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Studies

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Far from the core – regions and industrial parks in economic shadow in Hungary[1]

Part two

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Abstract

The first part of the paper (Hung. Geogr. Bull. No 2. 2010) was an attempt to evaluate the level of development of NUTS2 regions of the country on the basis of data for the leading 500 companies. The main results of the analysis showed close correlation between the geographical position and success (or failure) in business. The second part of the paper deals with economic efficiency of top firms that are settled into industrial parks of modestly developed and less favoured counties. Analyses were carried on using financial and statistical indicators published by different institutions and firms (e.g. Central Statistical Office, Creditreform Ltd.) electronically or in printed version. The conclusion of the study is that the economic crisis burst in 2008 has affected adversely both the annual revenues and profits of the top firms settled into industrial parks of the counties mentioned above.

Keywords: top 500 firms, revenues, profits, less favoured counties, industrial parks

Introduction

In the second part of the study our foci are the counties and inside them only those of the leading firms that belonged to the top 500 in 2005 and 2009 by the volume of their annual revenues and profit and settled into industrial parks of selected counties during the last decades. The investigation consisted of three phases.

– In the first phase annual revenues and profit of the leading 500 enterprises of Hungary were analysed and compared to each other for the year of 2005 and 2009 by counties.

– In the second phase the counties were evaluated by the change of ranking of their firms belonging to the top 500 ones.

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– In the third phase there were analysed the activities of the relatively small group of top 500 producing or servicing firms accommodated inside the industrial parks.

To avoid overflowing verbalism this part of paper tries to demonstrate the results by the help of several tables and figures.

Processes on county level

The change in the number of firms and in the volume of annual revenues by counties based on parameters of relatively small groups of their firms belonging to the top 500 firms in 2005 and 2009 indicates a highly distorted structure *(Table 1)*.

The fourth column of the table shows that between 2005 and 2009 nearly half of the counties had lost 36 top firms altogether and – without Pest County – only 7 counties gained 11 top firms altogether.

Table 1. The change in number of top firms and in the volume of their total annual revenues by counties between 2005 and 2009

County	Number of firms belonging to top 500		Change, 2009/2005	Total volume of annual revenues of the firms, bn HUF		Change, 2009/2005, bn HUF
	2005	2009		2005	2009	
Pest	46	66	+ 20	3,018	4,846	+ 1,828
Komárom-Esztergom	25	27	+ 2	2,311	3,879	+ 1,568
Fejér	27	22	– 5	1,659	2,259	+ 600
Győr-Moson-Sopron	25	25	0	1,759	2,221	+ 562
Borsod-Abaúj-Zemplén	20	23	+ 3	973	1,344	+ 371
Jász-Nagykun-Szolnok	11	12	+ 1	350	1,126	+ 776
Hajdú-Bihar	15	13	– 2	641	853	+ 212
Csongrád	15	16	+ 1	391	811	+ 421
Somogy	5	7	+ 2	477	606	+ 129
Heves	10	7	– 3	443	460	+ 17
Vas	10	10	0	420	374	– 46
Bács-Kiskun	12	8	– 4	225	240	+ 15
Szabolcs-Szatmár-Bereg	10	5	– 5	201	231	+ 30
Veszprém	11	6	– 5	264	226	– 38
Tolna	2	3	+ 1	123	188	+ 65
Baranya	8	5	– 3	276	159	– 117
Nógrád	3	4	+ 1	51	92	+ 41
Békés	6	3	– 3	106	77	– 29
Zala	8	2	– 6	132	39	– 93

Source: Creditreform Ltd. 2006–2010

During this period the number of top firms in Pest County had increased considerably and their total annual revenue exceeded 1,800 bn HUF. In Komárom-Esztergom County the volume of annual revenue was produced by the high incomes of Nokia Hungary Ltd. located in the town Komárom. In case of Jász-Nagykun-Szolnok County the spectacular increase in the volume of annual revenue owed to Samsung Hungary Ltd. (located in Jászfényszaru) which captured the 9th position in 2009 among the leading 500 firms in Hungary (its position was only the 39th in 2005). In 2009 three companies of the energy sector have realized considerable result in Csongrád county, and stepped to the 47th, 49th and 94th place of the ranking.

At the other extreme Baranya and Zala counties were the biggest losers in this process. There had been a serious fall in the nominal value of annual revenue of their top firms, because due to the sharp competition on the Hungarian energy market the biggest companies have lost their previous favourite position. There were also drops in the nominal values of annual revenues in Vas, Veszprém and Békés counties. Additionally, between 2005 and 2009 four counties (Bács-Kiskun, Heves, Szabolcs-Szatmár-Bereg and Nógrád) had experienced only very modest increase.

Analysing the change in the number of firms and the volume of profits by counties based on parameters of the relatively small groups of their firms belonging to the top 500, considerable regional inequalities could be observed between 2005 and 2009 *(Table 2)*.

Looking at the fourth column of the table it can be seen that between 2005 and 2009 there was a dramatic fall in the number of firms with top profitability in the majority of the counties. Only few counties showed a modest positive change in the number of top firms. This process marks heavy concentration of profits produced by top 500 firms at Budapest. It is a negative spatial trend with the strengthening position of Budapest versus the rest of Hungary. There is more evidence for it:

1. The number of profitable top firms in Budapest has increased from 224 (2005) to 296 (2009), so the rate of the capital had grown from 44.8 per cent (2005) to 59.2 per cent (2009) among the top 500.

2. In 2005 the profit realized by all the top firms was 838.6 bn HUF in the 19 counties, which has increased only up to 982.1 bn HUF in 2009. (Difference: 143.5 bn HUF, rate of increase: 17.1 per cent)

3. In contrast: in 2005 the total volume of profit of the top firms in Budapest has emerged to 1,382.4 bn HUF, and it reached 2,092.7 bn HUF until 2009. (Difference: 710.3 bn HUF, rate of increase: 51.4 per cent)

Consequently the economic crisis had really hit hard at the leading firms operating in the countryside, while largest companies with headquarters at Budapest and being active in the most profitable sectors of the Hungarian economy (energy supply, banking, insurance, public services) have managed to preserve their strong positions and even were able to further develop.

Table 2. The change in number of top firms and in the volume of their profit by counties between 2005 and 2009

County	Number of profitable firms belonging to top 500		Change, 2009/2005	Total volume of profit of the firms, bn HUF		Change, 2009/2005, bn HUF
	2005	2009		2005	2009	
Pest	45	42	– 3	203.5	298.0	+ 294.5
Győr-Moson-Sopron	33	18	– 15	132.1	172.3	+ 40.2
Komárom-Esztergom	24	18	– 6	109.6	103.5	– 6.1
Fejér	29	14	– 15	89.1	70.2	– 18.9
Borsod-Abaúj-Zemplén	21	11	– 10	89.2	59.0	– 30.2
Vas	8	10	+ 2	24.3	52.9	+ 28.6
Hajdú-Bihar	11	11	0	24.7	51.9	+ 27.2
Heves	10	7	– 3	26.6	31.1	+ 4.5
Veszprém	12	8	– 4	27.9	30.8	+ 2.9
Csongrád	14	9	– 5	18.6	29.9	+ 11.3
Jász-Nagykun-Szolnok	7	11	+ 4	25.6	29.3	+ 3.7
Bács-Kiskun	10	12	+ 2	11.2	22.3	+ 11.1
Tolna	2	2	0	2.6	19.5	+ 16.9
Somogy	4	3	– 1	17.7	17.9	+ 0.2
Szabolcs-Szatmár-Bereg	12	11	– 1	7.2	12.0	+ 4.8
Baranya	11	5	– 7	8.2	11.1	+ 2.9
Békés	4	5	+ 1	11.8	8.7	– 3.1
Nógrád	4	2	– 2	3.3	5.4	+ 2.1
Zala	5	4	– 1	5.4	3.5	– 1.9

Source: Creditreform Ltd. 2006–2010

The direction of changes in the case of 14 modestly or weakly developed counties[3] according to the annual revenues and profit of their top firms between 2005 and 2009 is demonstrated on *Figure 1.* Studying the direction of changes in revenues–profit relation it becomes clear that the position of four counties (Hajdú-Bihar, Jász-Nagykun-Szolnok, Csongrád and Vas) has improved by 2009 compared to 2005. On the other hand the position of the so-called "marginal countries" (Zala, Baranya, Nógrád, Békés and Szabolcs-Szatmár-Bereg) changed only to a minimum extent.

Evaluating the counties by the change in ranking of their firms within the top 500 category further negative processes can be observed *(Table 3.)*

Data on *Table 3* reflect not only the fact that two thirds of these counties have lost their more favourable position in the ranking of their top firms since 2005, but there were merely two counties (Szabolcs-Szatmár-Bereg and Csongrád) which were able to step on much higher stages of the ranking list

[3] Baranya, Somogy, Tolna, Veszprém, Vas, Zala, Heves, Nógrád, Hajdú-Bihar, Jász-Nagykun-Szolnok, Szabolcs-Szatmár-Bereg, Bács-Kiskun, Békés and Csongrád counties.

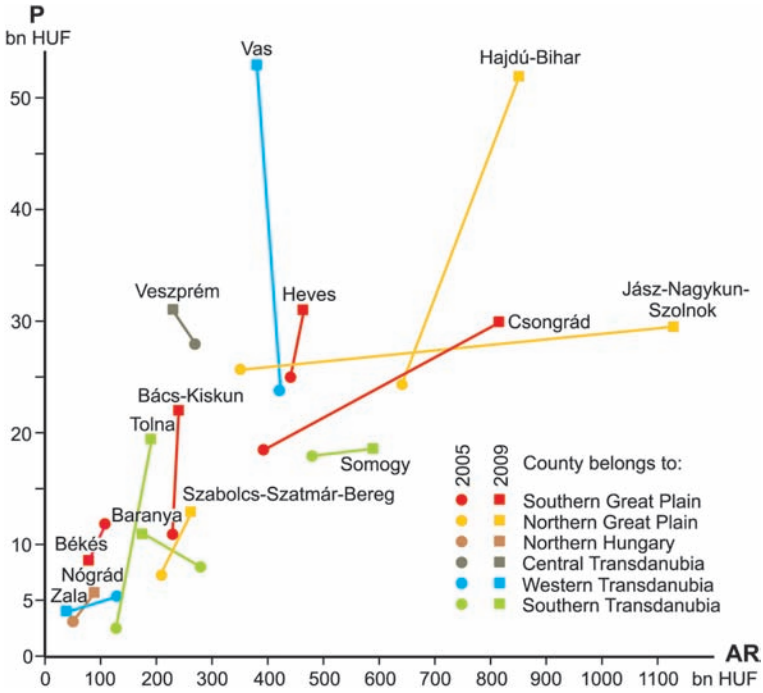

Fig. 1. Changing position of the top firms of 14 counties on the annual revenues–profit diagram. AR = annual revenue; P = profit

Table 3. The change in ranking of top firms according to the volume of their total annual revenues between 2005 and 2009 in 14 counties

County	Number of firms belonging to top 500		Average rank		Value of increase (+) or fall (–) of average rank
	2005	2009	2005	2009	
Jász-Nagykun-Szolnok	11	12	302	289	+ 13
Hajdú-Bihar	15	13	259	261	– 2
Csongrád	15	16	306	260	+ 46
Somogy	5	7	217	304	– 87
Heves	10	7	200	195	+ 5
Vas	10	10	208	291	– 83
Bács-Kiskun	12	8	305	289	+ 16
Szabolcs-Szatmár-Bereg	10	5	392	330	+ 62
Veszprém	11	6	233	267	– 34
Tolna	2	3	216	263	– 47
Baranya	8	5	242	278	– 36
Nógrád	3	4	302	345	– 43
Békés	6	3	303	304	– 1
Zala	8	2	376	389	– 13

Source: Creditreform Ltd. 2006–2010

of the top 500 companies. The positive change in the case of Jász-Nagykun-Szolnok and Bács-Kiskun counties was only modest. The position of Heves, Békés and Hajdú-Bihar counties has not changed significantly.

Evaluating the above mentioned 14 counties by the change in ranking based on the profit realized by the firms also negative trends could be observed *(Table 4.)*

Table 4. The change in the ranking of top firms by the volume of their annual profit between 2005 and 2009 in 14 counties

County	Number of firms belonging to top 500		Average rank		Value of increase (+) or fall (–) of average rank
	2005	2009	2005	2009	
Jász-Nagykun-Szolnok	6	11	194	269	– 75
Hajdú-Bihar	10	11	281	278	+ 3
Csongrád	14	19	267	220	+ 47
Somogy	3	3	227	270	– 43
Heves	11	7	262	250	+ 12
Vas	10	10	144	198	– 54
Bács-Kiskun	11	12	297	278	+ 19
Szabolcs-Szatmár-Bereg	10	11	395	363	+ 32
Veszprém	13	8	252	204	+ 48
Tolna	2	2	266	176	+ 90
Baranya	12	5	366	257	+ 109
Nógrád	5	2	315	254	+ 61
Békés	4	5	277	222	+ 55
Zala	5	4	311	387	– 24

Source: Creditreform Ltd. 2006–2010

Data on Table 4 demonstrate the results of a curious process. Namely, most of modestly or weakly developed counties managed to preserve profitable firms, and at the same time the latter had replaced the unprofitable ones. Their number was 116 in 2005 and 110 in 2009, so during four years they experienced only a minor decrease.

In the case of some counties the changing position of some dominant firms had resulted in higher or lower average values in ranking. (E.g. the fall in average rank of Jász-Nagykun-Szolnok County owed to the lower rank of the Samsung Electronic Hungary Ltd. and Electrolux Lehel Refrigerator Factory Ltd.) A spectacular increase could be recorded in Tolna county where the position of Paks Nuclear Power Plant Co. stepped forward from the 110th place (2005) to 28th place (2009) among the top 500 firms by profitability. Similarly the position of the E.On Southern Transdanubia Ltd. (energy supply) has advanced from 96th place (2005) to 77th place (2009) in Baranya County.

The tendency of changes between 2005 and 2009 in the case of top firms of the 14 modestly or weakly developed counties according to the average ranks based on annual revenues and profit is shown on *Figure 2.*

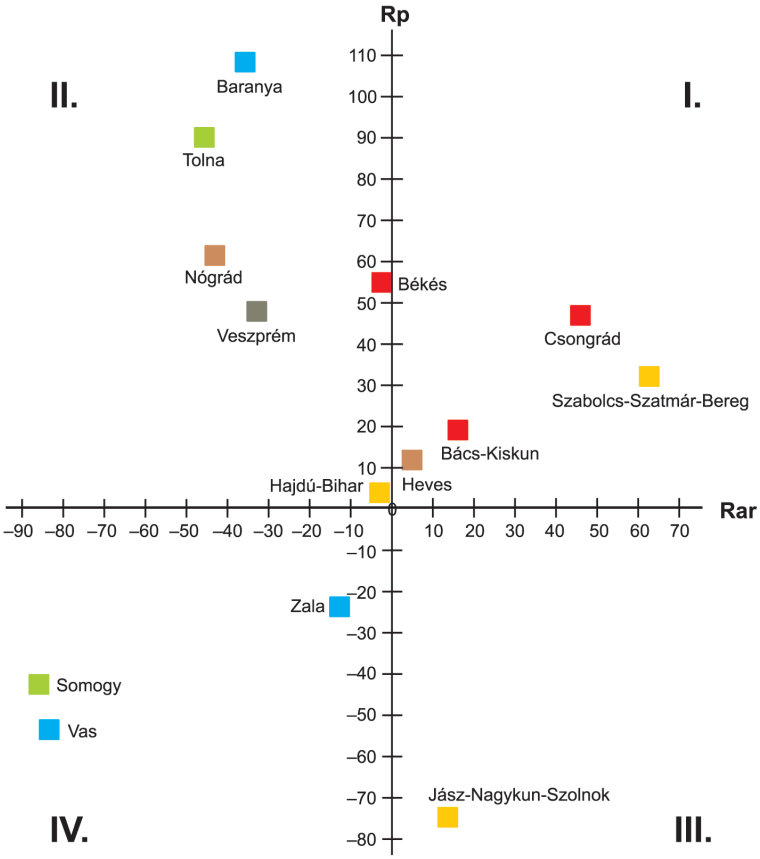

Fig. 2. Change in the ranking of the top firms of 14 counties on the annual revenues–profit diagram. Rar = Rate of change by annual revenue; Rp = Rate of change by profit

Evaluating the different positions of countries by the tendency of change and its dimension ranking by annual revenues–profit context, the following four groups (I–IV) can be identified.

– Between 2005 and 2009 the top firms in 5 counties of the first group – and partly in Békés County too – turned to a positive direction of development. The ranks have improved both by annual revenue and profit.

– A majority of top firms in the second group of 4 countries (members) were able to step forward and ranked higher by profit but their annual revenue increased only in small measure. Owing to this negative fact their position became unfavourable and these counties were dropped in the rank of annual revenues. (Close to the origo Hajdú-Bihar County belongs to this group but its position remained practically unchanged between 2005 and 2009.)

– Only one county forms the third group. Top firms of Jász-Nagykun-Szolnok County have managed to improve positions in the ranking by annual revenues, but they lost a lot in that by profit.

– Top companies of the three Transdanubian counties belonging to the fourth group were the real losers. They have lost their position in the ranking by annual revenues and by profit alike. Nevertheless one of them (Vas County on the Hungarian-Austrian border) has an advantage over the others. The closeness of Austria might bring some prosperity in the county's economy and probably would contribute to raise the rank values of the top companies of the county.

Table 5. The change in the ranking of top firms located in industrial parks by the volume of their total annual revenues between 2005 and 2009

County	Profile of companies belonging to top 500 and located in industrial parks		Rank by annual revenues		Value of increase (+) or fall (–) of rank
	Branch, profile	Seat	2005	2009	
Csongrád	Construction	Szeged	162	266	– 104
Csongrád	Rubber industry	Szeged	372	283	+ 89
Csongrád	Food industry	Szeged	150	188	– 38
Csongrád	Rubber industry	Makó	290	323	– 33
Csongrád	Car trade	Szentes	–	471	(+)
Csongrád	Machinery	Szentes	464	430	+ 34
Csongrád	Food industry	Szentes	185	258	– 73
Csongrád	Machinery trade	Hódmezővásárhely	311	470	– 159
Csongrád	Building material	Hódmezővásárhely	358	437	– 79
Csongrád	Tobacco trade	Hódmezővásárhely	291	313	– 22
Csongrád	Food industry	Hódmezővásárhely	–	231	(+)
Békés	Glass industry	Orosháza	327	364	– 37
Békés	Car accessories	Orosháza	230	249	– 19
Békés	Food industry	Szarvas	250	301	– 51
Bács-Kiskun	Food trade	Kecskemét	325	355	– 30
Hajdú-Bihar	Electronics	Debrecen	205	145	+ 60
Hajdú-Bihar	Machinery	Debrecen	–	333	(+)
Jász-Nagykun-Szolnok	Electronics	Jászfényszaru	20	9	+ 11
Jász-Nagykun-Szolnok	Car accessories	Jászárokszállás	–	277	(+)
Jász-Nagykun-Szolnok	Machinery	Törökszentmiklós	367	303	+ 64
Baranya	Electronics	Pécs	215	174	+ 41
Somogy	Electronics	Kaposvár	–	446	(+)
Somogy	Energy supply	Siófok	–	493	(+)
Vas	Electronics	Szombathely	190	167	+ 23
Vas	Car accessories	Szombathely	74	75	– 1
Vas	Wood industry	Szombathely	322	461	– 139
Vas	Car accessories	Szentgotthárd	41	282	– 241
Vas	Metalworking	Sárvár	–	499	(+)

Source: Creditreform Ltd. 2006–2010

Top firms in industrial parks of modestly or weakly developed counties

Surveying the location of firms operating or producing inside the industrial parks of the 14 modestly or weakly developed counties and belonging to top 500 by their annual revenue revealed that their number is very low, i.e. merely 28. Here it has to be mentioned that the total number of firms located in this group of counties is also far below the value of 100 (only 74). Consequently, 37.8 per cent of top firms of the 14 counties investigated are located in a kind of industrial parks. Looking at *Table 5* and *6* considerable regional inequalities can be found.

A closer examination of the data makes clear that 14 top firms have lost their position in ranking between 2005 and 2009. The average position loss exceeded the value of –73. Only 7 companies have managed to get higher position in this period, but this step was not spectacular (their average win has reached + 46 only). Further 7 firms managed to join to the club of top 500 between 2005 and 2009.

