.

The gas crisis burst out between Russia and Ukraine in January 2009 and cut or disrupted gas supplies to 18 EU member countries did not appear to be a sufficient argument in favour of Nabucco among experts of European Parliament's foreign affairs committee. At political level, at first it had appeared that Nabucco would gain credibility in light of the crisis.

In mid January 2009 the member states of the European Parliament have issued a rather pessimistic draft report on EU energy security, in which Nabucco featured prominently. This important report was presented just a few days before Hungary organizes a 'Nabucco summit' in Budapest at the end of that month.

The summit had raised hopes that the project could be re-launched soonest. Representatives of the Czech Republic, which country holds a half year rotating EU presidency, have indicated they will push for Nabucco project as one of its top priorities.

Idependent experts of the Centre for European Policy Studies emphasize that the main question is: Where the Nabucco-gas come from? Lack of large technical investment makes imports from Iran problematic. It is because that country is still a net importer of gas, despite holding the world's second-largest natural gas reserves. Besides, serious political and economic sanctions against Iran make the whole Nabucco project appear more likely to be realised only in the distant future.

As for Turkmenistan the country's government is reluctant to deliver gas to Europe, as it prefers to sell to Russia on high prices and Turmenistan also has China as an alternative client.

Regarding the issue of transit Turkey can be considered as a key transit country. It has huge domestic demand for Russian or othe natural gas itself, while legal disputes on the delimitation of the Caspian Sea could be used by Russia to block the project. Additional problem is the financing of Nabucco which remained a challenge.

Problems regarding to the Nabucco project has emerged in the focus of more NATO experts. They also express their scepticism towards the project. By their latest opinion it remains unclear which sources and routes would be more beneficial and reliable. The warned, if the main goal of the European Union is to enhance routes that are not controlled by Moscow, there is a real risk that the EU will compete in markets in which it is not familiar or well-placed.

The South and North Stream projects

The plan to build the South Stream, a new gas pipeline under the Black Sea linking the Russian Black Sea port Novorossiysk to Bulgaria's Varna would mean that Russia would no longer send its gas supplies through Ukraine,

which locked horns with Russia over payment of outstanding gas debts last December. The dispute led to gas supply disruptions to European consumers in winter. It will contribute the diversification of gas supplies, which is an important factor in energy security.

Putting into operation South Stream will meet these requirements. Gazprom's representatives more times promised to develop of the Arctic gas field, which has estimated reserves of 133 trillion cubic feet. That would supply the North Stream gas pipeline from Russia to Germany, currently being built under the Baltic Sea.

Bulgaria, Hungary, Slovenia, Italy and many other EU-members have also reiterated their interest in construction of the South Stream gas pipeline, intended to send Russian gas to Europe across the Black Sea bed. The South Stream gas pipeline, is due to be commissioned in 2013.

Meanwhile Belarus has proposed another pipeline to guarantee a stable supply of Russian natural gas to Europe, and has sought involvement of Poland and Germany in the project. The proposed pipeline would bring gas from the Yamal Peninsula in NW Siberia. But some Ukrainian experts are cautioning against such expansion. The emphasize, it is necessary to guarantee not just the route but the supplier. Presently, several European countries depend solely on the Russian monopoly Gazprom, and construction of more pipelines from Russia would only reinforce dependency on Russian gas.

Additionally, the major part of the North Stream pipeline is designed to be laid almost entirely along the sea bottom that runs through the economic zones of Baltic countries. This plan creates additional tension over national security concerns, land ownership and environmental issues. A purely economic issue here is ownership of the gas and the transmission pipelines.

Ukraininan economists suggest separating the object of gas transportation and the pipelines to avoid vertical integration and monopolization of the market. It would be necessary because both 'Stream' projects are not reliable means to diversify gas transit through Ukraine and to ensure constant gas supplies to East and West European countries as consumers.