Most of the winners represent electronics (N.I. Hungary Ltd., Debrecen; Samsung Electronics Hungary Co., Jászfényszaru; Elcoteq Hungary Ltd., Pécs;

Table 6. The change in the ranking of top firms located in industrial parks by the volume of their profit between 2005 and 2009

County	Profile of companies belonging to top 500 and located in industrial parks		Rank by profit		Value of increase (+) or fall (–) of rank
	Branch, profile	Seat	2005	2009	
Csongrád	Construction	Szeged	325	-	(–)
Csongrád	Rubber industry	Szeged	171	137	+ 34
Csongrád	Machinery	Szentes	476	188	+ 287
Csongrád	Food industry	Szentes	242	-	(–)
Csongrád	Machinery trade	Hódmezővásárhely	341	-	(–)
Csongrád	Building material	Hódmezővásárhely	164	-	(–)
Békés	Glass industry	Orosháza	78	222	– 144
Békés	Glassware	Orosháza	84	194	– 110
Békés	Car accessories	Orosháza	191	245	– 54
Békés	Food industry	Szarvas	457	-	(–)
Bács-Kiskun	Food trade	Kecskemét	352	423	– 71
Hajdú-Bihar	Machinery	Debrecen	-	305	(+)
Jász-Nagykun-Szolnok	Electronics	Jászfényszaru	-	84	(+)
Jász-Nagykun-Szolnok	Car accessories	Jászárokszállás	271	-	(–)
Jász-Nagykun-Szolnok	Machinery	Törökszentmiklós	187	202	– 15
Baranya	Electronics	Pécs	-	384	(+)
Somogy	Electronics	Kaposvár	-	492	(+)
Vas	Electronics	Szombathely	88	121	– 33
Vas	Car accessories	Szombathely	-	49	(+)
Vas	Wood industry	Szombathely	157	-	(–)
Vas	Car accessories	Szentgotthárd	79	162	– 83
Vas	Metalworking	Sárvár	285	428	– 143

Source: Creditreform Ltd. 2006–2010

Videoton Electro Plast Ltd., Kaposvár; Epcos Ltd., Szombathely) and machinery industry (Legrand Hungary Co., Szentes; FAG Hungary Ltd., Debrecen; Claas Hungary Ltd., Törökszentmiklós). The losers belong to food industry (Sole Mizo Co., Szeged; Hungerit Poultry Processing Co., Szentes; Gallicoop Co., Szarvas), car accessories (Linamar Hungary Co., Orosháza; General Motors Powertrain Ltd., Szombathely) and different type of trade companies (e.g. Bravotech Ltd. and Tabán Tafik Co., Hódmezővásárhely; Hansa Kontakt Ltd., Kecskemét).

The regional pattern of winners *(Figure 3)* demonstrates the relatively good position of firms located in the industrial parks of the counties belonging to Northern Great Plain Region and partly in Southern Transdanubia. The losers are mainly concentrated in the counties of Southern Great Plain region with few exceptions (e.g. ContiTech Rubber Industrial Ltd., Szeged; Legrand Hungary Co., Szentes), and in Vas County within Western Transdanubia Region.

When the profit of these firms accommodated in industrial parks is investigated the picture seems to be mixed. Firstly it can be stated that among the firms located in industrial parks of the 14 modestly or weakly developed counties and belonging to top 500 by their profit only 22 are profitable. The total number of firms belonging to this group of counties is relatively small (only 86). The rate (22 to 86) is an unfavourably low (25.6 per cent), marking a low economic efficiency of top firms located in industrial parks of the 14 sample counties.

The data of Table 6. clearly demonstrate that 7 of 22 top firms have lost their previous position and fell out from the list of 500 most profitable companies of Hungary between 2005 and 2009. Further 8 of 22 have lost their former more favourable position on the list.

This average position loss exceeded the value of –78. Merely 2 companies have managed to get higher position in this period, and only one of them (Legrand Hungary Co. located in Szentes Industrial Park) has got a spectacular profit increase since 2005. Additional 5 firms managed to join to the club of 500 most profitable companies between 2005 and 2009.

Out of the few profitable top companies settled in industrial parks of modestly or less favoured counties one belongs to rubber industry by profile (ContiTech Rubber Industrial Ltd., Szeged), and another one to machinery industry (Legrand Hungary Co., Szentes).

Three of the five companies having entered the club of top 500 by the volume of profit represent electronics (Samsung Electronics Hungary Co., Jászfényszaru; Elcoteq Hungary Ltd., Pécs; Videoton Electro Plast Ltd., Kaposvár), one of them – machinery industry (N.I. Hungary Ltd., Debrecen) and one –car accessories manufacturing (LUK Savaria Kuplung Producing Ltd).

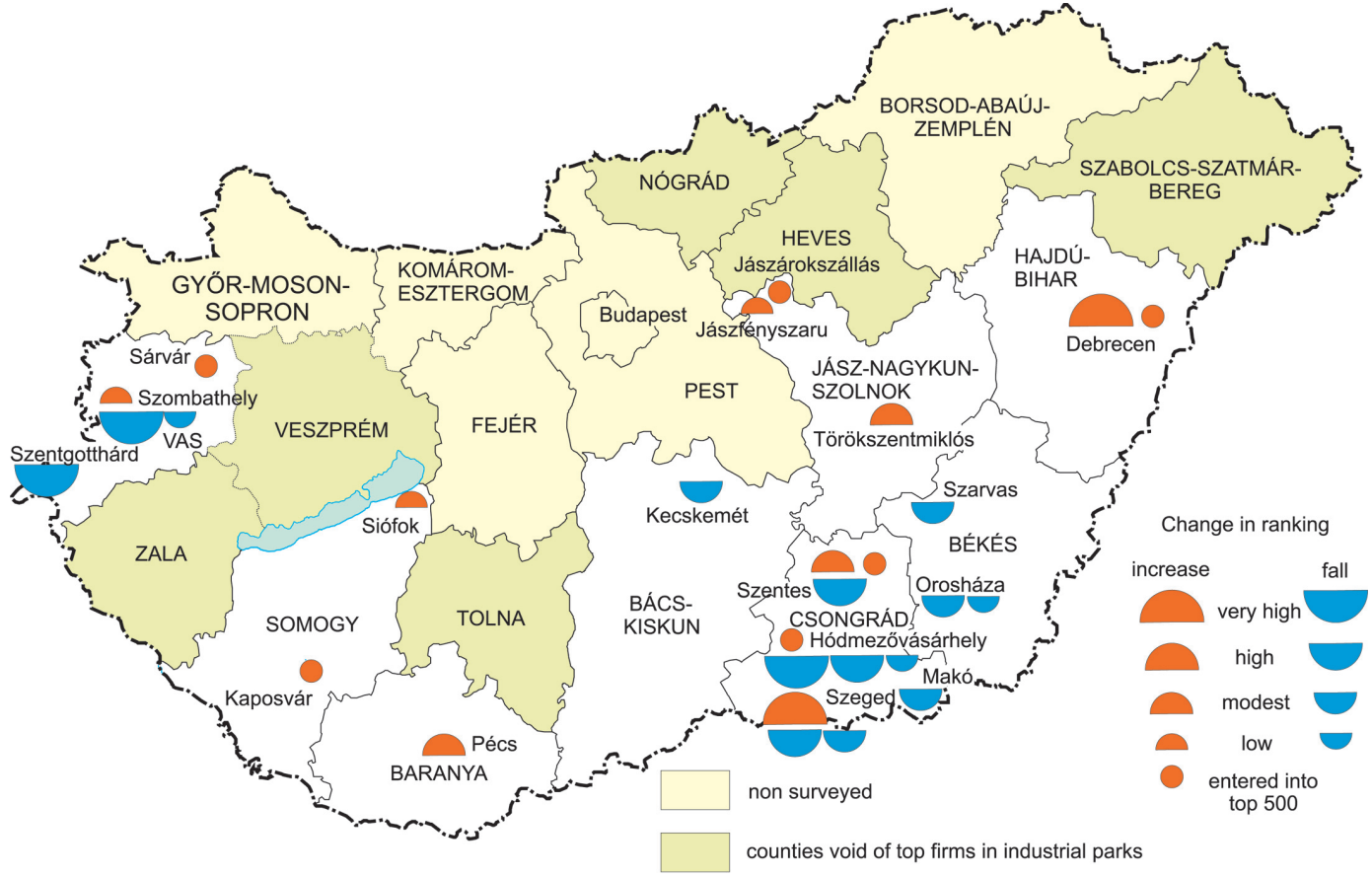

Fig. 3. Tendency and the rate of change in the ranking of the top firms settled in industrial parks of modest or less favoured counties by their annual revenue

It has to be emphasized however, that – opposite to the positive examples mentioned above – the overwhelming part of firms settled in industrial parks of modestly or less favoured counties have lost their previous favourable position in ranking between 2005 and 2009. The biggest losers belong to different branches of economy: Amtek Hungary Co. (metalworking, Sárvár), Hansa Kontakt Ltd. (food trade, Kecskemét), Guardian Hungary Ltd. and Glass Manufacturing Ltd. (glass industry and glassware products, Orosháza), Linamar Hungary Co. (car accessory products, Orosháza) and Epcos Ltd. (electronics, Szombathely).

The regional pattern of these 22 firms *(Figure 4)* demonstrates the falling of profit of the top firms located in industrial parks of the 14 counties. Their substantial part (9 per cent) belong to Southern Great Plain Region (with a concentration in Csongrád and Békés counties), a smaller group (4 per cent) to Western Transdanubia (Vas County). Tendency of change in the case of the firms located in Northern Great Plain Region and Southern Transdanubia seems to be positive, but the size of this group is unfavourably small.

Conclusions

– Comparing the change in revenues with that in profits in the case of NUTS2 regions in Hungary a very negative tendency can be seen. Between 2005 and 2009 in case of profits of leading companies a serious decline or stagnation can be observed in all regions except Central Hungary. This process is a result of heavy concentration of profit onto Budapest and its agglomeration zone.

– Between 2005 and 2009 the relative annual profit (profit per company) has changed also in the regions, showing a tremendous gap between developed and underdeveloped regions.

– Problematic Hungarian NUTS2 regions and their counties have a modest dynamism of economic development. Most of them is characterised mainly by processing industry, food industry and has agrarian character, which goes together with lower personal income and with a higher rate of unemployment than the national average.

– 14 counties of six NUTS2 regions belong to the category of modestly or weakly developed counties. In spite of a large number of industrial parks with good regional accessibility these counties have only few important industrial firms and service companies realizing high annual revenue and profitable production.

– Between 2005 and 2009 nearly half of the 19 counties have lost 36 top firms altogether and – without Pest County – only 7 counties have gained 11 ones at all.

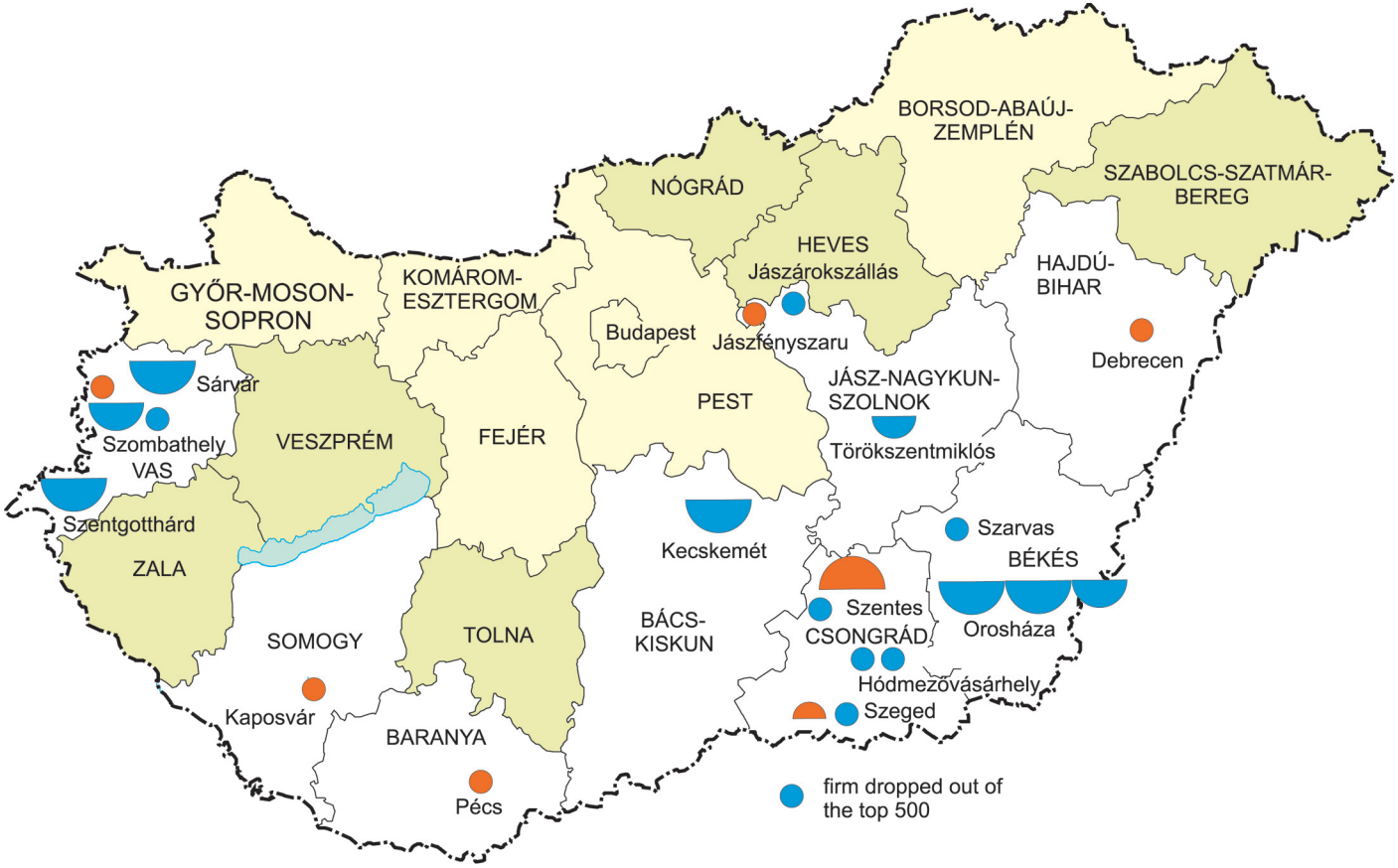

Fig. 4. Tendency and the rate of change in the ranking of the top firms settled in industrial parks of modest or less favoured counties by their profit

– Majority of top firms of the modestly or weakly developed counties was able to step forward in ranking by profit but their annual revenue increased only to a minor extent.

– There is a very small number of firms operating or producing inside industrial parks of the 14 modestly or weakly developed counties and belonging to top 500 by their annual revenue.

– The regional pattern of these companies demonstrates the falling profit of the top firms located in industrial parks of the 14 counties.

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Experiences with the use of European Union resources in the Southern Great Plain region (Hungary) in 2007–2008

Gizella Vajda[1]

Abstract

From the very formation of the European Union there have existed regions with different natural and social endowments. This causes a diversity in living conditions, income, and maturity within the integration. To reduce the socio-economic disparities between regions, and to raise the lagging ones are the major tasks within the EU in order to strengthen social and economic cohesion. The 2007–2013 year planning period for the first time opened an opportunity for the regions to develop separate operational programs in the EU. The present study summarizes the results of a survey which examined the direct or indirect resources that arrived into the region during the first two years (2007–2008) of the Southern Great Plain's Operational Program (SGPOP). An analysis is made how the EU funds were used, which part of the regional operational program was financed from them and how the mechanism for resource allocation worked.

Keywords: European Union, regional development, regional policy, Southern Great Plain

Introduction

Hungary's accession to the European Union in 2004 opened up new prospects for ample improvement in functioning of the country's urban system. The EU-membership has brought along a significant change in the settlement development in Hungary due to the access to the new financial resources providing new opportunities.

The resources provided by the EU funds support the advancement of the economic and social cohesion and balanced territorial development. From 1990 Hungary was a beneficiary of the PHARE (*Poland and Hungary: Aid for Restructuring of the Economies*) Program, which provided non-refundable resources to enhance the transition process into market economy, to advance the establishment of political democracy and to facilitate the integration process and the preparations for obtaining EU-membership (Horváth, Gy. 2001). From 2000 on, Hungary received a share from the two pre-accession funds: SAPARD

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and ISPA. While the PHARE Program mainly prepared Hungary for the utilization of the Social and Regional Development Fund, the SAPARD Program paved the way for the reception of the Agricultural Fund whereas the ISPA Program did it for the use of the support from Cohesion Fund. The significance of these programs amounts to much more than the financial advantages they provide. These programs could make Hungary acquire the knowledge necessary for handling the rather complicated procedures and performing tasks in relation with the Structural and Cohesion Funds.

Hungary established relationships with the European Committee as early as the first days of the change of regime and signed the articles of partnership in 1991. Among the first ones in Central Eastern Europe the country submitted its application for the EU accession in 1994 (Faragó, L. 2000). The Regional Development Policy of Hungary underwent a significant qualitative change in 1996, when the XXI Act on Spatial Development and Planning was passed including the establishment of the institutional system of regional policy as its greatest achievement (Forman, B. 2001). In 1996 the Act did not take the responsibility of accomplishing the "top-down" regionalisation of the country, but it determined the regional levels and their range of tasks delegating some of the latter to organizations for public benefit (Hrubi, L. 2000). The range of actions of regional politics is determined on the one hand by the institutional, operational and financial reforms of the EU and by its Eastern extension, and on the other hand by the decentralisation processes within the national states (Michalski, A. and Saraceno, E. 2000). As a consequence of the decentralisation it may occur that the consolidation of the regional level is not followed by cooperation between the local and other sub-regional authorities. The networks established between the various levels, sectors and actors as a rule improve the innovative capacity and flexibility of the regions significantly (Capellin, R. 1997).

On May 1, 2004 the European Union welcomed 10 new member states in the Union and Hungary was one of them (Probáld, F. and Szabó, P. 2007; Nemes Nagy, J. 2009). The benefits of the Eastern extension were expected from the region's dynamism and consequently from the increase of the EU's inner market and the growth of the EU's weight in world economy.

The economic development of the new member states is accelerated by the support granted from the EU funds. By the harmonized regulations, the risk foreign investors hitherto had to take has become reduced, thus the inflow of the capital could be growing. After the accession the newly accepted member states had the right to participate in the EU's decision making processes in those pointing out the future trends of the development over the whole continent (Probáld, F. and Szabó, P. 2007).

In the financial period of 2000–2013 more than one third of the budget was aimed at fulfilling the objectives of the EU's regional policy. More than

80 per cent of the whole sum is devoted to facilitate "convergence". Within the framework of the "convergence", the poorest countries and regions of the EU (among them Hungary and the Southern Great Plain region) are eligible to obtain financial support. There are significant differences regarding the economic structure and the development levels of the EU member states and regions (Probáld, F. and Szabó, P. 2007). Various methods have been used to reduce or balance these territorial differences, and depending on the methods the states and regions use, they may become either losers or winners (Horváth, Gy. 2009).

The primary objective of the policies in the European Community is to achieve balanced, harmonic development, which is not equal to "general" spatial development. Rather the policies highlight the most important developmental factors of the various territories, emphasise these factors and indicate the developmental directions, taking into consideration the most important characteristics of the various regions (Csatári, B. 2002). Stöhr, W. and Tödling, F. (1997) point out that the concept of "spatial equity" is rather changeable regarding its content. According to their research the internationally defined aim of spatial and settlement development policies are to create spatial equity and reduce inequality.

The agreements and documents of the EU concern all the member states impartially, but their effects may be different in the various member states and regions (Hamedinger, A. *et al.* 2008).

By now it has become obvious that in certain territories of the EU the financial resources distributed for developmental purposes have not yielded sufficient results (Boldrin, M. and Canova, F. 2001; Puga, D. 2002), which is the case in Hungary as well. It is impossible to control the spatial processes without monitoring them. This is the reason why the analysis of the spatial data is essential and has great importance in predicting the outcomes (Kis, K. 2008).

The Community's most important strategic aim is to mitigate the backwardness and to develop the regions. The member states and their regions receive significant monetary support from the common budget to overcome the differences (Horváth, Gy. 2009).

The changing role of the territorial levels in the new access countries

Comparing the countries that joined the European Union in 2004, it can be concluded that the territorial levels of the countries gain different functions.

– In *Poland* the spatial planning, regional development and economic development belong to the regions' range of authority (Young, C. and Kaczmarek, S. 2000; Swianiewicz, P. 2006).

– In the *Czech Republic* and in *Slovakia* the function of territorial development, which is rather important for the local economic development, also belongs to the regions' responsibility (Józsa, Z. 2006), but local governments have important functions as well (Mezei, C. 2006).

– In *Lithuania* the supervision of the use of territory, planning, education, the support of training and employment fall to the scope of the regions, however, in the field of infrastructural development the local governments also have the right to intervene (Petkevicius, A. and Linertas, R. 2005). The role of the Regional Development Agencies (RDA) being active participants in the management of the projects, is changing from country to country. RDAs are actually the actors between the public sphere and the market sector. Though forming part of the state governance still they are financed from public funds (Pálné Kovács, I. 2003).

– In *Latvia* the development concepts of the planning statistical regions are prepared by the RDAs, at the same time they cooperate with the local governments and with the regional organs (ESPON 2006).

– In *Romania* the RDAs are subordinated to the Regional Development Councils (RDC).

– In *Slovenia* the RDAs are the representatives of the settlements' interests both on local and national level, and also in the structures of the Union. Their task is to prepare the regional plans, to initiate regional developmental projects, to present them at public tenders and to monitor and evaluate these projects.

– In *Slovakia* the RDAs function as the local and regional governments' educational institutions, methodological centres or EU related centres for consultation (Bučeк, J. 2005).