Finally, Hungary has made a contract with Russia in March 2009 to contribute to the construction costs of Hungarian section of South Stream (in a rate of 15%) which offers an alternative solution in gas supply instead of the traditional route running via Ukraine.

Further alternative solution to Hungary for a safe gas supply

Hungary is one of the most energy-sensitive country among East Central European states. It was suffering from the negative effects of gas crisis during January 2009 and now is searching for alternative solutions to safe enough

quantity of natural gas for their consumers inside of the country. It seems to be a strategic question because of the high rate of natural gas consumption for electric energy production. Between 1990 and 2007 it's share has increased from 19.7% to 37,9% in Hungary (Reményi, 2009).

Desiring to perevent the crisis situation in the future Hungary and Croatia plan to build a brand new gas transit pipeline by mid-2011 which would ship gas from Hungary to Croatia, but would also allow two-way shipments later. This plan has been announced by the representatives of MOL's gas transmission 'Földgázszállító' (FGSZ = Natural Gas Transporter), the leading gas supplier in Hungary in February 2009.

The new pipeline would have an annual capacity of around 6.5 billion cbms. The heads of Plinacro, the gas branch of Croatian INA, and the Hungarian company FGSZ" decided to sign a joint development agreement soon aimed at connecting the pipeline networks of Hungary and Croatia.

The new pipeline will be reversible, which means once a planned liquefied natural gas (LNG) terminal which is built on the island of Krk in Croatia's northern Adriatic. This also means that this small independent country in SE-Europe will be able to connect to any of the major international pipelines that may be built in the future, like Nabucco or South Stream. By the content of the cintract Földgázszállító will build the 206-km long Hungarian section of the pipeline, while Croatia will cover the costs of the 88 km stretch in Croatia. The pipeline will connect the village of Városföld in Hungary with Slobodnica in Croatia.

The Balkans were severely affected by stopping in gas supplies arising from Moscow's dispute with Ukraine this January and Croatia considered the planned LNG terminal as crucial for diversifying energy supplies.

Hungary, which also heavily relies on Russian gas imports but has sufficient reserves and has also domestic natural gas production on the territory of Hungarian Alföld (Great Plain) shipped gas to Croatia, Bosnia and Serbia during the gas crisis in January. The large capacity LNG terminal planned by a consortium of Croatian and European energy firms, should also improve supply security for the wider region as it will be able to process more gas than Croatia needs.

Conclusions

The global increase of hydrocarbon energy demand resulted the sustained increase in energy prices since 1999 and pushed the energy (especially the gas supply) security as a dominant global geopolitical issue. There is an energy interdependency between the suppliers and consumers, which underline the need of security of supply and of markets. Although the fair relations between the exporters, importers and the transit countries should be the priority of energy issues, due to the increasing competition for energy resources and markets,

beside of economic factors also the geopolitical motivations could be observed at decision making. As a result of little unity among EU-member states' energy policies Russia often took advantage of this situation. Due to this lack of unity the Kremlin could "preemptively block European attempts to construct transport routes for Caspian and Central Asian oil and gas that do not involve Russia" (Baran, Z. 2007). The countries, and the large European energy companies (e.g. ENI, BASF, Ruhrgas, Gaz de France, Gasunie) are played against each other by Moscow in order to secure more favourable (often dominant) market situation for Russia. Sometimes Russia seems to strive after driving wedge between the eastern (former Soviet ally) and western member states of the EU.

The energy strategy of East Central European countries have joined to EU in 2004, it can be stated that majority of these countries have already energy policy and strategy to secure their own energy supply. All of them are making fluent efforts to be independent from considerable part of the Russian oil and gas import in the near or farer future. To avoid negative effects of the future's unforeseen gas wars and unfriendly actions originated from Russia or Ukraine, the new member states of the European Union have worked out more scenarios and projects for the future. Additionally, they have also declared targets to increase the rate of renewable energy in their domestic energy production.