– In *Bulgaria* the agencies operating in developmental-financial regions both coordinate the resources deriving from the Structural Funds and play a mediating and communicating role between the public and the private spheres.

The *Hungarian* RDAs are not only the operative organs of the Regional Councils, but they also play an active, initiating role in spatial development (Somlyódiné Pfeil, E. 2004), and as a re-conciliating organisation of the regional operational programs, they also manage the EU applications and participate in regional innovative and international projects.

Southern Great Plain region

Taking into consideration the state of infrastructural development, the Great Hungarian Plain (Alföld) usually is listed as underdeveloped macro-region in Hungary. This statement is exaggerated and it simplifies the existing differ-

ences in the urban system of the Great Hungarian Plain (Kovács, Z. 1999). The Great Hungarian Plain is one of the most extensive physico-geographical units of Hungary. The endangered state of its environment, the structural problems of its economy, the unique structure of its settlement system, the state of its infrastructural development contribute to the area's being "different", due to its unique characteristic features that are strikingly different from those of other Hungarian regions.

On the basis of NUTS2 Great Hungarian Plain consists of two parts: Northern Great Plain and Southern Great Plain regions. By area Southern Great Plain located in the south-eastern part of Hungary, is the largest region in the country. Southern Great Plain is covered by Bács-Kiskun, Békés and Csongrád counties. Most of the territory is flat – no more than 200 m above sea level – and rich in diverse natural assets and landscapes. Given the number of municipalities (254 being the lowest value within one region compared with the rest of the country) and the size of the region Southern Great Plain has the lowest density of municipalities in Hungary. However, with 49 towns, it is also the second most urbanized area of the country after Northern Great Plain (*Figure 1).*

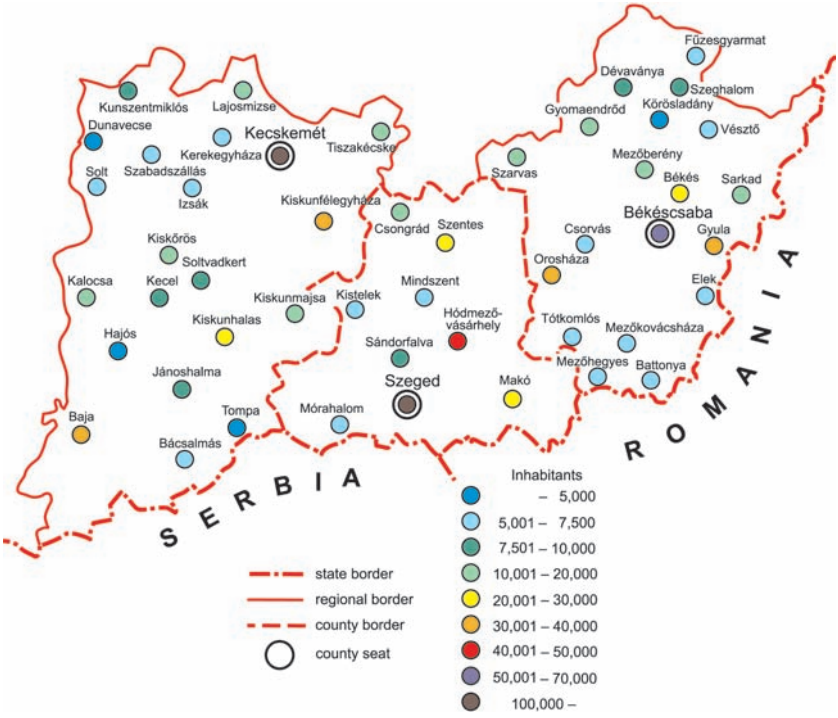

Fig. 1. Size of urban settlements in Southern Great Plain. *Source:* Own editing on the basis of Statistical Yearbook, 2008

Municipalities lagging behind in regional, social and economic terms include villages and towns alike and these municipalities represent 42 per cent of all populated areas. It is highly typical of the network of municipalities in Southern Great Plain that there is an increasingly varied range of scattered farmsteads, which constitute an integral part of the municipalities and therefore they cannot be developed separately from them (SGPOP).

Taking into consideration the GDP per capita, of all the Hungarian regions only Central Hungary belongs to the "Competitiveness and Employment Regions", all the other ones are "Convergence Regions". The present study deals exclusively with the "Convergence Regions". Of the latter Southern Great Plain is among the most populous ones in Hungary being second only to Northern Great Plain *(Table 1).*

Table 1. Comparative figures for regions in Hungary

Region	Population, person	GDP per capita, 1,000 HUF*	Share of GDP, per cent*	EU source development, 2007–2013, billion HUF**
Southern Great Plain	1,334,506	1,564	8.8	207.05
Southern Transdanubia	960,088	1,596	6.5	194.99
Northern Great Plain	1,514,020	1,490	9.6	269.64
Northern Hungary	1,236,690	1,512	8.0	249.91
Central Transdanubia	1,104,841	2,139	10.0	140.46
Central Hungary	2,897,317	3,921	47.1	430.29
Western Transdanubia	997,939	2,370	10.0	128.25
Total	*10,045,401*	*2,363*	*100.0*	*1,620.59*

* 2006 data, ** data calculated on 2007 prices

Source: Own editing on the basis of Hungarian Statistical Yearbook 2007, and regional development operational programs

Regarding the GDP per capita, Southern Great Plain is far from being in the leading group. When compared to the other regions, it is considered to be a medium-ranked one. If the financial resources distributed by the EU in the 2007–2013 period are taken into account, it can be seen that the regions with lower GDP and development level have gained stronger financial support. The greatest amount of the EU-resources was received by Northern Great Plain, followed by Northern Hungary, whereas Southern Great Plain ranked third.

The financial period of 2007–2013 was the first one, when the regions were given the opportunity to work out their independent operational programs for the utilization of the financial resources allocated for development purposes *(Table 2).*

The Southern Great Plain's Operational Program (SGPOP) was the first Hungarian regional programme that was accepted by the European Commission in July, 2007. The first tenders for applying for the EU-resources

available from 2007 were published in April 2007. Since then 53 tenders have been invited. The financial resources could be applied for by submitting projects within the framework of one- or two-round procedures. In case of two-round procedures the preliminary proposal of the project had to be submitted first, and the detailed project was to be submitted only later, in case the preliminary proposal had been accepted and its further elaboration advised.

The aim of the two-round procedure is to make it easier for the large investments with the requirement to elaborate the projects in more detail only if they have not been rejected in the first round. The projects of high priority are the special ones that are approved by the national government, and thus they are treated differently.

The analysis of the submitted projects

During the first two years of the implementation of the SGPOP nearly 45 per cent of the financial resources of the 7 year-long financial period became applicable. 60 per cent of the financial resources aimed improving tourism and human infrastructure became applicable in the first two years of the period. In connection with the tenders invited in 2007 and 2008, 1315 project proposals arrived at the Instrumental Constitution from the region (*Table 3*). The outstandingly high proportion (46.5 per cent) of the projects aims to develop human infrastructure.

Table 2. Southern Great Plain's Operative Program resources allocated and announced during the 2007–2013 planning period

Priority number and name	Source 2007–2013, million HUF*	Announced source in 2007–2008, million HUF		Advertised resources in relation to the annual source in 7 years period, %
		Tendering	Featured project	
1. Regional economic development	37,523	5,471	1,120	17.6
2. Tourism-related development	39,608	18,324	4,500	57.6
3. Development of transport infrastructure	45,677	13,951	4,844	41.1
4. Human infrastructure development	40,648	23,785	0	58.5
5.1. Urban development actions	26,578	6,502	2,999	35.7
5.2. Settlement development with environmental focus	18,426	4,570	5,778	56.2
Total	*208,460*	*72,603*	*19,241*	*44.1*

* Data corrected on 2009 prices

Source: Own edition based on data from Southern Great Plain Regional Development Agency (SGPRDA) and National Development Agency (NDA)

Table 3. Tenders received for the SGPOP in 2007–2008

SGPOP priorities	Advertised resources (million Ft)	Tenders received		Claims received / available resource share, %
		Number (pieces)	need for support (in millions Ft)	
1. Regional economic development	5,471	70	6,842	125.1
2. Tourism-related development	18,324	120	24,877	135.8
3. Development of transport infrastructure	13,951	405	43,869	314.5
4. Human infrastructure development	23,785	611	85,930	361.3
5.1. Urban development actions	6,502	48	16,615	255.5
5.2. Settlement development with environmental focus	4,570	61	11,713	256.3
Total	*72,603*	*1,315*	*189,846*	*261.5*

Source: Own editing based on data of SGPRDA and NDA

Other substantial part (30.8 per cent) of the projects is related to the development of transport infrastructure.

The amount of the required financial support of the submitted applications three times exceeds that of the available financial resources, which shows the region's sore need for sources of development. The invited financial resources to develop human infrastructure proved to be insufficient, as applicants would require 3.5 times more money. The greatest need for the financial resources appeared in the fields of transport infrastructure and educational infrastructure. School buildings and equipment in Southern Great Plain badly need modernisation, which is strikingly visible. The greatest interest was shown in the complex projects aiming to improve the infrastructure of educational institutions on the elementary and the secondary levels and of dormitories. Most of the projects arrived at the Instrumental Constitution in this area, claiming financial support five times more than the available sum.

The number of the submitted projects and the claims for the financial resources show uniform distribution between the three counties (Csongrád, Bács-Kiskun and Békés) of the region. Taking into consideration the main indicators related to the territory and the population of the counties, it is Bács-Kiskun County that claimed 34.9 per cent of the region's financial resources. This value is only slightly above one third still it does not reach the county's share within the regional population or territory of the region, which means that Bács-Kiskun County is underrepresented in the 2007–2008 period. On the other hand 32.4 per cent of the submit-

ted projects from Békés, and especially 32.7 per cent from Csongrád (the latter with a territorial share of 23.2 per cent within the region), indicate overrepresentation of these two counties.

If the number of the submitted projects and the amount of financial resources claimed in them are also compared to the different types of settlements, a rather surprising result is obtained *(Table 4).*

Analysing the number of the submitted projects and the claims for financial resources, it can be seen that the major part of claims was submitted by villages. 45 per cent of all the competing projects and 30 per cent of the claims for financial support originated from these types of settlements. This is due to the thematic separation of the Sectoral Operational Programs (SOP) and the Regional Operational Programs (ROP). While the larger towns can finance their development from the resources of the Sectoral Operational Programs, the opportunities of the smaller settlements are rather limited. They can promote their development by using the financial resources obtained from the SGOP or occasionally from the Rural Development Programs.

The analysis of the projects from financial point of view shows that the average financial requirement of a project is nearly 150 million HUF. The projects that claim less than this amount were submitted by the villages. This is due to both the size of the projects and the restricting effect of the shortage of the settlements in own resources. Taking into consideration the type of settlement where the projects were submitted, it can be concluded that the number of the

Table 4. Tenders received according to settlement types

Settlement categories (resident population)	Advertised resources (million Ft)	Tenders received		Settlement rate of total need for support %
		Number (pieces)	Need for support (in millions Ft)	
County Town	72,603	183	32,687	17.2
Populous city of 30,000 inhabitants		85	21,361	11.3
Towns with population between 10,000 and 30,000		215	43,648	23.0
Towns with population of 10,000 inhabitants		235	36,198	19.1
Municipalities		597	55,951	29.5
Total		*1,315*	*189,846*	*100.0*

Source: Own edition based on data from SGPRDA and NDA

submitted projects is in direct proportion to the size of the settlements. While the urban counties (towns with county rights) submitted 46 projects on an average, villages presented 2–3 projects at tenders to receive financial resources from the SGPOP.

The analysis of the supported projects

During the evaluating process of the projects, the Examination Committees decide whether certain projects are supported or rejected and whether the projects of two-round procedure are to be remodelled. The division of the winning projects according to the developmental spheres in Southern Great Plain is the following *(Table 5)*.

As it is visible the amount of the claimed financial resources was 2.5 times higher than the available sum, however only 70 per cent of the available sum was distributed and 26.4per cent of the submitted projects were decided to be supported.

There are several reasons behind this fact:

1. In case of two-round-procedures, the ultimate decisions regarding the range of the supported projects has not been taken yet,

Table 5. Rate of supported/received tenders

SGPOP priorities	Advertised resources (million HUF)	Tenders received		Tenders supported		Rate of supported of recieved tenders %	
		Number (pieces)	Need for support (million HUF)	Number (pieces)	Total support (million HUF)	Based on number of tenders, %	Based on amount of support, %
1. Regional economic development	5,471	70	6,842	37	3,680	52.9	53.8
2. Tourism-related development	18,324	120	24,877	47	9,651	39.2	38.8
3. Development of transport infrastructure	13,951	405	43,869	136	16,437	33.6	37.5
4. Human infrastructure development	23,785	611	85,930	171	15,308	28.0	17.8
5.1. Urban development actions	6,502	48	16,615	10	455	20.8	2.7
5.2. Settlement development with environmental focus	4,570	61	11,713	17	4,558	27.9	38.9
Total	*72,603*	*1,315*	*189,846*	*418*	*50,088*	*31.8*	*26.4*

Source: Own edition based on data from SGPRDA and NDA

2. The submitted and professionally acceptable projects (e.g. developing cluster management, creating barrier-free spaces) have not required all the available financial resources,

3. In case of several tender implications, there were no sufficient financial resources to support the professionally correct projects.

Taking into consideration the decisions about the supported projects taken in the first round of the two-round-procedures, the winning projects are going to receive nearly 95 per cent of the available financial resources. (In the areas of human infrastructure and environmental development this percentage is nearly 100 per cent.)

If the proportion of the supported projects within the submitted ones is examined, it can be seen that the projects submitted in the field of regional economic development were the most successful. On the one hand every second project submitted in this area won, whereas in the field of urban development only every fifth project was supported. On the other hand more than 50 per cent of the available financial resources were distributed between the applicants. The projects submitted in the area of urban development proved to be the weakest, as only every fifth project won and only 2.7 per cent of the claimed financial resources could be distributed.

Taking into consideration the territorial division of the submitted and the supported projects in the region the greatest number of projects and claims for financial support were submitted in Bács-Kiskun County. Regarding the number of the supported projects and the amount of financial resources distributed, Csongrád County was the most successful, where more than 37 per cent of the winning projects was submitted, which covers 45 per cent of all the distributed amount. If the efficiency of the two other counties is analysed, it can be concluded that in case of Békés County nearly 30 per cent of the submitted projects won, whereas Bács-Kiskun County proved to be the least efficient. The reason for these relatively low values is due to the unsatisfactory elaboration of their projects.

All the statistical subregions of the Southern Great Plain Region have submitted projects, and all of them – although in various proportions – have received some financial support in the financial period of 2007–2008. Szeged statistical subregion was the one that submitted the most projects with the highest amount of claimed financial resources. When taking into consideration the ratio of the supported projects and the received financial support it is again Szeged statistical subregion that has proven to be the absolute winner. The statistical subregion of Kistelek achieved the highest financial aid per capita, with more than 138,000 HUF *(Figure 2).*

Analysing the distribution of the submitted and the supported projects by type of settlements, it can be concluded that projects were submitted at all the types The settlements received financial aid in various percentages, but nearly

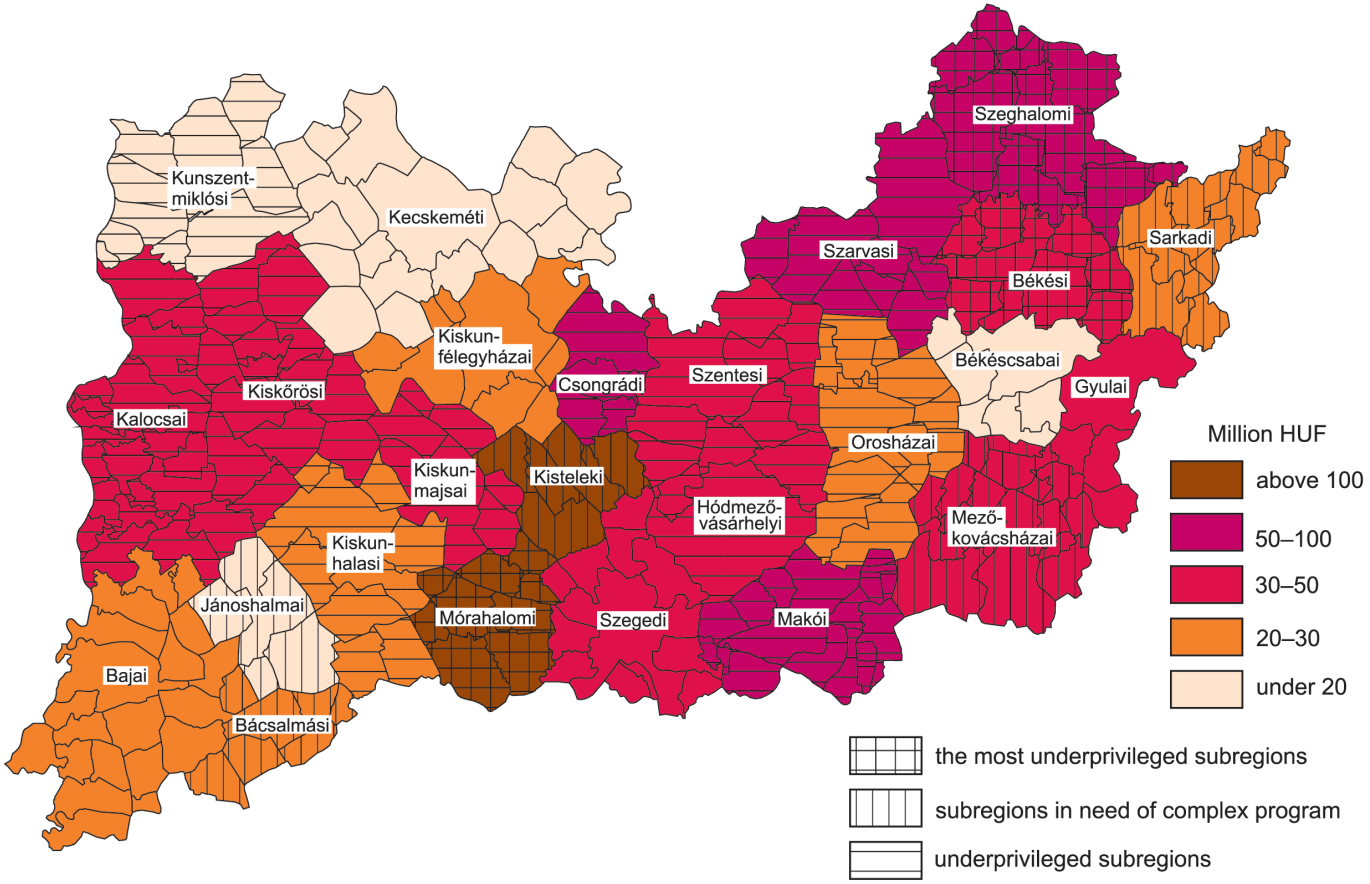

Fig. 2. Support needs per capita in the statistical subregions of Southern Great Plain. *Source:* Data collected by Vajda, G., map design: Nógrádi, Gy.

Table 6. Supported tenders according to settlement types

Settlement categories (resident population)	Tenders received		Tenders supported		Rate of supported of recieved tenders %	
	Number (pieces)	need for support (million HUF)	Number (pieces)	Total support (million HUF)	Based on number of tenders, %	Based on amount of support, %
County Town	183	32,687	61	11,203	33.33	34.27
Populous city of 30.000 inhabitants	85	21,361	24	3,893	28.24	18.23
Towns with population between 10.000 and 30.000	215	43,648	69	11,685	32.09	26.77
Towns with population of 10.000 inhabitants	235	36,198	89	9,992	37.87	27.60
Municipalities	597	55,951	175	13,316	29.31	23.80
Total	*1,315*	*189,846*	*418*	*50,088*	*31.79*	*26.38*

Source: Own edition based on data from SGPRDA and NDA

in direct proportion with the number of projects they had submitted. In the financial period of 2007–2008 most of the projects (597 items) were submitted by villages with the highest claim for financial resources (29.5 per cent). This type of settlement was the winner when taking into consideration the number of the supported projects and the amount of the distributed financial aid *(Table 6).*

Regarding the number of the submitted projects, the towns with less than 10,000 inhabitants were the second most active type of settlements (235 items). Regarding the claims for financial resources and the amount of the distributed aid, the same position is taken by the towns with population number between 10,000 and 30,000.

When the amount of the distributed aid was compared to the amount of the claimed financial support, the towns with less than 10,000 inhabitants have proven to be the most successful, since 37.9 per cent of the projects submitted by them won support. Urban counties were also successful, as 33.3 per cent of their projects were also supported. Taking into consideration the amount of the distributed financial aid, the villages and the towns with inhabitants between 10,000 and 30,000 were followed by the urban counties. Regarding the number of the winning projects and of the amount of the distributed financial aid, the category ranked last were the towns with more than 30,000 inhabitants. These towns submitted the least projects selected to be supported and the smallest amount of financial aid was also received by this type of settlements.