Opposite to it Hungary is still stuck into powerful energy economies that drive to international energy-security politics. The county has just switched sides when turned off from US initiations and gave preference to Russian connections. Furthermore there are no visible indication of a coherent national energy security strategy. It is not surprising that the country is not taken into account when decisions are made, neither to the extent is should. It shoud be priority to take pending political decisions and form a real national strategy.

Hungary's EU lobbying techniques should also be enhanced. However, without clear political intentions and decisions it is difficult to lobby for anything. Technically and financially the country is not prepared to provide a substantial portion of national energy production from renewable energy sources. It is very unlikely that long term objectives will be integrated into effective government actions. The European Union is also putting the requirement of sound economic management over savings energy and all these initiatives Hungary have to take into consideration.

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Costa, C.S. *et al.* (eds.): GreenKeys at Your City: A Guide for Urban Green Quality. Leibnitz Institute of Ecological and Regional Development, Dresden, 2008. 105 p.

A new, remarkably useful *guide* has been added to the already abundant list of references to spatial and urban planning. The booklet is aimed to prove the importance and to present opportunities for a relatively new spatial planning purpose: the urban green development. The content of the present volume was based on findings of an EU Interreg III B CADSES (2005-2008) project, titled: '*GreenKeys – Urban Green as a Key for Sustainable Cities*'. The project had three main objectives. Firstly, to plan and implement pilot projects in the partner cities and collect the experience gained during the whole process. Secondly, to formulate an Urban Green Space Strategy, which can be used as a template in future projects. Finally, to help transfer the knowledge and know-how in the topic, and to publish the results. The GreenKeys brought together 12 cities from 7 countries, 8 scientific supporters (among them the research group of the Geographical Research Institute Hungarian Academy of Sciences, Budapest), external experts, design studios and NGOs. Besides, the public participation and involvement of local stakeholders were a crucial goal of (and at the same time tool for) the project. It is worth to mention that the GreenKeys project has partly been built upon the EU FP5 project, called URGE (Development of Urban Greenspaces to Improve the Quality of Life in Cities and Urban Regions) as an antecedent.

The fact that the present book was written by authors who participated actively in the whole procedure of the given pilot project could guarantee what one can claim from a guide: to provide swift, definite and universally usable methods for solving the problems and to give answers to the emerging questions. The structure of the volume (made up of five major chapters) certainly meets this requirement.

In the Introduction the authors proclaim their credo: the urban green space development contributes to the sustainability of cities in all detail. The benefits are observable in the economic, social, ecological and environmental spheres of life. Four major phenomena make this issue timely: the numerous 'brownfields' within urban areas having appeared after economic restructuring and deindustrialization, the climate change which affects the built-up city areas profoundly, the increasing need of better quality of life and the aspect of public health.

The second, most lengthy part makes the readers acquainted with strategy planning procedure step-by-step. Three main phases can be defined: the *starting* part, in which the aims, priorities, and the exact implementation steps have to be identified after establishing the strategy group. Collecting and analyzing data and subjective information are the primary purpose in the second, *analytical* part. The third, *action* part deals with the development of urban green space strategy and ends with the preparation of its draft version. It also offers an implementation plan in accordance with the needs that have already been revealed. Here we can find a subsection (Pool for strategies) which gives exact examples not only from the experiences of the project partners, but from the UK (Bristol, Doncaster) and Germany (Münster) as well, about how to deal with the emerging issues and to surmount possible obstacles. It also offers different types of solution in such cases.

One of the most difficult questions of the action part of every project is how to raise funds. The example of Nova Gorica, Slovenia was mentioned where the HIT Group (a

casino and tourist corporation) co-financed the development of the green space. The story of the involvement of a private company began with an event organized by a local artist. The artist sold hand-made plastic flowers to collect money to build a children's playground in the city park. Naturally, the amount collected this way was not sufficient but publicity was aroused among politicians and other decision makers. All this contributed to the decision of the management of the casino, situated near to the projected playground, and run by the HIT group, to co-finance the project.