Summary

To balance spatial concentration and promote territorial equalisation, polycentric development has to become of primary importance in the future. When future project tenders are invited, effective measures are needed to be taken to embed the region-specific elements into both the determination process of the supportable activities and the establishment of the criteria for the evaluating system. For example, it would be reasonable to give preference to the projects submitted in inner or outer peripheries by giving them extra bonus; or to definitely separate the innovation-type development of economic centres and the balance-type development that aims to moderate the spatial concentration.

As to facilitate the preparation works of the following periods, the implementation of the Southern Great Plain's Operational Program has to be continuously monitored and recommendations are needed to be produced based on the evaluation of financial and professional advancement. The content of the future project tenders has to be adjusted to the economic processes (crisis-management, more effective utilisation of the external sources).

The success of territorial development is signalled by emerging and strengthening of centres, by stabilisation and improvement of disadvantageous statistical subregions. In my opinion the evaluations of the developmental programs and regional developments are not to be regarded as mere evaluating reports. They aim is to identify the effects of interventions and also to – by providing feedback – help to establish a basis for future development. For decision making persons evaluating reports have to become an instrument that helps to understand the processes of interventions and the causes of the changes that take place. By taking all these into consideration, decision making persons need to make recommendations as to foster the elaboration of regional policy. In my view the necessity of the evaluations of development is obvious; however, further steps are needed to be taken as to put the gained results into practice.

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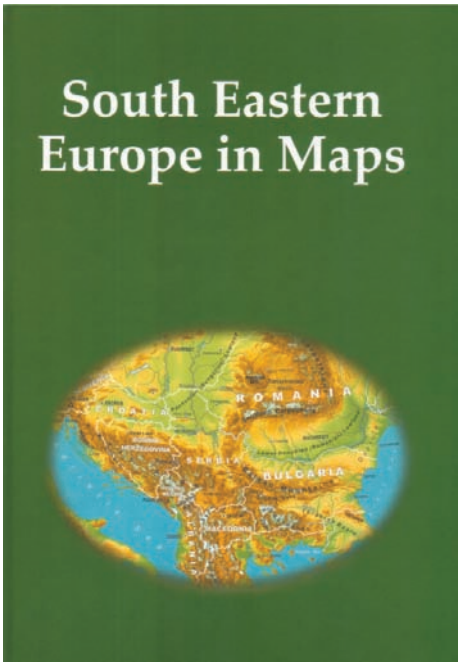
Geographical Research Institute Hungarian Academy of Sciences. Budapest, 2007. 136 p.

Over the past fifteen years the explosion of the "Balkan powder-barrel" shocking the European continent deeply i.e. the fanning of ethnic-religious tensions (suppressed for several decades) into regional conflicts and warfare renewed traditional interests of the Hungarian public towards the countries of South Eastern Europe (the former member republics of Yugoslavia, Albania, Bulgaria and Romania).

There has emerged a necessity to publish an atlas in the form of a book or a book combined with an atlas in which a large number of attractive thematic (political, ethnic, religious, economic) maps, charts, tables completed by concise textual analyses provide explanation for the up-to-date societal and economic issues of South Eastern Europe and the most characteristic segments of the region's development in the 20th century. The present publication produced in the Geographical Research Institute of the Hungarian Academy of Sciences serves as a brief account for public and scientific audiences and political decision makers on the region which largely belongs to the Balkans, with some countries as the primary targets of the enlargement of the European Union. The chapters are entitled by the main topics figuring in the book: the concept of South Eastern Europe and the Balkans; territorial distribution by states; ethnic and religious patterns; urbanisation and town network; the standard of economic development; spatial disparities; industry; transport; and tourism.



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A method for complex spatial delimitation of tourism destinations in South Transdanubia

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Abstract

As a special segment of the research of the interrelated system of tourism and regional development, the present study is aimed to deal with and focus on the methods of the regional delimitation of spaces and areas of tourism based on its supply and demand aspects, providing recent data on this rather neglected field. Following the general introduction of the study area (South Transdanubia, Hungary), the research background with a literature review of the international practice on the given topic is presented. The main portion of the paper is the introduction of a new method elaborated by our research group concerning the demarcation possibilities of core/periphery areas of tourism, among others using GIS methods. This method provides a fairly accurate approach for centre–periphery research concerning the study of tourism.

Keywords: destinations vs core areas, demand-supply relations, tourism products, GIS

Introduction

As a special segment of the research of the relation system between tourism and regional development, the main aim of this study and our research is to present new methods and open up perspectives for the regional delimitation and evaluation of tourism zones or destinations with the help of GIS applications. As spatial processes of tourism are getting increasingly complicated in the 21st century it is assumed that for using more detailed and exact methods of the assessment of the tourism sector map representation should play an important role in its planning and monitoring. A basic concept is that with the

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exception of areas clearly focal in tourism it is not so obvious to identify tourism sites or areas. This is also supported by the fact that in spite of the ever increasing social-economic role of tourism and its potential for development, there have been very few studies purposed to build models for evaluating the economic impact of tourism on certain administrational levels.

Some models are known for the evaluation of certain factors such as economic impact on jobs and revenues within tourism, but only few of them have so far been used to analyse spatially the complex factors in a systemic way using GIS methods (Da Cunha, S.K. and Da Cunha, J.C. 2005; ESPON Atlas 2006; Gagnon, S. 2005, 2008; Potts, T.D. and Uysal, M. 1992; Raymond, C. and Brown, G. 2007; Trusins, J. and Bebriss, I. 2005; World Economic Forum: The Travel and Tourism Competitiveness Report, 2008; Zhong J. *et al*. 2007).

The present article proposes a complex approach to the spatial and regional assessment of tourism destinations in a more holistic approach based on the analysis of the demand and supply side. The theoretical basis and the initial concept of the research and development of the model is provided by the centre-periphery research and the authors were also influenced by the carrying capacity concepts and studies (Butler, R.W. 1996; Coccossis, H. 2001; Da Cunha, S.K. and Da Cunha, J.C. 2005; Lozato-Giotart, J.P. 1992; Mytelka, L.E. and Farinelli, F. 2000; Nordin, S. 2003).

Following the general introduction of the study area (South Transdanubia, Hungary) the research background with a literature review of the international practice in the given topic will be presented. The study highlights the first stage of the research, which further on as it is assumed might lead to the creation of a complex delimitation method of regions representing importance for tourism.

General introduction of the study area

Although the cultural and natural assets of South Transdanubia are favourable for the development of tourism, the region's location is unfortunately peripheric, so the settlements often are isolated and their accessibility is poor. The transport and traffic corridors of north – south and west – east directions are scarce and there are only few border crossing points. The economy has been determined by the decline of the former industries (heavy industry and mining in Baranya County), foreign investors prefer Budapest or the western Hungarian region and the ratio of SMEs is the smallest in this region of the country. On the other hand R&D activity (at the University of Pécs and Kaposvár) as well as the agro-ecological potential is outstanding and unemployment is below the national average.

The tourism supply of the region relies on the slogan 'Hungarian Mediterraneum' reflecting anthropocentricity, beautiful scenery, tranquillity and relaxation. The most important tourism products are health tourism (Harkány, Szigetvár, Igal, Tamási, Dombóvár–Gunaras, Kaposvár, Csokonyavisonta, Nagyatád), cultural tourism (Pécs – UNESCO World Heritage Site and European Capital of Culture in 2010), ecotourism (Danube–Drava National Park), wine tourism (Villány–Siklós, Szekszárd, Mecsekalja, Tolna wine region), rural and hunting tourism (Aubert, A. *et al*. 2007; Aubert, A. and Csapó, J. 2003; Berki, M. and Csapó, J. 2003).

The international tourists are coming mainly from Austria, Poland, Croatia, and the Netherlands. The tourism of the region is highly concentrated spatially since the south shores of Lake Balaton account for some 57% of the total number of tourist arrivals, while the Pécs–Villány-Siklós region attracts another 28%, as the second major destination of South Transdanubia is the Pécs–Mecsek and the Siklós–Villány microregions. (Aubert, A. 2000; Hungarian Tourist Authority, 2005)

Research background

Literature review

Based on the reviewed international literature it could be claimed that there is no accepted practice for the delimitation of core areas or destinations. However, concerning the basic principles of the destination(s) there seems to be a consensus among the international professionals (researchers, practical professionals) which can be summarized in the following (Bieger, Th. 1997; Butler, R.W. 1996; Pechlaner, H. *et al.* 2002; Pechlaner, H. 2003; Potts, T.D. and Uysal, M. 1992):

– The delimitation of a certain destination is carried out from the visitor's point of view, disregarding administrative or political borders;

– A destination has a clear, unique profile so that it can become a realizable and independent brand in the tourism market;

– The destination should provide a wide range of supply for the tourist;

– The market initiation of a certain destination should be carried out by a professional management bearing the responsibility for communication, information supply and turnover as well;

– The local population should be able to identify themselves with the spatial delimitation of the destination and also its market initiation (especially with the brand).

During the research it was experienced that the determination of the parameters cannot be independent of the size of the core areas/destinations.

The international practice frequently uses the concepts of core areas/destinations alternately. In favour of definite terms the appellation of destination will be used in the following.

Examples of international practice

Concerning the minimum size and the delimitation criteria of the destination(s) there are significant variations based on the travel drift research among the tourists in different countries. Consequently they take sides on the system of 'small', 'medium sized' or 'great' destinations which margins are disposed by the travel distance on the one hand and concerning the behaviour and habits of the visitors within the target area on the other hand.

In the case of Switzerland threshold values were set such as (Pietro, B. *et al*. 2004; Larbig, C. 2003. *et al*. 2003; Bieger, Th. and Laesser, C. 1998):

– 300,000 guest nights in the case of a destination with national or international reputation (receiving domestic visitors);

– 600,000 guest nights in the case of a destination with international reputation (with national reach and also taking into consideration the nearby neighbouring target markets);

– 1 million guest nights in the case of a world famous destination which also attracts other continent's visitors and market;

– For further delimitation criteria the disposable marketing budget is utilized;

– When the turnover of one day visits seems to be of great significance, they could take it into consideration with an equivalence value estimate.

In the case of Germany there seems to be a concordance in the following (Becker, Ch. 2004):

– The nearly 350 regional organisations or tourism associations and the approximately 4,000 local or community tourism bureaus should be colligated in 35–40 competitive destinations – supposing at least 5 million guest nights in every case;

– These are regions or areas of great international recognition (Oberbayern, Schwarzwald, Harz etc.);

– For the new federal states the DWIF of Munich elaborated a differentiated model to be able to support the determination of their marketability;

– This model is based on numerous criteria (number of guest nights, size of the budget for the tourism organization, market policy etc.);

– On this basis only 12 former East-German tourism regions (out of 42 as national total) have such a potential to be able to function as an independent destination.

In English speaking countries the application of such sharp distinctions is not common (Howie, F. 2003; Ritchie, J.R.B. and Crouch, G.I. 2000). They basically

consider two decisive factors if the destination creation is related to more than one settlement:

– Form and quality of the existing transport relations among the members of the destination;

– Form and content of the existing/future cooperation among the members.

In addition to the national approaches in this area – also influencing our research aims – another initiative is to be emphasized which was recently introduced by the World Economic Forum concerning the competitiveness of travel and tourism investigations. Realizing the importance of the travel and tourism (T&T) industry for industrialized and developing countries alike, the fundamental objective of the Travel and Tourism Competitiveness Report (TTCR) is to explore the factors driving T&T competitiveness worldwide. The aim of the second edition of TTCR covering 130 countries is to provide a comprehensive strategic tool for measuring 'the factors and policies that make it attractive to develop the Travel and Tourism sector in different countries.' (World Economic Forum: The Travel and Tourism Competitiveness Report, 2008.)

Methods

In order to validate the principle of concentration on the core areas during the realization of tourism developments the precise delimitation of the core areas needs to be carried out on the settlement level. According to the professional definitions core areas are tourism centres, which now serve as in the future will also do as attractions which stimulate the tourism of the region. Though the developments should not exclusively concentrate on the appointed areas in any case these would mean the basics for concentration. At present these areas should not be considered as tourism destinations in the modern sense, but due to their further middle term focused development they could turn into them.

Based on the above, in the present research core areas were considered as one of the catalysts of the destinations. Relying on the reviewed international literature it is claimed that there is no uniform methodology concerning the delimitation of core areas or destinations.

The parameters of the delimitation process

Based on the Hungarian professional and administrational networks, civilian cooperation, international experience and the available data of the region six parameters were identified as suitable to draw the boundaries of core areas. The main parameters comprising 24 parameter elements are the following:

1. Present attractions

2. Decisive tourism products (through qualified service providers and accentuated products)

3. Accommodation capacity and performance data (reservations per 1000 residents and reservations in absolute terms)

4. Tourism networks and development activity (network cooperations and application sources)

5. Local tourism tax

6. Transport conditions (not considered in this model)

At the same time it is to be emphasized that via innovative products the present core area system could alter at any time and a new core area can also be generated. Therefore a continuous data collection is necessary from the study region. The core areas created using the above mentioned set of parameters are formed along the boundaries of the present positions so the non-innovative developments (e.g. transport) could modify these boundaries.

For the parameters identified the following weights have been determined:

- Present attractions (20%);
- Decisive tourism products (25%);
- Accommodation capacity and performance data (30%);
- Tourism networks and development activity (20%);
- Local tourism tax (5%).

The research of spatial units delimited by social-economic indicators with GIS methods can open up new perspectives in determining more exact spatial categories and also in creating more expedient subvention networks. Such a problem is the creation of the tourism centre–periphery, centre–centre, agglomeration–periphery systems as well. How can uniform model parameters be identified and conceptualised that, due to the numeric features can provide a possibility for quantitative and not for qualitative decision making? The answer is hard to find since, based on the parameters, an index or characteristic value are to be constructed, that enable to identify regions spatially in an environment with certain values (attraction, landscape elements, service structures etc.) that are difficult to express numerically.

Naturally, when building models a problem is emerging immediately: is it possible to design a method which is applicable for any area or centre-periphery system based on a relatively small study area? It is assumed that it rather depends on the attraction structure (its diversity) than on the size of the given area. In this study numerous possible solutions are demonstrated, which allow the representation of central zones or peripheries of tourism on the basis of uniform parameters and then the strong sides and weak points of these spatial unit analyses can be highlighted.

It is very important however that the given GIS method is a general scheme in which the parameters can be varied hence they provide opportuni-

ties for generalization and its utilization in different areas as well by changing the investigated parameters but keeping basic model principles.

The basic problem of any spatial delimitation is the determination of parameters (Kariotis, G. *et al*., 2007). The parameters of central areas for tourism can be approached presumably from two different aspects: one of them is the supply and the other is the demand side, which generate supply or demand (or both) centres or core areas. This approach can result in three outputs. In the most favourable case (1) the supply centres appear as demand centres as well and so the analysis will show the complete coincidence of the two spatial categories. The other possibility (2) demonstrates areas where the demand side is high with a relatively low supply side while the most unfavourable scenario (3) can be experienced where a remarkable supply centre is coupled with a very restricted demand potential.

The demand–supply relation system would result in a clear analyzing environment. But there are no clear processes since in numerous cases the political, economic changes would set back the emergence of market processes. So this model consists of several parameters which cannot be considered as primary input data but they can rather be interpreted as values deduced either from the supply or the demand side (e.g. sources of support).

The methods of shaping spatial categories were also demonstrated with the help of GIS and then investigated if these methods could be extended to any other Hungarian regions or counties. By using the above analysis, during the investigations a high priority was given to drawing exact and unambiguous boundaries between the core areas, their direct agglomeration and the regions peripheral for tourism.

It was evaluated statistically how the support systems and sources won via tenders promoted the possible strengthening of the core areas or induced disadvantaged areas to catch up. This research indicates a very important task for the development of tourism, namely that the support sources could really be used within the spatial units selected to be subsidized.

In our method, the basic units for the creation of tourism core areas are limited by administrational settlement borders. The smallest central area can cover a single settlement, which emerges from the surrounding areas without any surrounding semi-peripheral regions.

Our model and database were built up using ARC/GIS 9.2. For the delimitation of central areas the module of ARC/GIS Spatial Analyst was used. The numeric analysis was carried out by Microsoft Excel.

The spatial basis for our GIS model is provided by the database on Hungary's administrational borders of where settlements are stored as polygons. The related primary, unique key of the database network is the KSH (Central Statistical Office of Hungary) code linking the database to the polygon and the database proper. In the region 652 settlements were analysed and

classified by the index as either core or periphery areas. The decisive elements of the supply side were framed based on the settlement data (called TSTAR) of the CSO.

The attraction survey and evaluation criteria of tourism attractions

The demand data was compiled from several databases. First the data were analysed from the 1997 Attraction Survey carried out by the Hungarian Tourism Ltd. In our analysis first we carried out a comparison survey concerning the spatial texture the evaluation of attractions shows from both viewpoints – local government and private sector – since the two approaches take their decisions by differing interests. It is valid first of all for physical (natural) attractions. The survey covered all the settlements of Hungary, so here the settlement itself was the smallest spatial category studied as well. The survey for the total area of the country was implemented by several consultant agencies on a uniform criteria scale *(Table 1).*

For every settlement, they determined physical/natural, cultural and special attractions. These attractions were supplied with a uniform code system – e.g. 100–199 to the physical attractions, 200–299 to the cultural ones etc. – then two numbers were rendered to the attraction. These value pairs expressed the assessment of the attractions by the local governments and by the private sector. Values ranged from 1 to 9 for any attraction, in which system 1 meant an attraction of local significance and 9 indicated that of international importance.

The data of this attraction survey was renewed by a reambulation in 2007 by the staff members of the Institute of Geography, University of Pécs. Thus in a microregional system the attraction structure was analysed and re-evaluated. This research was initiated and implemented by the commission of the DDRFT (South Transdanubian Regional Development Council) (Aubert, A. *et al*. 2007).

The attraction survey and classification were performed by the representatives of the private sector and of local governments. In the course of the analysis first a comparison survey was carried out concerning the spatial texture the evaluation of attractions shows from both i.e. local governmental and private sectoral viewpoints since the two approaches take their decisions based on different criteria. In this correspondence the private sector can be handled as purely market oriented while the classifications conducted by local governments seem to reflect other social expectations too. This alteration raises further intriguing research issues beyond the topic of the present paper.

In our opinion a settlement deemed a core area should reach the national attraction level concerning at least one out of the attractions, so value 6 was identified as a threshold above which tourism attractivity was considered

Table 1. Evaluation of tourism attractions by their reach

Attraction value point	Attraction category, reach	Complementary terms
1	Local attraction 1: Can be developed to a potential attraction	Local inhabitants know about the attraction and visit it, but without any tourism flow. If a tourist arrives there – and obtains knowledge about it – visits the place as a complementary program, but does not travel to the settlement only because of that particular attraction.
2	Local attraction 2: With a reach and visit of a micro region	The neighbouring inhabitants are aware of it and so show it to their guests. It has a certain tourism flow as well but does not generate an independent demand.
3	Regional attraction 1: The majority of the visitors come from the given region; induces a significant turnover	It is a known, visited and recognized attraction in the region, but is not familiar outside the region, its external demand is negligible.
4	Regional attraction 2: The majority of the given attraction's visitors are arriving from the same region but it also attracts visitors from settlements of the neighbouring region (tourists from remote regions or abroad are present but in small numbers)	It is well known in its region, the population of the region concern it as a part of its image and visit regularly. It is externally known as well beyond the regional boundaries and so receives external visitors.
5	National attraction 1: The visitors of the attraction are coming from the entire area of the country but they only form a special guest flow segment; the attraction does not generate significant international visits	The attraction is completely accepted and accentuated in the region generating demand for one guest segment from the whole country (e.g. a cross country track), but does not motivate other segments.
6	National attraction 2: The visitors of the attraction are coming from the complete area of the country in every segment; the attraction does not generate significant international visits	Generates visits in almost all of the visitor segments but is only known and received by the domestic culture (lingual, historical peculiarities) and has no international attraction.
7	International attraction 1: A significant ratio of the visitors come from abroad but it is basically attractive from one special segment (the ratio of the domestic guests is lower)	Its significant international guest flow has a special interest segment (e.g. hunting tourism).
8	International attraction 2: A significant proportion of the visitors comes from abroad, representing a wide range of segments (the ratio of the domestic guests is lower)	It attracts a significant international guest flow basically from the neighbouring countries and from the traditional sending countries. Its demand is massive but does not generate new markets in its present state although it has the potential.
9	Global attraction: Its interpretation exceeds the previous category in that the attraction induces global tourism flow and visits to the area independent from geographical distance	In Hungary there are only a few of them such as Budapest or Hungaroring (Formula 1 race track).

Source: Own editing

significant. When building the applied index for delimiting central areas, as a result of the earlier mentioned survey, areas above value 6 received such a weighing factor solution which raised the significance of the attraction if it was present and highlighted in both surveys (local government and public sector) and gained an international rating.

The supply side of the index was analysed from the viewpoint of service providers. Here the category of the so called 'qualified service providers' was analysed. The service providers of the region were summarized then the related factor of the index was created from this database.