The third part of the book is an attempt to present an overview of the experience gained from the implementation of the GreenKeys pilot projects. As a general rule we can state that the faults committed in the starting and analytical part of the strategy can easily hamper implementation or raise difficulties.

The fourth chapter provides an overview of the tools developed during the project. This section practically functions as a manual for the contents accessible in the website (http://www.greenkeys-project.net) and on the enclosed CD-ROM, which is a good idea indeed as the documents, questionnaires, tables with the instruments, techniques, concepts are completely downloadable and applicable in the work of experts and interested and committed civil stakeholders.

In the last chapter recommendations concerning the green policies of cities are formulated and the local authorities, national governments and the European Commission are called for action. This chapter describes the multilevel benefits (for individuals, local communities, tourists) of green space development in different (social, environmental, economic) aspects. The importance of the initiative and supportive roles of the local government is emphasized, and the special relevance of cooperation between the related actors i.e. the local authorities, professional consultants, scientific advisors and the inhabitants, local stakeholders is pointed out. The involvement of the inhabitants (primary users of the green area) into the procedure from the planning phase till the implementation and maintenance means to contribute to the local civic awareness in positive sense and to motivate the population to care for the new or renovated green area. Next to the involvement of the local stakeholders and public participation it is the interdisciplinary approach and the co-operation between the scientific and administrative experts that are the key elements for the successful planning and realization of an Urban Green Strategy.

In most cases the logical structure of the booklet is accompanied with an attractive appearance. The framed texts refer to examples from the practice of the project partners but in other cases they stand for important statements, recommendations. Maybe it would have been more logic to differentiate between the two. Another problem with these green-framed writings is that they sometimes hamper the understanding of the subsection as they are cut in the main text. Beside these, an abundance of maps, figures and diagrams help the better interpretation of the message. Photos made the book colourful and 'easy-to-read' – notwithstanding some of them seem to be unnecessary and redundant. The green CD-ROM-symbol always reminds the reader to check further information on the attached CD-ROM, while the green arrow indicates cross-reference to other chapters of the book.

The experience and problem oriented approach of the guide might encourage and could inspire launching further similar projects. Additional strong point is that beside the enumeration of benefits emerging from the green space renewing projects it also indicates the difficulties and dysfunctions.

The guide can suggest good ideas to the professionals, and also may be used by the interested civilians who care for maintaining and improving of their residential environment.

Ágnes Erőss

Kocsis, K., Rudenko, L. and Schweitzer, F. (eds.): Ukraine in Maps. Institute of Geography National Academy of Sciences of Ukraine, Geographical Research Institute Hungarian Academy of Sciences. Kyiv–Budapest, 2008. 147 p.

The second volume of a series prepared in the Geographical Research Institute Hungarian Academy of Sciences (GRI HAS) focuses on an East European state, Ukraine. The first member of the series presented South Eastern Europe (2005, 2007) whereas the third book will introduce Hungary as it were to give the public a foretaste of a new edition of the national atlas of the country. This series of publication is aimed at presenting a comprehensive overview of regions and countries in English richly illustrated by maps. The volumes might have an importance for geographers, be informative for experts in foreign affairs and politicians, and they are also to serve business, especially firms with intentions to invest in the regions and countries in concern.

The launch of the series (and the fact that already the third volume is in preparation) is clear evidence that research of the foreign countries and territories have a firm place in academic institutions including the GRI HAS. Studies on areas beyond the national boundaries is going to have an increasing strategic importance making classic regional geography face new challenges at the same time promoting its revival.

Ukraine in Maps is a publication accomplished by adaptation of the aspects of classic geographical description to the contemporary conditions in Ukraine and purposed for general orientation. It means that it is not the new achievements of the scientific research that have been placed in the focus, instead the volume offers essential knowledge for the broad audience in the form of an atlas: maps with textual comments. A high level outward appearance is at par with similar publications in the west and might have a place on the bookshelf along with standard atlases.