Also for evaluating the value of the supply side 'four products' category was used. The so called 'qualified service providers' in Hungary are: (1) wine route service suppliers, (2) rural tourism accommodation suppliers, (3) equestrian tourism hosts, (4) craftsmen. From them only the so called Boole values were analysed, which show whether the given product is present or absent at the settlement. The importance of the specific local parameters should be emphasized, since the 'thermal and spa' category characteristic for the South Transdanubian Region could be substituted by another product in another region.

The demand side can be defined more unambiguously than the supply one since it is the most expressed parameter of tourism concerning the number of visitors and their time and money spent. There was analysed the number of guest nights which were applied not in absolute numbers but incorporated in five groups in the model mentioned earlier (present attractions, decisive tourism products, accommodation capacity and performance data, tourism networks and development activity, local tourism tax).

During the survey of commercial and private accommodation capacities and guest flows the contradiction was found that in numerous cases no guest flow values were linked to the registered capacity. So in this case in reality the given accommodation was not functioning or it had a minimal registered turnover. From a professional point of view the guest night data show the real tourism turnover however the absolute values show a very high standard deviation over the region (Siófok 675,541 person/night/year vs Decs 18 person/night/year). So it was found reasonable to use a specific index of the settlement value of guest nights per 1,000 residents from the KSH database and its categories. It also stands by the application of specific index that – knowing the settlement structure of the region – we could decrease the weight of the settlements with large population and considerable tourism potential (e.g. Pécs: the value of guest nights per 1,000 residents is 1742) but also we highlight from the lower settlement category those which could be raised using this index (e.g. Patca: the number of guest nights per 1,000 residents is 59,778). Naturally on the top of this list there are the settlements with an abundance of tourist flow and visitation (e.g. Zamárdi: the number of guest nights per

Table 2. The KSH (Central Statistical Office of Hungary) value categories considering the number of guest nights per 1,000 inhabitants

Number of guest nights per 1000 inhabitants	Category
0–1	0
2–100	1
101–200	2
201–500	3
501–1,000	4
1,001–3,000	5
above 3,000	6

Source: own edition based on KSH (Central Statistical Office of Hungary) score categories

Table 3. The turnover (guest nights) in commercial and private accommodation (person/year)

The turnover (guest nights) in commercial and private accommodation (person/year)	Category
1–1,000	1
1,001–10,000	2
10,001–50,000	3
50,001–150,000	4
150,001–250,000	5
above 250,000	6

Source: own edition based on KSH (Central Statistical Office of Hungary) score categories

1,000 residents is 101,013). These indices were classified into 7 categories *(Table 2).*

During the survey it was suggested to use not only the specific but the absolute values in delimiting of the areas as well. These values (the absolute settlement level values of commercial and private accommodations) were taken into consideration in the same way as the KSH created the above mentioned categories *(Table 3).* These two values relating to accommodation received equally shared weights within the parameter.

The next topic of the present study is the system of spatial supports and grants in which an attempt was made to describe numerically how much a settlement had been supported from governmental sources and on how many occasions. When constructing the index, it was taken into consideration to what an extent the settlement is 'committed' to tourism development, how much it is important (e.g. to establish a tourism information bureau).

Finally, it was also recorded if the given settlement was a member of any regional integration and whether the local tourism tax system was applied.

The model provides information for 653 settlements, based on the described algorithms and determined the core area values for each settlement. Estimates show that a total of 197 settlements were unable to attain score, while the maximum score for a settlement was 19. Settlements with at least 0.4 score were considered eligible for the promotion of development and further cooperation with the core areas.

Results

The map of core areas representing settlement level

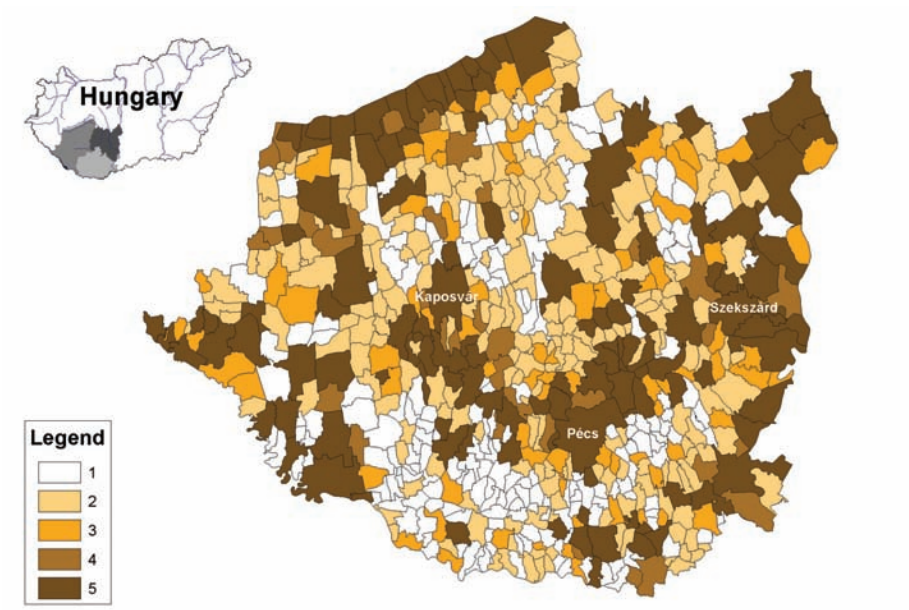

Fig. 1. Value scores by settlements. – 1 = 0; 2 = 0,001–0,4; 3 = 0,4–0,8; 4 = 0,8–1; 5 = score 1>

When establishing the limit value during the process of demarcation several alternatives were examined. The results of these analyses are visualised in maps with threshold scores serving as limits *(Figure 1).*

It can be well observed from the figures that the number of those settlements exponentially decreases that cannot be classified into any core areas for reference applying the score 1.

Proposed core areas

Based on the above considerations the settlements of the core areas were mapped schematically. The fragmentation of core areas is clearly visible on the map *(Figure 2).* This fragmentation is less striking if we consider those areas of sporadic distribution at present with a relatively favourable potential as part of the core areas. It is also worth considering that along the river Danube three core areas have been identified. As they bear the same tourism attraction and product potential (natural attractions and the relating services) presumably they should be connected to produce one contiguous linear core area.

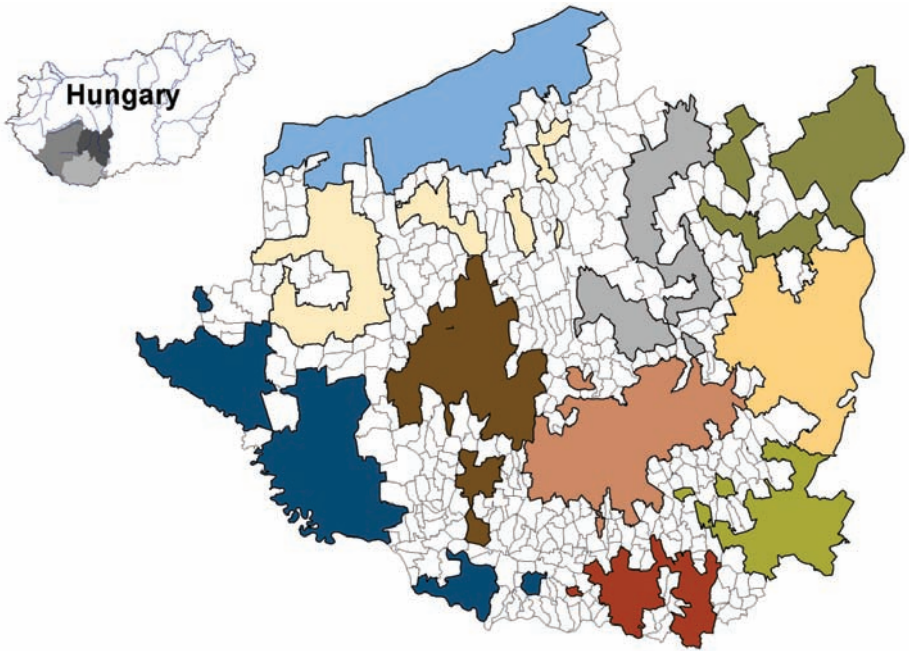

Fig.2. Settlements and their regional delimitation above the score of 0.4

This research could further on raise some new scientific issues providing a significant support via our model by promotion of cooperation among settlements, solution of communicational, positioning tasks or by the determination of the optimum frequency of data collection.

The final output of the research was the regional delimitation of areas where tourism is of priority. Eventually 8 tourism destinations were identified within the South Transdanubia NUTS2 region *(Figure 3).* It should be emphasized as well that this operation has something not only to add to tourism research but also has significance for regional development since state support for tourism product development and other activities will mainly be available for settlements referred to one of the core areas/destinations of the region.

Conclusions

Relying on the analysis of the relationship between regional development and tourism in South Transdanubia the authors claim that it can provide experience for researchers from multiple perspectives. In Hungary, parallel

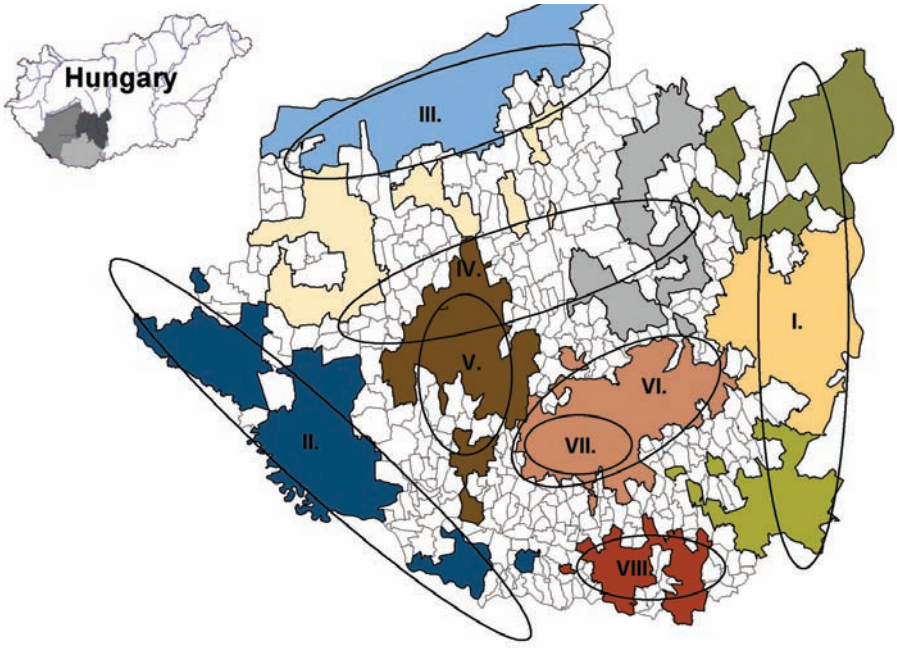

Fig. 3. Tourism destinations in South Transdanubia. *Source:* Aubert, A. and Szabó, G. (ed.), 2007. – I = Dunamente (zone along the river Danube); II = Drávamente (zone along the river Drava); III = „Kis-Somogyország" (Somogy County); IV = Kapos-völgy (Kapos Valley); V = Zselic Hills; VI = Mecsek Mountains; VII = Pécs; VIII = Harkány-Siklós-Villány

with the emerging regional thinking and the change of objectives in regional development and coherent regional policy, the development and planning of tourism is going to gain a more significant role than ever before. Therefore a more precise analysis of tourism dominated regions is required.

Based on this research, the South Transdanubian Regional Development Agency's Tourism Strategy Development Program assigned the core areas of tourism within the region. Using their potentials they are adequate to become clearly identifiable, characteristic tourism destinations. During the development of tourism – instead of the thematic, product based development – the emphasis is to be put on the complex development of the certain core areas. The major aim is that these areas i.e. destinations should advance into competitive regions of tourism and that the drawing products should be identified upon which the unique product supply of each of the core areas could be created along with a complementary product supply as well.

To validate the principle of concentration during the realisation of tourism developments it is needed to delimitate the core areas on the settlement level thus identify them precisely. Investigations demonstrated that

model building with GIS methods provide a relatively simple and easy access to determine regions with importance for tourism, critical in terms of tourism planning and regional development both concerning national support and EU assistance or simply the delimitation of tourism spaces. Data at settlement level can be the starting point for studies which analyze information on guest nights, income and tourism spending, accommodation etc.

The proposed model deploys a holistic, quite complex and systemic approach to the assessment of tourism from the spatial and regional perspectives. Its results could also contribute to provide strategic guidance for regional development agents or agencies on several administrational levels (national, regional, microregional, local government), and to elaborate strategies for tourism development in central or periphery areas concerning either tourism, economic or social development. So the result obtained from the possible application of the model could be a more accurate and precise tourism assessment and evaluation method with GIS tools generating a more comprehensive understanding of the processes within tourism. It is believed that such investigations can be and shall be used in practice especially at the regional level of tourism planning, describing the regions using exact data with or without importance for tourism. Thus, a more detailed picture can be obtained on the economy and social background of the geographic region studied.

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Hungary in Maps

Edited by
Károly Kocsis and Ferenc Schweitzer

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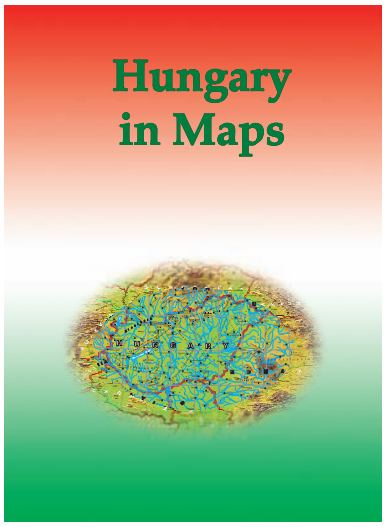
Budapest, 2009. 212 p.

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

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



This project serves as a preliminary study for the new, 3rd edition of the National Atlas of Hungary, that is to be co-ordinated by the Geographical Research Institute of the Hungarian Academy of Sciences.

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Factors influencing solution in karren and on covered karst

Márton Veress[1]

Abstract

The effect of the following factors on karstification were investigated: the presence of *Pinus mugo*, slope length, and slope angle (Totes Gebirge, Austria), the wind action (Diego de Almagro Island, Chile), the thickness and quality of covering sedimentary rock (Bakony Mountains, Mecsek Mountains, Hungary) and the role of karst water (tsingies, Madagascar). The methods were as follows. The specific cross-sectional area of rinnenkarren and their specific shape-parameter in Totes Gebirge were calculated. Morphological maps of several karren forms at Diego de Almagro Island were prepared and specific width of these karren features was also computed. Topographic cross-sections were created and height measurements of Madagascar tsingy areas carried out as well. Vertical electrical sounding (VES) method was applied in the Bakony Mountains and in the Mecsek Mountains. The following conclusions could be established: dissolution is more intense on slopes with *Pinus mugo* than on bare slopes. Rinnenkarren (channels) may develop under rivulets, but they can be created by seepage, too. The wind moves the water on Diego de Almagro Island, therefore it controls the dissolution process. On the windward side of landforms both the number and the size of karren forms are increased and as a result, the amount of total dissolution is also higher due to the wind effect. Tsingies represent the initial phase of karstification. They develop when the karst water table sinks temporarily to a lower level after reaching the surface. The covered karst forms of the Bakony Mountains developed at places where the covering sedimentary rocks are thinner, whereas the covered karst features in the Mecsek Mountains developed where the clay beds of the covering sedimentary strata end.

Keywords: karren, covered karst, factors effecting karstification, plants, dip angle, length of slope, wind, karst water table, thickness of covering sedimentary rock

Introduction

Karstification is influenced by many factors. These are e.g. the characteristics of the limestone (its contamination, fabric, structure, bedding and thickness, the characteristics of the karst movement, the climate and of the soil). The role of these factors were investigated by many authors and the results may be found in standard works on karstification (Sweeting, M.M. 1972; Jennings,

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J.N. 1985; Trudgill, S.T. 1985; Jakucs, L. 1977; Ford, D.C. and Willams, P.W. 1989, 2007).

In this study a few findings from various sample areas will be presented. These phenomena are the following: the presence of *Pinus mugo*, the slope angle and slope length, the wind action, the position of karst water table (as to the development of surface karst forms), the quality and thickness of the covering sedimentary rock.

Sample areas

The scope of research included the following areas: Totes Gebirge (Eastern Alps, Austria), Island of Diego de Almagro (Chile), Ankarana tsingy and Bemaraha tsingy (Madagascar), Bakony Mountains and Mecsek Mountains (Hungary).

The Totes Gebirge is the remnant of the overthrust fold of Upper Eastern Alps. The mountains are built of Dachsteinkalk. Karren formation in Totes Gebirge mainly takes place on the cuesta surfaces of glacier valleys. Wallkarren are found on the steep slopes of the heads of the cuestas, while rinnenkarren dominate the gentler slopes of the cuestas with bedding planes *(Photo 1).* The investigations were carried out in the *Pinus mugo* belt. They addressed the development of channels (runnels), furthermore the relationship

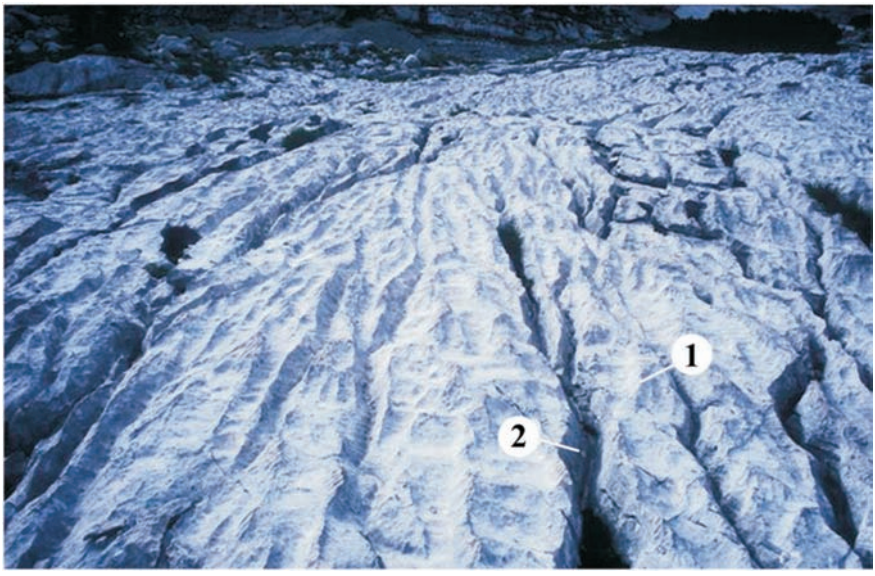

Photo 1. A bare slope with small dip angle from Totes Gebirge. – 1 = type A channel; 2 = type B channel

Photo 2. Shadow dune karren. – 1 = direction of wind

between the development of channels in the presence and absence of *Pinus mugo*, and the dependence on the length of the slope and the slope angle.

Diego de Almagro Island is situated in the Patagonian group of islands. The rocks of the island became metamorphosed during the Upper Carbonic tectogenesis (Maire, R. *et al.* 1999). Three marble stripes edged into the non-karstic metamorphic rocks, which were of lamprophyres and basalt origin (Maire, R. *et al.* 1999). Upon the marble surface extensive karren forms developed. The most frequent of them are dissolutional basins (kamenitzas), rinnenkarren, meanderkarren, wandkarren, ripple karren and remnant forms (e.g. shadow dune karren inselberg, whaleback dune karren inselberg, *Photo 2).* These were described by Jaillet, S. and Hoblea, F. 2000. (2000) and Veress, M. *et al.* (2006).

According to Maire, R. *et al.* (1999) the amount of the rainfall can reach 8000 mm/year. The duration of rainfall can be several hours a day. The wind has played an important role in the development of the karren features of the island. According to Zamora, E. and Santana, A. (1979) the average velocity of the wind can be 60–80 km/h, but sometimes it reaches 150–200 km/h. The influence of the wind on the formation of karren was investigated with a special reference to the dissolution on Diego de Almagro Island.

The Island of Madagascar is built mainly by gneiss. Jurassic and Eocene limestone occur in small expansions. The characteristic karst type of the island is the tsingy (the Ankarana tsingy, the Bemaraha tsingy, the Namoroka tsingy and the Bemarivo tsingy). Collapse dolinas occur in many karst areas of the island and different kinds of them were distinguished (Rossi, G. 1986). Solution dolinas however occur on the higher karst plateaus exclusively, e.g. on Kelify Plateau (Rossi, G. 1986) and in the higher part of the Bemaraha tsingy (Balázs, D. 1980). The amount of the rainfall decreases from north to south. It is 2200 mm/year on the Ankarana tsingy, and drops down to 1100–1500 mm/year on

the Bemaraha tsingy. Also there is a southward decrease in the duration of rainfall events. The maximum altitude of the surface of the Ankarana tsingy is higher than that of the Bemaraha tsingy (it is 295 m on the Ankarana Little tsingy, 318 m on the Ankarana Great tsingy, 75 m on the Bemaraha Little tsingy and 190 m on the Bemaraha Great tsingy). The karst water table may occur on the bottom of the grikes of the Bemaraha Little tsingy. Its depth compared to the surface is about 25 metres on the Bemaraha Little tsingy, while it is about 140 metres on the Bemaraha Great tsingy (Veress, M. *et al.* 2008a, 2008b). Since the tsingies can be found close to the sea, the sea-level fluctuations caused a rapid change in the karst water table level, with high intensity and in the immediate vicinity of the tsingies. The reason for it was that the rivers which are the local erosional bases of the tsingies did not exist at the time of the rise of the sea level. Thus the River Manambolo which is the erosional base of the tsingies with an altitude of 50 m, occurred under the sea level when the rise of the sea level exceeded 50 metres. The effect of the karst water table on karstification of the surface was analysed on Madagascar.

The tsingy karst is built by assemblages of large-sized grikes (*Photo 3*, Veress, M. *et al.* 2008a, 2008b). The depth of the grikes is between 0.5–7 metres on the Ankarana tsingy, while they can reach a depth between 10–120 metres on the Bemaraha tsingy. Clints of various dimension and pinnacle with diverse shape and size are among grikes (Rossi, G. 1986; Veress, M. *et al.* 2008a, 2008b). Rillenkarren, kamenitzas, pits, rinnenkarren occur in great density on the clints and pinnacles of the tsingies (Veress, M. *et al.* 2008a, 2008b).

Photo 3. Grike systems from the Bemaraha tsingy (Delaty, J.N. *et al.* 2006)

The Bakony Mountains in Hungary are a type of faulted mountains built of Mesozoic and Eocene calcareous rocks. The surface of the 300–500 m high blocks is covered with loess and partly with various types of loess loam. These are the covered karst surfaces of the mountains. The calcareous floor is dissected under the covering sedimentary rocks, because karstification already happened previously on the surface of these rocks (Végh, S.-né 1976). The covered karst forms are limited in size and they have a low density in the Bakony Mountains (Veress, M. 2008, 2009).

The Mecsek Mountains are faulted-folded structures. The northernmost margin of the West Mecsek built of Triassic limestone is affected by karstification. Limestone is superimposed by loess and sandy-clayey cover sediment.

Two generations of dolines were distinguished by Szabó, P.Z. (1968) on this covered karst surface. The older generation of dolines are the larger landforms of those developed on the limestone floor, therefore they are solution dolines, being lined or filled with sediments completely. The latter (buried dolines) do not have depressions on their surface. The younger and smaller dolines have developed in the sedimentary rock cover. These dolines are covered karst features. There is a high density of the dolines (solution dolines and covered karst dolines alike) in the Mecsek Mountains. Their values can even reach 137 pieces/km^2 and 164 pieces/km^2, respectively (Hevesi, A. 2001; Lippmann, L. *et al.* 2008).

The thickness and quality of the covering sedimentary rock were investigated to establish the relationship between the overlying sedimentary rock and covered karstification.

Methods

– The width and the depth of karren forms along profiles were measured on bare slopes of the Island of Diego de Almagro. Similar measurements were carried out both on bare slopes and slopes with *Pinus mugo* in Totes Gebirge where they are located closely to each other. Several profiles were erected here in three-metre distance from each other in areas with minor dip angle and bare slopes. The depth and width of the channels were also measured along these profiles.

– The specific width *(c)* and the density *(ρ)* of the karren forms on the Island of Diego de Almagro were computed. The values of *(c)* and *(ρ)* of the forms as well as the specific cross-section areas of the channels (*A)* and shape-parameters of the channels *(f)* were also calculated for the study area in Totes Gebirge (Veress, M. *et al.* 2008c, 2010). The above parameters can be calculated as follows:

$$c = \frac{\Sigma W_k}{l}$$

$$A = \frac{\Sigma A_0}{l}$$

$$f = \frac{\Sigma f_0}{l}$$

Where W_k is the width of a channel along the profile (if the calculation of specific width is to be meant for the channel, its width is concerned),

A_0 the cross-section area of a channel along the profile,

f_0 the shape of a channel along the profile,

l the length of the profile,

$$A_0 = a \cdot b$$

$$f_0 = \frac{w}{d}$$

where w is the width of the channel,

d the depth of the channel.

The average cross-section area of the channel *(A)* and the average channel shape *(f)* were calculated as well. To calculate *(A)* and (l) the overall cross-section areas and the overall shapes of the channel were divided with the number of the channels.

– Function relationships were searched between D (the distance between the upper margin of the slope and the site of the profile), *A* and *f*.

– The karren features of the leeward slopes and windward slopes were compared on Diego de Almagro Island.

– Karren forms were mapped on Diego de Almagro Island.

– The thickness and the quality of different beds and that of the covering sedimentary rock were measured with vertical electrical sounding (VES). Geoelectrical-geological cross sections were constructed. The morphology of the limestone floor, the thickness and the structure of the covering sedimentary rock and its beds may be determinant along these geoelectrical-geological cross sections (Veress, M. 2008).

Results

The impact of plants, dip angle and the length of slope on karren formation

Based on the measurements it can be stated that the specific cross section areas of channels are more extensive on slopes with *Pinus mugo* than on bare slopes (9.12 dm^2/m vs 3.65 dm^2/m, respectively). According to the measurements by Mariko, S. *et al.* (1994) the cause of it is that the snow which covers vegetation

in high mountains has a high CO_2 content. *Pinus mugo* cannot photosynthesize under the snow but it is able to dissimilate. Therefore the dissolution capacity of the meltwater originating from the *Pinus mugo* patch is higher.

Channels develop under rivulets (Trudgill, S.T. 1985; Ford, D.C and Williams, P.W. 1989). According to Veress, M. *et al.* (2008c) the channels may develop in two ways: due to percolation or due to rivulets. After filling of the channel the meltwater seeps between the snow and the limestone during the development generated by percolation. The current of this water is laminar and it dissolves the side and the bottom of the channel. Rivulet generated development can change into percolation generated development at the same channel, and vice versa. The specific cross section area of the channel and the specific shape of the channel also depend on the dip angle of the slope with *Pinus mugo* (Veress, M. *et al.* 2008c; Veress, M. 2010). The velocity of the flow is higher on a steeper slope. The greater velocity induces turbulent flow which in turn increases the rate of dissolution. Therefore dissolution is also more intense on slopes of greater dip angles covered with *Pinus mugo*. The flow velocity may change only if the water flows on the slope but it cannot change in case of seepage. During the percolating generated development the incision of the channel does not depend on the dip angle. Therefore development due to rivulet can dominate on slopes with *Pinus mugo*.

Type A and type B channels were distinguished on bare slopes with small dip angles *(Photo 1).* Type A channels have small sizes, V cross sections, small catchment areas, small specific cross section areas and great shapes. Due to the latter one, the specific cross section area of type A channels which can be found along a profile is small and their specific shape-parameter is great *(Table 1).* Type A channels do not have tributary channels. Type B channels have U cross sections, extensive catchment areas, great cross section areas, and small shapes. Due to the latter one, the specific cross section area of type B channels which can be found along a profile is great and their specific channel shape-parameter is small *(Table 1).* Type B channels have tributary channels of type A. Type A channels dominate bare slopes with great dip angles. There is a dense network of channels on such steep slopes.

There is a functional relationship among d and the specific cross section areas of type B channels and the specific shape-parameter of type B channels on bare slopes of small dip angles (Veress, M. 2010). The specific cross section areas of these type B channels can be greater while the specific shape-

Table 1. Parameter values of type A and type B channel of some bare slopes from Totes Gebirge

	Type A channel						Type B channel					
Mark of the slope	n	P	T	t	f	l	n	ϱ	T	t	f	l
slope marked I/9/1	11.8	1.3	100.7	67.1	3.2	1.9	3.3	0.4	183.0	278.5	0.3	0.6
slope marked I/9/2	24.6	1.6	153.7	107.2	3.1	1.9	5.7	0.3	305.4	699.2	0.4	0.8
slope marked I/9/3	9.8	1.1	94.0	89.6	2.4	2.3	3.6	0.4	172.6	420.4	0.4	1.1

parameter of the channels can decrease in the function of d *(Figure 1).* It is only possible if an increasing amount of water flows across the lower and lower parts of the channels for even longer time. The cross section area of the channel will increase due to the growing amount of water. The channel will incise due to the growing existing rivulet as dissolution at the bottom of the channel will take more time. Hence type B channels increase due to rivulets. Such functional connection cannot be established in case of type A channels. Therefore type A channels develop due to percolation.

The influence of the wind on solution and karren formation

The rate of dissolution of marble is 0.06 mm/year on Diego de Almagro Island (Hoblea, F. *et al.* 2001). The rate of dissolution of limestone is 0.015 mm/year in the Alps (Bögli, A. 1961). The speed of dissolution is as many times higher on the island as the rainfall is more abundant than in the Alps. At the same time the karren forms of the island sometimes can be tenfold or fifty times larger in size than the karren forms of the Alps. The cause of the development of the greater sizes is that the wind moves the surface water into a narrow stripe. Therefore dissolution is concentrated only in limited place. Dissolution does not take place in leeward for example behind boulders. Thus shallow dune karren inselbergs develop at these places *(Figure 2, Photo 2).* The following facts prove the effect of wind action:

– The residual forms (karren inselberg) have W–E trend.
– The windward sides are steep, the leeward sides are gentle.
– The remnant forms have a streamlined shape *(Photo 2).*

The wind controls the process of dissolution in the following manner:

– The wind moves the water from west to east.
– The wind separates the sheet water into rivulets as observed on numerous occasions.

Wind action could increase the rate of dissolution; also dissolution of higher intensity contributes to the development of larger karren forms. It might happen in the following way:

– More rainwater falls on the windward slope than on the leeward slope (per time unit). The wind makes the raindrops move therefore the dissolution is stronger on the windward slope than on the leeward one. According to calculations of Szunyogh, G. (2004, 2005) the rate of denudation is four times higher if the angle of the slope is 70° and the velocity of the wind is 10 m/s than in calm conditions with the direction of the wind being perpendicular to the slope.
– High wind velocity increases the speed of the flow, which causes turbulence. The intense collision of raindrops and snowflakes produces a similar effect.

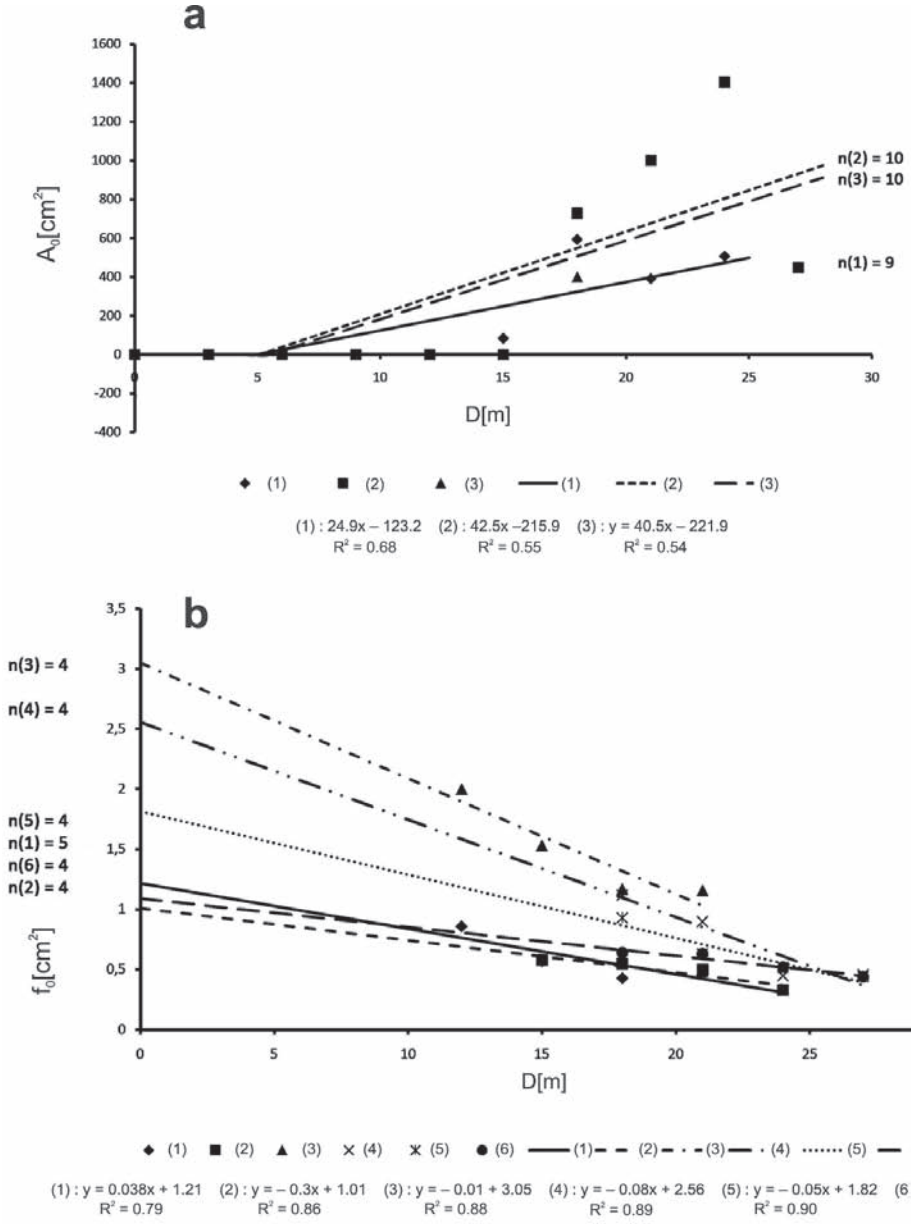

Fig. 1. Functional relationship between the various parameters of the type B channels on a bare slope of Totes Gebirge. – a = f_0-D functions of the channels; b = f_0-d functions of the channels, F_0 cross section area of the channel, f_0 the cross section shape of the channel, d. distance between the upper margin of the slope and profile site (similar signs are calculated F_0 and f_0 values of the same channel at various profile sites)

– The wind increases pressure, therefore atmospheric CO_2 penetrates into the water. According to Veress, M. *et al.* (2006), as a result the dimension of the dissolution is increased by 0.18 mg/l in case of laminar water current if the velocity of the wind is 100 km/h. The collision of the raindrops and snowflakes also increases pressure. According to our calculations the pressure will increase up to 130% in the water if the velocity of the wind is 50 km/h, therefore solubility will increase 1.3 times at laminar flow (Veress, M. *et al.* 2006).

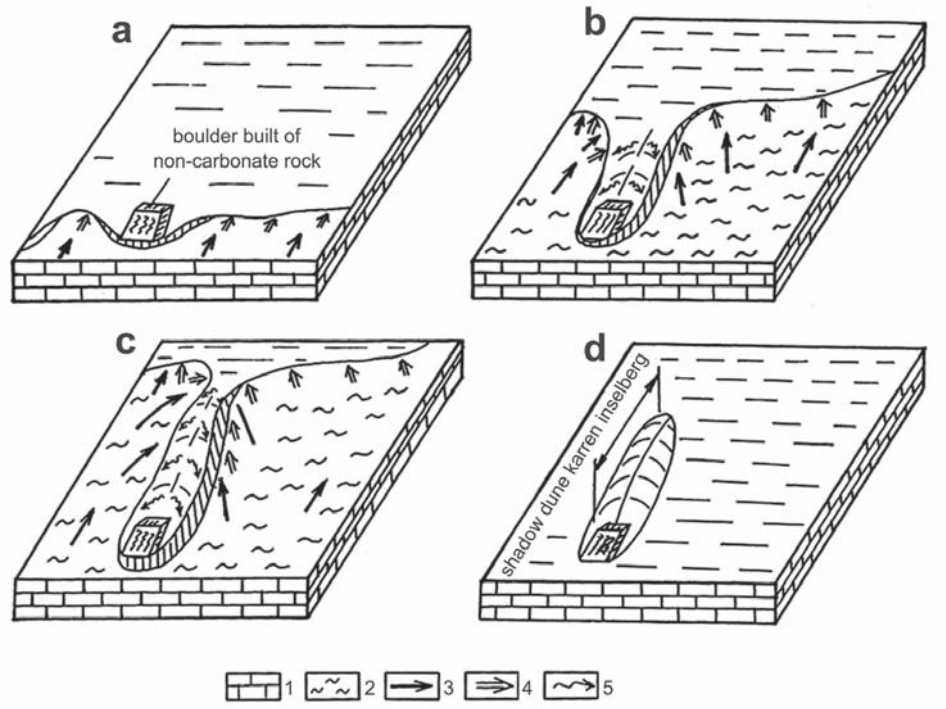

Fig. 2. The development of the 'shadow dune karren inselberg' (Veress, M. *et al.* 2006). – a = the water moving to the east dissolutes the surface except the part of the surface which is behind the boulder; b–c = elevation develops at the wind shadow; d = where the wind shadow surface ends the surface dissolutes behind the boulder too, the elevation budds; 1 = marble; 2 = puddle; 3 = wind direction; 4 = dissolution; 5 = dissolution at sheet water

The effect of karst water on the development of the tsingies

Rainfall percolating along cracks created the Ankarana tsingy by dissolution (Balázs, D. 1980; Rossi, G. 1986; Veress, M. *et al.* 2008b). The great grikes of the Bemaraha tsingy developed when small grikes and caves coalesced into each other. They might have developed due to the collapse of caves. The former

caves were created under the karst water table in the phreatic or epiphreatic zone (*Figure 3*, Veress, M. *et al.* 2008a, 2008b).

The sea level had been 60–70 metres higher before the Ice Age compared to nowadays (Mitchum, R.M. *et al.* 1977). Therefore the karst water table was about 60–70 metres higher compared to that of nowadays on the tsingies. (Tectonic uplift was not taken into account because since the beginning of the Ice Age the rise has not been substantial.) Other factors also influence the level of karst water table such as the distance between any parts of the karst and temporary base level and the cavity index of the rock.

The farther is the site of the karst from the contemporary base level the higher is the karst water table. For example it is 200 m higher even at a distance of 25 km from the contemporary base level in the Bakony Mountains, as shown by karst water table maps (Lorberer Á. and Maucha, L. 1982). Its vertical oscillation may even reach 100 metres in dolomite with lower cavity values in the Bakony Mountains, according to the data gained from a karst table observing well in Hárskút, Hungary (Böcker, T. 1972).

The surfaces of the Madagascar tsingies were close to karst water table before Ice Age. (The karst water might create lake or lakes on the deeper parts of the Bemaraha Little tsingy.) Therefore dissolution might happen during arid seasons and low tides or in the glacial stages of the Ice Age on the surface. Therefore in these cases the karst water table sank deeper in the rock. Where the karst water table was higher than the surface of the tsingy (Bemaraha Little tsingy) dissolution took place in the glacial stages of Ice Age, when the karst water table was located lower than recently. Dissolution of short time duration has not stimulated the development of solutional dolina. This landform develops where all of the rock is dissolved over a certain area. This process needs a prolonged dissolution. The cavity level was nearer to the surface on the Bemaraha tsingy than on the Ankarana tsingy. On the one hand it is because the surface of the Ankarana tsingy is higher than that of the Bemaraha tsingy. On the other hand the Manambolo River kept the karst water table 50 m higher above the sea-level during Ice Age on the Bemaraha tsingy. Formation and development of the two tsingies were different from each other as the grikes and the caves could not coalesce to each other on the Ankarana tsingy because of the deeper level of the caves. The coalescing process could happen on the Bemaraha tsingy because the caves were nearer to the surface.