The volume is a product of cooperation between two workshops in geography: Institute of Geography of the National Academy of Sciences of Ukraine and GRI HAS. Beside the publication of the book this collaboration has made a substantial contribution to the development of links and deepened scientific relations in geography. Preparations, editing and finalization required exchange of experts i.e. study trips to Kiev and Budapest. In the wake of *Ukraine in Maps* new publications came into being and cooperations were initiated so joint activities have proven to be a good start.

The actuality and novelty of the pictorial textbook is that it is a pioneer edition, since no similar publication was hitherto issued on Ukraine either in Hungary or abroad. Certainly there was a previous attempt (e.g. Ukraine. Industry and investment activity) but beside map inscriptions it contained only very short explanations in English. A new National Atlas of Ukraine (NAU, 2008) is a rather prestigious volume but only map titles appear in that language. Another specific feature of the joint Hungarian-Ukrainian album is its approach stemming from confers of Hungarian geographers with the Ukrainian colleagues, consequently it contains both external and internal reflections.

The work is subdivided into three parts and further into eleven chapters. A short historical overview is followed by the analyses of natural environment and social conditions; they form the background behind the state of economy which is in the focus of the book. An introduction into the national economy of Ukraine might rely on eager interest of the reader; this is why such an emphasis has been put on this topic.

77 maps and 21 tables are accompanied with the explanatory notes. Part of the maps was constructed by Ukrainian geographers but the Hungarian contribution is significant as well. The latter maps as a rule are of illustrative in character, striking and easy to survey. They are chiefly associated with human geographical phenomena, such as ethnic

composition, languages, population change, incomes, urbanization and also appear in the chapter on agriculture. For some figures the spatial patterns are shown by raion instead of the oblast level, which is a pioneer undertaking; similar maps of detailed resolution does not even appear in the new NAU. The differences between the approaches represented by the Ukrainian and Hungarian schools of geography are clearly discernible in the chapter on economy which praises the efforts made overwhelmingly by the Ukrainian party. These maps often require long analyses and less interpretable at first glance because they reveal intricate spatial structures relating to e.g. privatization, gross value added (GVA) or foreign direct investment (FDI). Ukrainian human geography is dominated by industrial geography still based on the spatial distribution of productive forces, epitomized in a heavily descriptive chapter. Factors putting the country in an international context as its transit position with a special reference to the pipelines in hydrocarbon transport were mainly presented by the Hungarian experts.

The introductory chapter is aimed at positioning Ukraine in Europe. Beyond the classic aspects such as geographical setting, territorial extension, borders, administrative divisions, an assessment of the economy is presented in European context with an emphasis on aspirations of the country to the integration in the EU. Participation of Ukraine in TACIS programme is also referred to.

A short outline of the country's historical evolution also allows a brief insight in ethnogenesis of the Ukrainians. It is supported by a spectacular map series depicting the change in statehood on the territory what is now Ukraine during the past more than one thousand years, initially in Kievan Rus, then within the Polish-Lithuanian Union, later in the Ottoman Empire then under the Russian czarism and more recently in the Soviet Union.

Natural conditions are addressed to a relatively minor extent in the album. Nevertheless after tackling topography and geological structure it is the soils, followed by solid mineral fuels (coal, peat) and metal ores (iron, manganese, chrome, nickel) of utmost economic significance that are introduced in detail. There is an extensive description of climatic conditions which have a key importance for the country with high agroecological potential. Following landscape types and physical-geographical divisions the ecological situation comes to the fore. A general assessment made by the Ukrainian geographers is accompanied by a map of air pollution and by another one of the Chernobyl aftermath.