The influence of the sedimentary rock on covered karstification

Data are available on the thickness and the quality of the covering sedimentary rock, the morphology of the limestone floor of 37 pieces of covered karst forms in the Bakony Mountains, and of 21 pieces of covered karst forms in

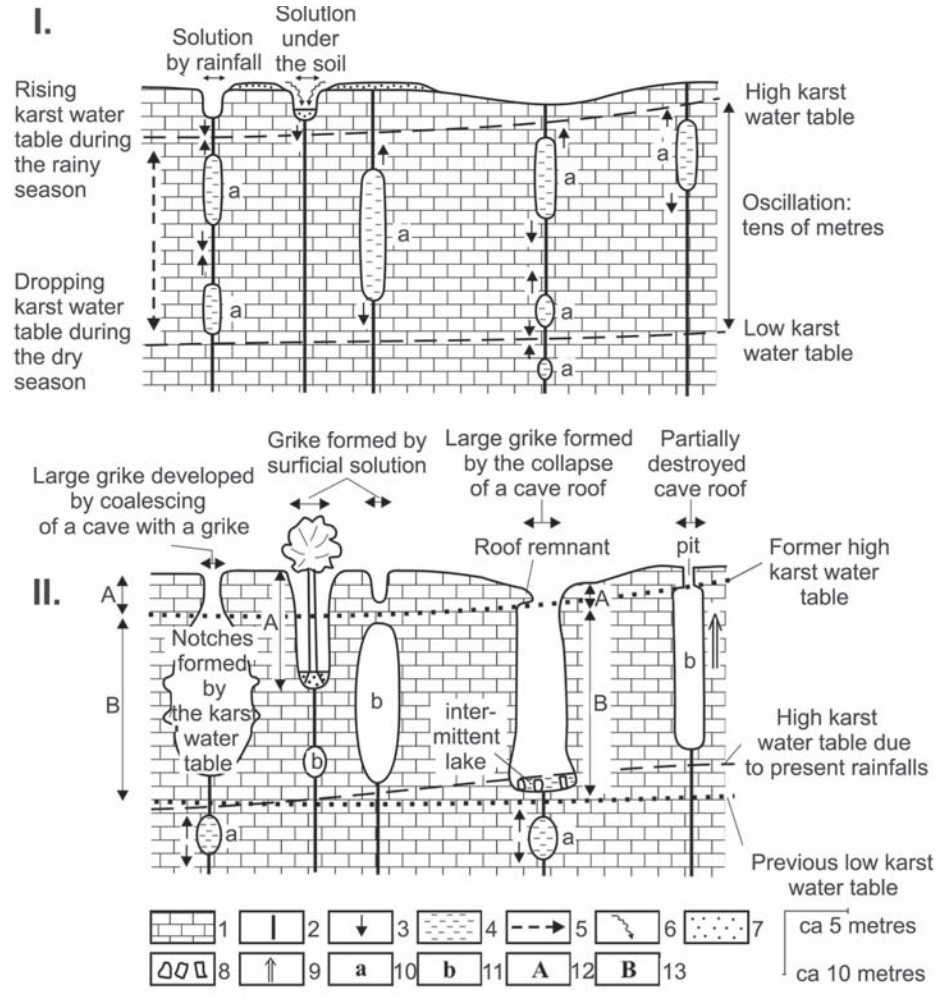

Fig. 3. The development of the Bemaraha tsingy. – 1 = limestone; 2 = crack; 3 = direction of dissolution; 4 = karst water; 5 = oscillation of karst water table; 6 = infiltration into the karst; 7 = soil; 8 = collapse; 9 = uplift; 10 = cave filled with karst water; 11 = the cave above karst water table; 12 = grike part which developed above the karst water table; 13 = part of grike developed under the karst water table; I = initial phase; II = present phase

the Mecsek Mountains. (Veress, M. 2004, 2007, 2008, 2009). According to VES measurements 78 per cent of the covered karst forms occur above mounds of the limestone floor in the Bakony Mountains *(Figure 4).* The morphology of the limestone floor is indicative of the development of the covered karst forms because the covering sedimentary rock is thinner above the mounds of the limestone floor, than above its depressions. The thickness of the inner sediment

rock of karst forms above the mounds does not reach 6 metres (the thickness is measured below the bottom of the depression). Only 7 covered karst forms have external sedimentary rock cover with a thickness greater than 6 metres (its size may be measured at the margin of the depression). But the thickness of the covering sedimentary rock above the depressions of the limestone floor always exceeds 6 metres and it often reaches 10, or 20 metres depth. Water percolating into the thinner sedimentary rock can reach the limestone floor easier above the mounds. It could also be established that 26 forms occur at the

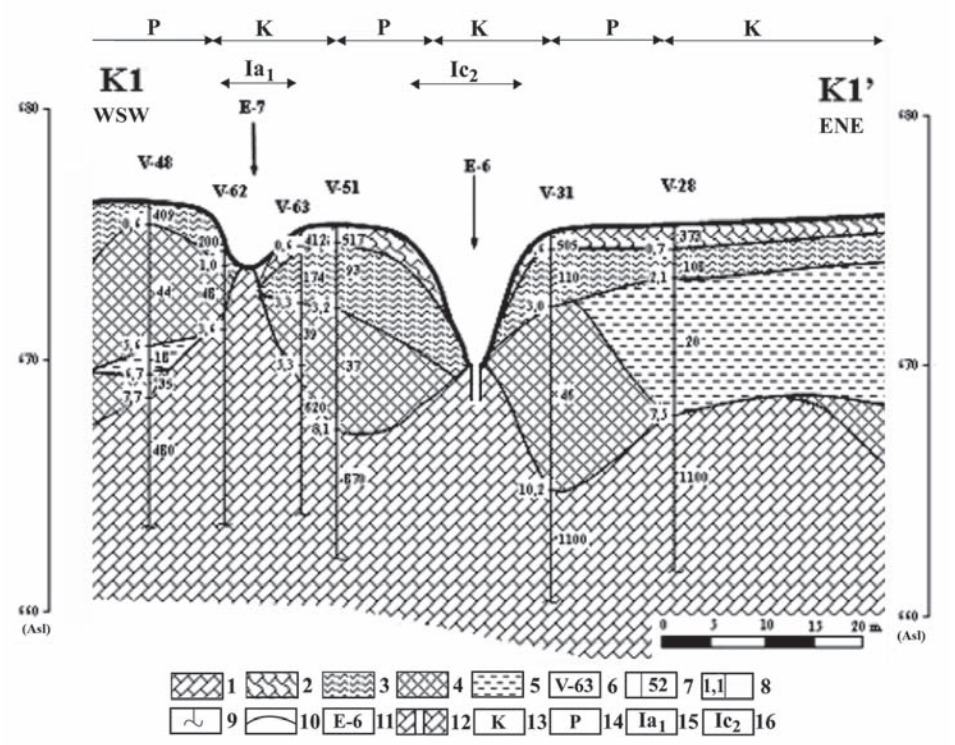

Fig. 4. Covered karst dolinas developed above the mounds of the limestone floor (Bakony Mountains, Kőris Mount, Veress, M. 2008). – 1 = limestone; 2 = limestone detritus; 3 = limestone detritus (with clay); 4 = clay (with loess and limestone detritus); 5 = clay; 6 = number and place of VES measuring; 7 = geoelectrical resistance of the beds (Ohm); 8 = depth of the bottom of the geoelectrical beds (m); 9 = penetration of the VES measuring; 10 = border of the geoelectrical beds; 11 = mark of the covered karst form; 12 = pit; 13 = elevation on the limestone floor; 14 = paleokarst depression of the limestone floor; 15 = syngenetical (the karst form and the pit are of the similar age) covered karst form above the elevation of the limestone floor; 16 = postgenetical (the karst form is younger than the pit) covered karst form above the elevation of the limestone floor. Note: the karst forms (marked E-6 and E-7) developed with the sinking of the surface, further with the sinking of the uppermost beds (due to the loss of the matter of the covering sedimentary rock

bottom of the valleys of the covering sedimentary rock. Hence the denudation of the surface adds to that of the covered karst forms. It means that denudation causes the further thinnering of the sedimentary rock cover. Naturally the development of the covered karst depressions rather promotes the increase of the water at the bottom of the valleys than somewhere else.

VES measurements testify about the covered karst forms of the Mecsek Mountains having developed in the areas of the lined or filled solution dolinas. They formed where clay beds or sequences containing clay wedge out

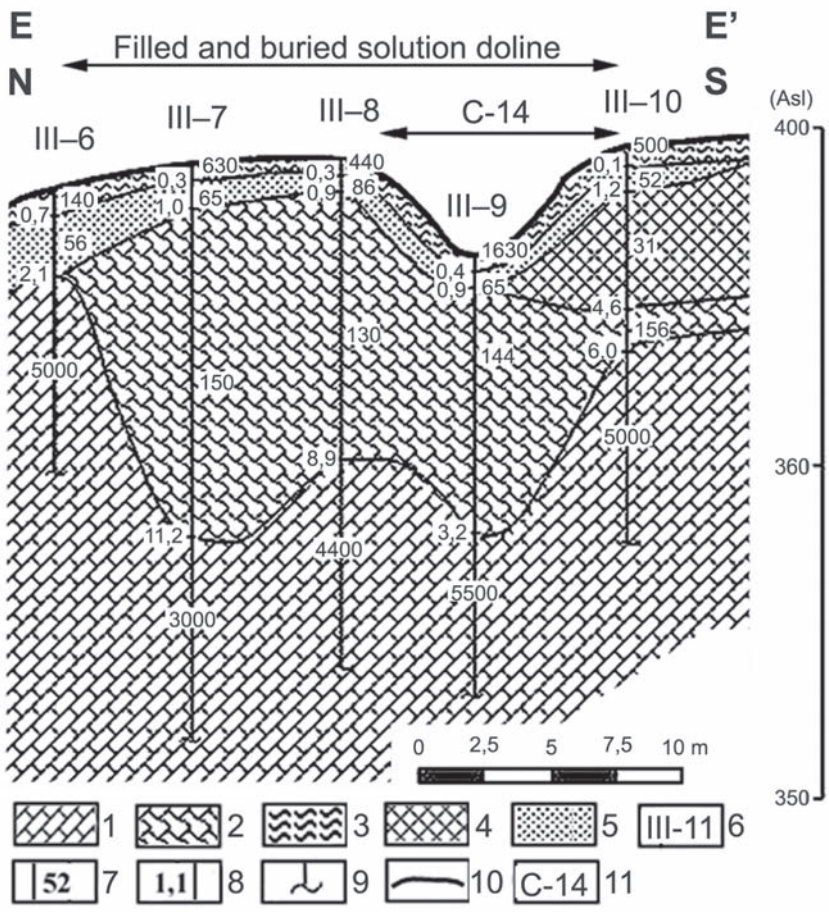

Fig. 5. Covered karst doline which developed at wedges out of permeable, filled and buried solution doline (Mecsek Mountains, from the area of Czigány land near Orfü). – 1 = limestone; 2 = limestone detritus (sand?); 3 = soil; sand; silt; 4 = clay (with limestone detritus and sand); 5 = sand, loess (with limestone detritus); 6 = number and place of VES measuring; 7 = geoelectrical resistance of the beds (Ohm); 8 = depth of the bottom of the geoelectrical beds (m); 9 = penetration of the VES measuring; 10 = border of the geoelectrical beds; 11 = mark of the covered karst form

(Figure 5). Out of the 21 covered karst formations there are 16 with such attributes. (The cause of this phenomenon is as follows: the water percolates into the karst where clay beds wedge out. The water creates a pit on the limestone floor.) The matter of the covering sedimentary rock can be transported into the pit. A blind burrow develops in the sedimentary rock. A covered karst forms due to the sinking or breakdown of the covering sedimentary rock above the blind burrow (Veress, M. 2008, 2009, *Figure 6*).

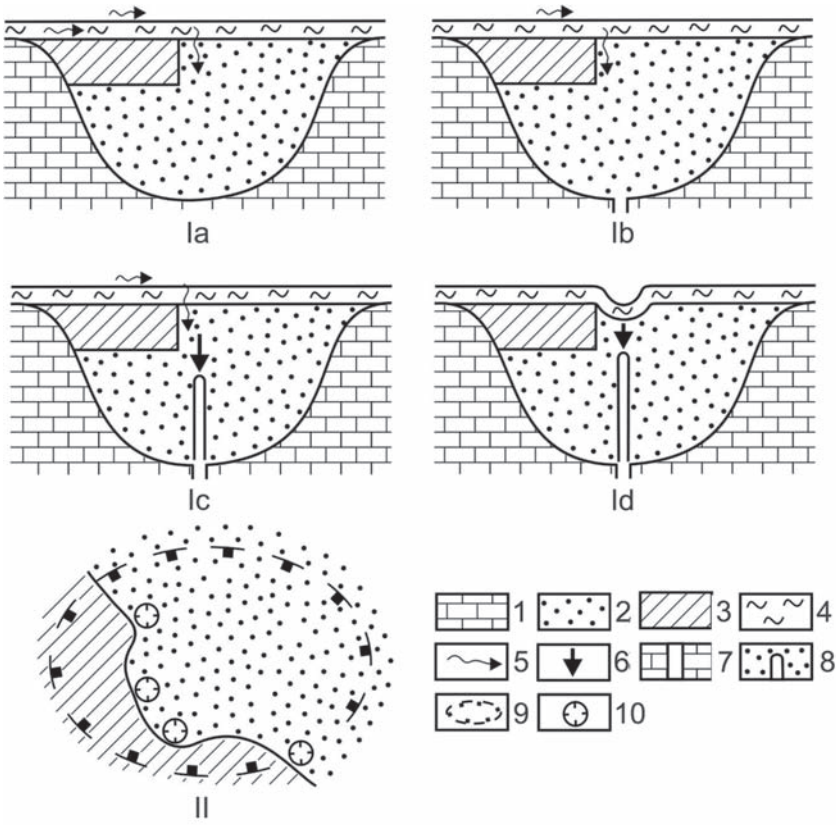

Fig. 6. Covered karst form which developed at the margin of the permeable beds wedged out which is above a filled solution doline. – 1 = limestone; 2 = sand-loess (with limestone detritus; 3 = clay (with limestone detritus and sand); 4 = soil, sand, silt; 5 = water flow on the surface, and water infiltration into the covering sedimentary rock; 6 = suffusion; 7 = pit; 8 = blind burrow; 9 = buried solution doline; 10 = covered karst form; I = cross-section; II = view from above; Ia = the flowing water of the surface and that of the permeable beds of the covering sedimentary rock seeping into the limestone at places where the permeable beds wedge out; Ib = pit develops; Ic = a blind burrow develops; Id = a covered karst form develops above the blind burrow by sinking of the covering sedimentary rock (suffusion doline)

Conclusions

Karren formation is more intense on slopes with *Pinus mugo* than on bare slopes. The channels of the slopes with *Pinus mugo* develop due to rivulets. Channels with small catchment areas on bare slopes are exceptions.

The channels may be formed due to rivulets and by percolation of the water on bare slopes. Channels can develop due to percolating with greater chance if the dip angle is smaller and the slope is shorter.

The wind has an effect on dissolution. Large-size and elongated forms develop on Diego de Almagro Island if the velocity of the wind is high enough and its direction is constant. The rate of the dissolution increases too on the windward side if considerably strong winds blow.

The development of the tsingies of Madagascar is only partially due to the specific climate. In its development the karst water table has played a more important role. Tsingies might develop because karst water was close to their surfaces. There is not a direct connection between the quantity of the rainfall and the development of the tsingy. (E.g. precipitation is less on the Bemaraha tsingy of a larger size.) Therefore the tsingy represents the initial phase of karstification and it has remained in the phase where the karst water table was the most influential factor in its development. The development of the tsingy began already before Ice Age. The distance which is between the karst water table and the surface of the tsingy controlled the size and morphology and the process of tsingy formation.

The covered karst form developed above the mounds of the limestone floor, or in the denudation stripes of the covering sedimentary rock. Primarily they are on those denudation stripes (valley bottoms), where mounds can be found on the limestone floor. It means that the covering sedimentary rock is the thinnest at these places and this is why water can percolate through the covering sedimentary easily.

The clay beds of older dolines make the development of the karst forms possible. Where the clay beds end the water can infiltrate from the surface. The amount of infiltrated water also increases at these places, because the water of the clay surface parts may infiltrate there. This process is helped by older lined dolinas. Namely surface flow of the rain which falls on their areas is not possible.

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Studies on paleoenvironmental change using a method of sedimentological assessment

Ferenc Schweitzer[1], Éva Kis[2] and Anikó Kovács[3]

Abstract

There are only few loess exposures in Hungary where red clays and very ancient „pink" loesses can be studied not only in deep boreholes but where they are found in uplifted position subsurface. Szulimán section studied in detail belongs to them. The same method was applied for the investigations of similar sequences in elevated position at Hévízgyörk. In this way Quaternary deposits in different regions of the country can be parallelized.

The investigations were aimed at disclosing changes in paleogeographic conditions during Pleistocene in the environs of the studied exposures with the involvement of new analytical methods of Quaternary sedimentology. An important requirement was that a rapid and exact information be obtained directly from the stratigraphic diagrams and the summary tables containing the parameter values for the individual layers.

Our primary aim was to present diagrams and tables with information for the reader about the layers to be found at different depths.

Keywords: granulometric parameters, demarcation of the layers, warming and cooling peaks, erosional gaps

Introduction

The 6 *granulometric parameters* involved in the method are conceived as environmental indicators. They characterise Quaternary deposits and dynamics in rate of sedimentation, allowing the local correlation between the similar layers. To specify our knowledge two newly introduced indices of environmental discrimination (Kis, É. 1995): *fineness grade* (F_G) and *degree of weathering* (K_d) were applied together with four traditional granulometric parameters: *sorting, kurtosis, asymmetry, median* (S_o *K*, S_k, M_d respectively), $CaCO_3$ content, and

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variations in grain size composition (percentage of clay, silt, loess and sand). The method applied enables vertical correlation of sequences.

Description of the Szulimán profile

The studied section is located near the village of Szulimán, Hungary, in the southern part of Zselic region, in the valley of the stream Almás. Based on the parameter values 9 layers could be identified *(Figure 1, Photos 1* and *2, Table 1):*

I. 2 fossil soils
II. 3 loess layers
  – 1 old loess layer
  – 2 silty loess layers
III. 1 level of slope sediments
IV. 1 level of Pannonian clay
V. 1 level of mottled clay
VI. 1 level of silty sand

Fig. 1. The Szulimán and Hévízgyörk sections on the map of Hungary

Photo 1. Eastern part of the Szulimán loess section (Photo by Kıs, É.)

Photo 2. Western part of the Szulimán loess section (Photo by Schweitzer, F.)

Table1. Szulimán section: granulometric parameter values by horizons and their interpretation (Kıs, É.). (Granulometric analyses in 9 grain size categories: di Gléria, M.)

Depth, m	Fineness grade, F_G		Degree of weathering, K_d		Sorting, S_o		Kurtosis, K		Asymmetry, S_k		Remark
	value	sediment	value	sediment	value	grade	value	boundary of layers	value	energy of transport	
0.00–0.60	71.78	Slope sediment (greyish-yellow, with reddish-brown soil crumbles)	0.94	slope sediment (greyish-yellow, with reddish-brown soil crumbles)	2.21	very poor	0.28	–	0.01	average	–
0.60–1.30	74.04–75.50	paleosol (reddish-brown)	1.25–1.47	paleosol (reddish-brown)	2.45–2.61	very poor	0.28–0.31	At 1 m: boundary of layer in the middle part of the upper soil	0.01–0.02	average	–
1.30–2.20	67.34–75.50	Old loess (with loess dolls and 3 cm loess concretions, red krotovinas)	1.25–1.57	old loess (with loess dolls and 3 cm loess concretions, red krotovinas)	2.61–2.77	extremely poor	0.13–0.23	At 1,80 m: boundary between two layers within the apparently uniform old loess	0,24–0.32	low and very low	At 1.9 m: soil hiatus
2.20–5.30	69.93–75.25	paleosol	0.60–079	paleosol	3.21–4.53	extremely poor	0.15–0.29	At 5 m: boundary of layers in the lower third of red paleosol	0.04–0.19	average and low	At 5.0 m: soil hiatus
5.60–5.80	Carbonate bench										
6.00–7.00	75.62	Pannonian clay (grey)	1.0	Pannonian clay (grey)	2.13	very poor	0.21	At 6.5 m: boundary within Pannonian clay	0.02	average	–
7.00–8.50	65.43	silty loess	2.12	silty loess	2.45	very poor	0.27	–	0.04	–	–
8.50–8.55	Carbonate bench										
8.55–9.50	65.43	silty loess	2.12	silty loess	2.45	very poor	0.27	–	0.04	average	–
9.50–10.10	56.57	mottled clay (greyish-yellow)	2.43	mottled clay (greyish-yellow)	2.41	very poor	0.28	At 9.8 m: boundary between mottled clay and Pannonian silty sand	0,03	average	–
11.90–12.10	50.29	silty sand (Pannonian)	3.64	silty sand (Pannonian)	1.96	poor	0.30	–	-0.22	high	Intense surge of waves in the coastal zone

The field works conducted and a combined assessment of granulometric parameters led to a conclusion that the sequences of the section contain part of the "Dunaföldvár series" according to the Hungarian loess terminology. This sequence is represented by alternating "pink loesses" or "pink silts" and red soils. Downward the profile grey Pannonian clay and mottled clay also occur. Previously – based on paleomagnetic measurements by M. Pevzner – the formation of "pink loesses" was put by M. Pécsi (1993) to the period between Jaramillo and Olduvai events. More sophisticated dating methods might suggest that the formation of these sediments could have started even earlier, from the Gauss/Matuyama paleomagnetic boundary.

The upper layers of the section must have been eroded, including the former marker horizons: tephras, solifluctional and pseudogley levels and younger chernozem soils with the superimposing "marker loess" and "crumbling clayey sand".

The uppermost layer of the profile is greyish yellow slope sediment of ca 60 cm thickness with reddish brown soil crumbles. Below that there is a ca 70 cm thick reddish brown paleosol, superimposing a ca 1 m thick loess layer. The latter is rich in loess dolls and contains a level of loess concretions of ca 3 cm and red krotovinas.

This loess is underlain by a paleosol of ca 3 m thickness. This fossil soil is separated from the underlying grey Pannonian clay by a "bench of carbonate debris" of 20 cm thickness. Downward there is a silty loess layer of 1.5 m thickness (with an interbedding of a 5 cm thick "debris limestone bench" in the middle part), superimposing mottled clay. A silty sand horizon lies at the bottom of the profile.

Method

*A*n exact demarcation of the layers *(Figure 2, Table 1)* is facilitated by F_G and K_d values obtained. A joint evaluation of these parameter values makes it possible a clear distinction between young and old loesses, an exact stratigraphic subdivision, drawing conclusions concerning the environmental conditions during the deposition of sediments, identification of sedimentation gaps.