Social conditions start to be displayed with population: ethnicities, languages and religions. Along with the actual patterns this chapter presents an analysis of changes during the 20th century and shows (eastern and western) diasporas of the Ukrainians. Chapter on the demographic features along with population patterns and change also include level of education, economic activity and unemployment. These characteristics are shown on raion level as well. The chapter on the settlement system focuses on the urban network; rural Ukraine (in spite of its high relevance) has a regrettably subordinate part to play in this account. Beyond the historical development size categories and urban functions are described. Urban population is outlined on raion level too.

The most extensive chapter deals with the national economy. Apart from the general characteristics (privatization, GVA, investment including FDI) if focuses on the power industry and infrastructure as a strategic sector. Most of the pipelines transporting liquid and gaseous hydrocarbons cross Ukraine and the country also is a zone of encounter between the European and Russian electric power systems. Further the chapter describes machinery engineering, chemicals and food industries with long traditions but nowadays suffering from a sharp decline. Farming has a particular importance and summarized in a special chapter. Agricultural production, structures and ownership patterns are presented along with crop cultivation and livestock breeding.

There are three chapters left to depict transport and telecommunications, R&D, recreational potential and tourism turnover. Beside the characteristics of transport performance and traffic volume (public roads, railways, pipelines, waterways) a separate map shows international transport corridors. Wired and wireless systems of telecommunication, cellular network and mobile phone services are described. The chapter on tourism lists places worth to visit by categories such as natural attractions (forests, watersides, mountains, mineral springs including medicinal waters) and cultural heritage (e.g. monasteries, UNESCO World Heritage sites). Tourism infrastructure and the international tourist flow are also presented within this increasingly important sector of economy.

The volume is a worthwhile undertaking to complete the literature on the geography of Ukraine available in English. Its comprehensive and versatile approach brings the reader closer to the understanding internal structures and conditions of Ukraine. The album can be recommended for study in general orientation and in a starting phase of any research.

Dávid Karácsonyi

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In memoriam András Rónai

On November 21, 2006 Geographical Research Institute of Hungarian Academy of Sciences (GRI HAS) held a birth centenary conference in honour of András Rónai (1906–1991), the geographer and geologist of wide renown. After the opening speech of academician Sándor Marosi (GRI HAS), professor Zoltán Dövényi, deputy director of GRI HAS made a broad outline on Rónai's life-work and on the historical circumstances of his activities. He drew attention on the dramatic events in Hungary during the 20th century which had had an adverse effect on the scientific public life. Following World War II hitherto flourishing academic disciplines disappeared or sank into negligence having not fitted into the new official political orientation. These changes also affected the career of scholars who conducted such studies and there had been only few among them to carry on through giving up original field of interest and taking up a politically neutral stance. Such a representative of geosciences was András Rónai, who cultivated human geography (primarily political and ethnic geography) until the end of the 1940s, then switched to geology and had become an expert of world renown in hydrogeology and Quaternary studies.

Professor Zoltán Hajdú (Research Centre for Regional Studies HAS, Pécs) spoke about Rónai's contribution to political geography which could be characterised by an overall fair and unbiased approach to the issues that had to be solved, through the analyses of high accuracy, orderly and scholarly level. He had always accepted this principle as valid, even in the course of handling statistical data produced in successor states of the Austro-Hungarian Monarchy. Rónai wanted to get a clear insight in autorepresentation of these states and formed his analysing and correcting criticism on the basis of fairly elaborated data sets. Rónai had come from below socially, i.e. he did not belong to the ominous middle classes, which did not stand unprecedented in Hungarian geography of the period between the world wars. He became university professor thanks to his gift, diligence, stubborn and persevering work; his advancement along the social ladder was purely due to his merits. He engaged himself to service in sharp historical and political situations and represented scholarly approach in an age when it was not advantageous in many cases, because propaganda seemed to yield more spectacular results than making use of well-founded arguments.

Professor Károly Kocsis (GRI HAS) emphasized, that in the first third of Rónai's academic career he acted as political geographer. Though he never considered himself an ethnic geographer, from the viewpoint of the discipline in the present-day sense, i.e. research of spatial aspects of ethnic issues and their mapping, his scientific activity prior to 1949 is to be considered a milestone in the development of Hungarian ethnic geography of the 20th century. His studies on political and economic geography of Central Europe and the Carpathian Basin and their regions were subordinated to the efforts in territorial revision of Trianon Peace Treaty by Hungary. These demands were also supported by ethnic geographical investigations. Apart from the multi-ethnic composition of population of the whole area in general and of Transylvania as his homeland in particular, this approach stemmed from impressions of childhood and youth spent there, his ethnic tolerance, command of languages and last but not least from the moral and scholarly influence of his

patron and mentor, Count Pál Teleki. Rónai's research activities of nearly two decades in ethnic geography can be subdivided into four phases on the basis of national and personal cataclysms (1938, 1941, 1945) presented by his main publications.

Academician István Klinghammer (Eötvös Loránd University, Budapest) gave a detailed information about the Atlas of Central Europe, Rónai's masterpiece in cartography. From December 1940 until May 1945 Rónai acted as director of the Institute of Political Sciences at Budapest. According to the verbal testament of Count Pál Teleki immediately prior to his suicide (he probably anticipated an eventual defeat of the Axis Powers) Rónai launched a project to publish an Atlas of Central Europe containing a series of predominantly thematic maps which was compiled from more than 3.5 million statistical data published by ten states of the region in the 1930s and 40s (environment, population, economy, transport etc.). The atlas represents an area from Saxony to Lemberg (west to east), to the Abruzzi and Foggia in Italy, Albania, Skopje and Edirne (down south). This volume of 171 maps with an extensive explanatory notes (altogether 367 pages) had been edited and drawn at the Institute, which was relocated to Balatonfüred at the end of the war. A limited number of rotaprint copies (quasi-proofs) were produced by March 15, 1945. The Soviet troops took the settlement ten days after. From the material a digital facsimile was produced at the Department of Cartography of Eötvös Loránd University, Budapest and the Atlas was printed out anew in 1993. It provides an image of Central Europe on the eve of World War II.

The last paper was presented by Dr László Kuti (Geological Institute of Hungary, Budapest) who spoke about Rónai's activity in the field of geology. Rónai joined the Geological Institute of Hungary in February 1950 as the head of the Department of Cartography. He became involved in the newly initiated mapping of the Great Hungarian Plain led by J. Sümeghy, organised and managed groundwater mapping of lowland areas to the very end. In 1956 he was appointed head of Lowland Department. He initiated the mapping of lowland areas at 1:200 000 scale being as a matter of fact the revision of the previous survey. During this campaign he elaborated the methodological bases of lowland mapping. Upon these principles he started the complex, comprehensive geological mapping of the Great Hungarian Plain in 1964. The survey based on a shallow borehole grid spaced in a predefined network opened a new perspective in lowland mapping on international level as well. The work had not only been initiated but it was completed brilliantly, though the last map sheets were compiled by his colleagues half a year after his retirement. Just another result of international interest was the establishment of deep subsurface water monitoring network in the Great Hungarian Plain. Drillings set up along two profiles and penetrating the whole Quaternary sequence not only contributed to the unrivalled monitoring network but they put the Quaternary stratigraphy of Central Europe on a completely new basis. The results of his survey of the Great Hungarian Plain during several decades were summarised in his last substantial work "The Quaternary Geology of the Great Hungarian Plain" (1985).

In the closing part of the three-hour-long memorial conference professor Ferenc Schweitzer, director of the GRI HAS summarized the results of the meeting. He emphasized that Rónai's scientific heritage must be referred to among the greatest achievements of Hungarian geology. Rónai presumed that geological survey would in perspective shift from classical geology, lithology and paleontology towards hydrogeology, engineering geology and environmental geology. It was the promotion of the latter disciplines that he recommended strongly. At last professor Schweitzer added: András Rónai was a real Hungarian patriot, who did his best for our homeland and Hungarians in all of his life.

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