All information concerning the individual layers can be read from the diagram constructed. Parameter values are related to the corresponding depths. Boundaries of layers otherwise not discernible can be recognised including variations within the given layers. For example, peaks of and K_d values indicate a boundary in about the middle of old loess. This is corroborated by K and S_k peaks. F_G peaks are extremely high (68.00–70.00) being typical of old loess, whereas those of K_d are very low (1.4–2.0, with the prevalence value of 1.5) suggesting "pink loess", i.e. sediments having formed earlier than old loess.

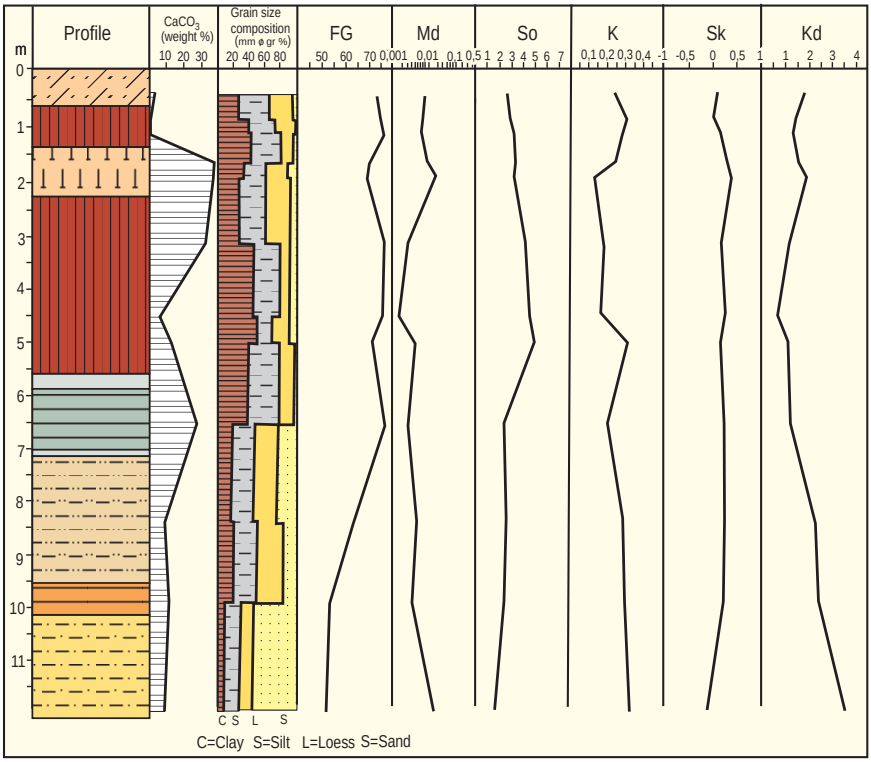


Fig. 2. Granulometric parameter values by samples from the Szulimán section (Kis, É.). Stratigraphical analysis: Schweitzer, F., Kis, É., Balogh, J. and di Gléria, M.

Within the apparently uniform second paleosol (at a depth of 5 m) a boundary is suspected: F_G values drop from 75 to 70, M_d indicates granulometry turning coarser rapidly and S_o – an explicitly coarse sediment. These values suggest redeposition in the lower horizon of the soil. These assumptions are supported by K and S_k values substantially differing from the average.

Warming and cooling peaks can be established with the help of K_d through the delimitation of different types of sediments. A genuine *warming maximum* could not be found within the old loess where K_d reaches values around 2, whereas these peaks generally fluctuate between 3 and 4 within the loess.

The highest warming maxima were found at a depth of 4.5 m within the second paleosol (0.5). Such a low parameter value was not established even in the borehole part of the Paks section. Brownish red soils there showed values above 1. Consequently, climate must have been much warmer at Szulimán. Similarly, warm climate is suggested by the soils of the Hévízgyörk section (*Figure 3, Photo 3*). Second paleosol at Szulimán (with the warming maximum mentioned) is overlying Pannonian sediments.

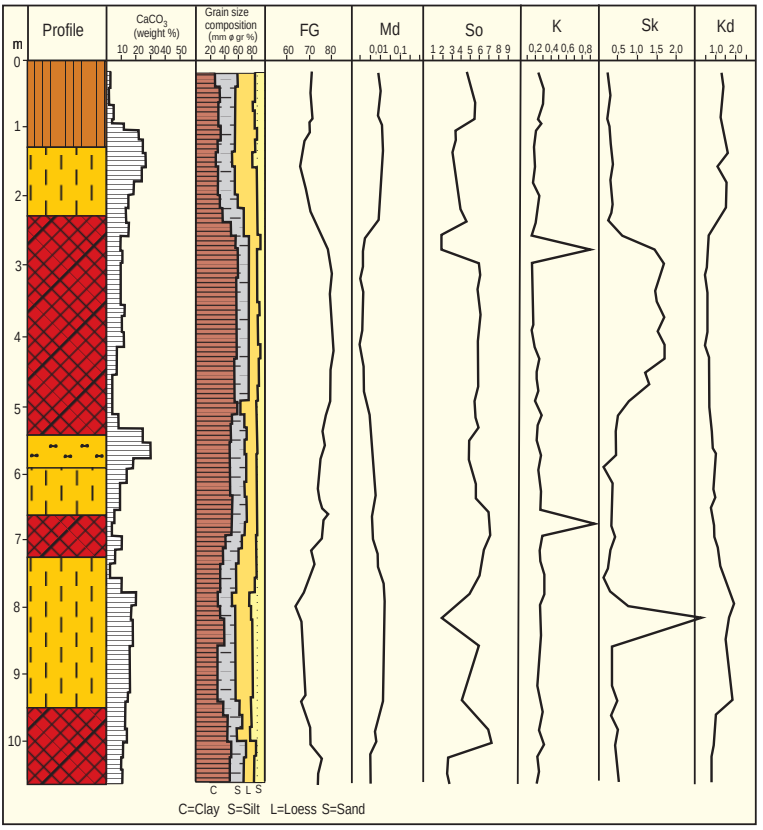


Fig. 3. Granulometric parameter values by samples from the Hévízgyörk section (Kis, É.). Stratigraphical analysis: Pécsi, M., Hahn, Gy., Schweitzer, F. and Szebényi, É.

Photo 3. Hévízgyörk loess section (Photo by Kis, É.)

Extreme values of F_G and K_d indices (when they occur within deposits of entirely different typical values) refer to erosional gaps (eroded horizons), e.g.:

- at a depth of 5 m: soil hiatus,
- at a depth of 6.5 m: Pannonian clay hiatus,
- at a depth of 8.5 m: silty loess hiatus,
- in the silty sand at the bottom (Kd = 3.5): silty loess hiatus.

Asymmetry (S_k) values may differentiate between the redeposited and *in situ* character of layers. Redeposited layers within the section are:

– at a depth of 3.5 m: in the uppermost third of the upper paleosol,
– at depths of 4.5 and 5.0 m: in the same paleosol,
– at a depth of 8.4 m: in the middle part of pink silty loess.

Silty sand occurring in the lowermost part of the profile has a negative asymmetry value. This is an indication of surf in the coastal zone.

Granulometric curves with double or triple maxima also testify to redeposited sediments. E.g. triple maxima could be observed in the curve of sample N7, 4.4–4.6 m *(Figure 4)* from the paleosol superimposing grey Pannonian clay and also in that of sample N4, 1.5–1.7 m, from old loess with red krotovinas below the upper paleosol, whereas double maxima occur in sample N8, 4.9–5.1 m *(Figure 5)* from the paleosol below the old loess. Triple peaks refer to multiple redeposition, double peaks indicate double redeposition.

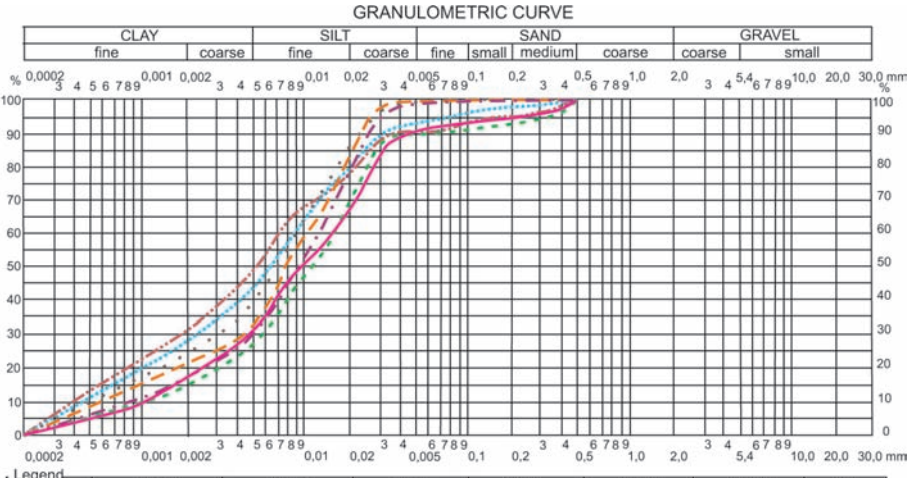
Exact boundaries of layers can be deduced from *kurtosis (K)* index values. They coincide with the extreme values of F_G and K_d; e.g. at the boundary of Pannonian clay at a depth of 6.7 m K=0.2; F_G=78; K_d=1.0. Also using these values variations in grain size become detected not visible to the naked eye.

Sorting (S_o) provides information about the origin of sediments. Sorting values by layers of the Szulimán exposure are the following: slope deposit: 2.21, upper paleosol: 2.45–2.61, old loess: 2.61–2.77, lower paleosol: 3.21–4.53, Pannonian clay: 2.13, silty loess: 2.45, mottled clay: 2.41, silty sand: 1.96.

Granulometric parameter values concerning all samples collected from the Szulimán exposure can be read immediately from the diagram constructed along with the profile, and their interpretation – from the table. By correlation of diagrams related to other key sections changes in environmental conditions of the surrounding loess regions can be compared. Through these comparisons new proofs can be found for the correlation heretofore based upon the description of the profiles, sampling and subsequent laboratory analyses.

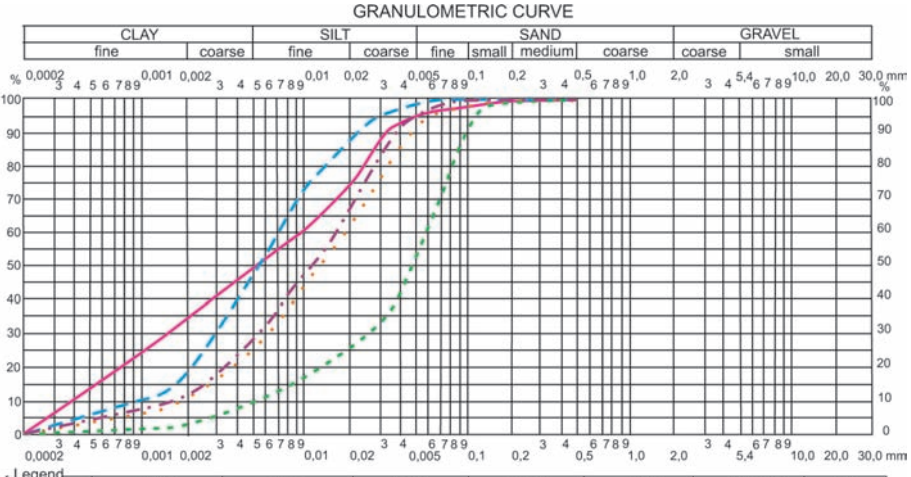
Conclusions

Characteristic features of the Szulimán section (boundary and thickness of layers, and variations within them) strongly resemble those of the Hévízgyörk section elaborated using the same analysis of environmental indication.



1	0,0008	0,0037	0,0091	0,018	0,0265	0,0004	0,03
2	0,0006	0,00275	0,0077	0,0165	0,023	0,00033	0,026
3	0,00052	0,0022	0,007	0,015	0,023	0,000315	0,0285
4	0,0008	0,0034	0,0094	0,026	0,05	0,0005	0,026
5	0,00098	0,0045	0,0125	0,023	0,07	0,0005	0,034
6	0,00043	0,00165	0,0063	0,017	0,047	0,00029	0,05
7	0,00038	0,0125	0,0052	0,0185	0,06	0,00026	0,2
	10%	25%	50%	75%	90%	5%	95%

Fig. 4. Granulometric curve with triple maxima at the Szulimán section *(sample N7: 4.40–4.60 m)* in the paleosol superimposing grey Pannonian clay and in old loess underlying upper paleosol, interwoven with red krotovinas (Kıs, É.)



1	0,0008	0,001	0,005	0,0205	0,034	0,00027	0,06
2	0,001	0,00265	0,00535	0,012	0,0235	0,00043	0,03
3	0,002	0,005	0,0135	0,03	0,048	0,0008	0,0665
4	0,00175	0,0044	0,0125	0,0255	0,04	0,0005	0,05
5	0,0058	0,02	0,048	0,077	0,1	0,003	0,125
	10%	25%	50%	75%	90%	5%	95%

Fig. 5. Granulometric curve with double maxima at the Szulimán section *(sample N8: 4.90–5.10 m)* in the paleosol underlying old loess (Kıs, É.)

It is probably the uplifted position of the Pannonian basement that contributed to lower horizons of considerable thickness occurring on the surface. In both exposures a great amount of sandy sediments is observed; they originate from Pannonian deposits. On the bottom of the section sand and silty sand occur. Series of mottled clay found at Szulimán is of lacustric origin. The superimposing horizon is silty loess with carbonate concretions.

The real key to correlate between the different profiles is presented by marker horizons of "calcareous debris" with a thickness of some decimetres which can hardly be visualised when drawing profiles. They are horizons of Ca accumulation of red clay soils formed upon sand. The superimposing red clay has been eroded and sandy carbonate occurs in many places. The same horizons – or the red clay instead – can be found at Hévízgyörk section.

These "benches of carbonate debris" enable conclusions e.g. on a hiatus of red paleosol at a depth of 7 m. Here is a similar carbonate bench as Ca horizon of a red paleosol has been eroded. The same red soil occurs in the section at 6.6–7.2 m *(Figure 3).* There is the bottom of the upper red paleosol within both exposures at 5.5 m below surface, with the "bench of carbonate debris" at Szulimán, whereas the same formation only occurs in some places at Hévízgyörk. The two red paleosols can be correlated, and their identity proven using granulometric parameter values. The latter show striking similarity in fossil soil horizons: F_G at Szulimán: 70.0–75.0 and at Hévízgyörk: 70.0–76.0; K_d at Szulimán: 0.5–1.2 and at Hévízgyörk: 0.4–1.0. The paleosols must have developed under warming maximum, the highest in the profiles studied so far (K_d = 0.5); they are very old red soils. Parameter values for the rest of the sequences also can be deduced and permit similar correlation.

By comparison of granulometric curves the differences and disparities between the profiles (elaborated by the same method) can be traced rapidly and it is possible to obtain information concerning variations within the layers.

The results produced enable conclusions which contribute to our knowledge about the environs of the given profile; at the same time earlier concepts might be verified i.e. corroborated or corrected.

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Ukraine in Maps

Edited by

Kocsis, K., Rudenko, L. and Schweitzer, F.

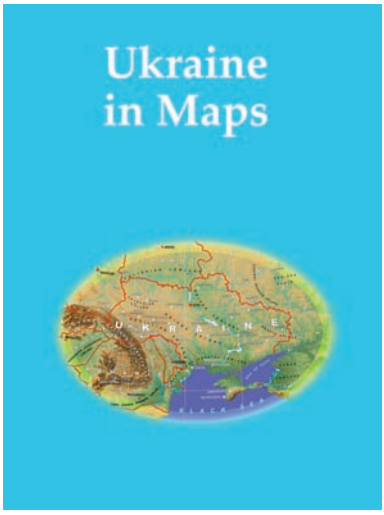
Institute of Geography National Academy of Sciences of Ukraine

Geographical Research Institute Hungarian Academy of Sciences. Budapest, 148 p.

Kyiv–Budapest, 2008

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

This recognition has prompted the Institute of Geography of the National Academy of Sciences of Ukraine (Kyiv) and the Geographical Research Institute of the Hungarian Academy of Sciences (Budapest) to initiate cooperation, and the volume entitled "Ukraine in Maps" is the outcome of their joint effort. The intention of this publication is to make available the results of research conducted by Ukrainian and Hungarian geographers, to the English-speaking public. This atlas follows in the footsteps of previous publications from the Geographical Research Institute of the Hungarian Academy of Sciences. Similar to the work entitled South Eastern Europe in Maps (2005, 2007), it includes 64 maps, dozens of figures and tables accompanied by an explanatory text, written in a popular, scientific manner. The book is an attempt to outline the geographical setting and geopolitical context of Ukraine, as well as its history, natural environment, population, settlements and economy. The authors greatly hope that this joint venture will bring Ukraine closer to the reader and make this neighbouring country to the European Union more familiar, and consequently, more appealing.



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Scale dependence of gully investigations[1]

Gergely Jakab[2], Ádám Kertész[1] and Zoltán Szalai[1]

Abstract

Soil erosion causes considerable damage both for the agriculture by soil loss and for the environment by sedimentation via contribution to eutrophication. Disastrous soil erosion events due to extremely high intensity rainfalls have recently posed serious danger to roads, dams, and edifices in Hungary. Gully erosion plays a particular role in rapid and extreme erosion processes. Research at regional, catchment or gully scale may have different objectives. The main aim of this paper is to compare methods from the local to regional scale. Three case studies are presented. The results suggest the following statements to be made. At local scale the processes are determined by gully morphology, material and energy transport as well as by soil properties. The topographical and lithological factors parallel with land use have growing importance with the decreasing scale.

Keywords: gully erosion, scale dependence, GIS

Introduction

Gully erosion is the prevailing soil degradation process under arid and semiarid climatic conditions. Due to the insufficient precipitation amount biomass production is very much restricted, almost inhibited and the low canopy cover cannot stop or slow down surface runoff (Kertész, Á. and Centeri, Cs. 2006; Kertész, Á. 2006; 2009). Rainfall events occur irregularly in time and the increasing probability of heavy rainstorms with extreme intensity generates more frequent gully development (Malzorff, I. and Poesen, J. 2009). As a consequence under arid and semiarid climatic conditions the contribution of gully erosion to total sediment loss can reach 50–80%, meanwhile in humid and subhumid regions it varies between 10–50% (Poesen, J. *et al.* 2006).

Under subhumid climate the biomass production is rather high and the vegetation cover gives a certain protection against the direct impact of the raindrops. In spite of the sheltering effect of the canopy rapidly developing gullies can be found even in forested areas (Kertész, Á. *et al.* 2000). The significance of

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gully erosion under subhumid climate is shown by the results of an investigation carried out in Western Hungary pointing to 50 % of the total sediment amount in a catchment being delivered by gully erosion (Jakab, G. *et al.* (2009).

Gully formation has always been an important geomorphic process in Europe. It is well known that gully development was launched and accelerated by various forms of anthropogenic activities over the last 2 to 3 thousand years (Gábris, Gy. *et al.* 2003; Lang, A. *et al.* 2003; Vanwalleghem, T. *et al.* 2003).

Humans cleared the land in order to obtain new territories for agriculture and land clearing completely changed the hydrological conditions of the field. In many cases in line with land use modifications climatic conditions change, too with the involvement of possible interactions (Poesen, J. *et al.* 2006).

A gully can be filled up because environmental conditions change; however, gully incision is generally faster, than the filling-up of gullies. Gullies affect their surroundings in a relatively long time span (Jakab, G. *et al.* 2005).

Landforms of linear erosion collect surface waters, consequently they are deeply incised into the surface. Insolation into the gully is very limited and almost no wind can reach inside the gully. The consequence is lower evaporation intensity, wetter microclimate conditions and soil moisture surplus inside the gully (Mac Nally, R. *et al.* 2000). Because of the wetter conditions species composition, the number of individuals and even the fertility of the individuals increase (Soderquist, T.R. and Mac Nally, R. 2000).

Measurements performed by Palmer, G.C. and Bennett, A.F. (2006) in forests indicated that on wetter areas the flora composition changes and the diversity of bird species grows. In contrast to this statement Lindenmayer *et al.* (2009) did not find more bird species in forest gullies than in the other parts of the forest. An explanation for these conflicting views can be the scale (size) dependence of various species.

The size of an average gully is large enough to determine the microbiological and non-arboreal composition but in case of vertebrates it is not so direct and evident (Naiman, R.J. *et al.* 1993). The environmental influence of gullies depends on their size, it is scale dependent. The local impact of gullies is manifested in the increase of the number of land mosaics. The role of gullies in soil erosion (Hegedűs, K. *et al.* 2008; Jakab, G. 2006; Kertész, Á. 2004) and in fertilizer and pesticide transport (Madarász, B. *et al.* 2003) is extremely significant at catchment scale.

The main objective of this paper is to analyze the distribution and morphological appearance regularity of gullies from the local to regional scale. The identification of the most important characteristics of a gully is mainly affected by the scale. Research at different scales requires different methods. The case studies presented in this paper apply different methods for gully investigation at different scales.

Methods

At local scale morphometric measurements were carried out in Somogybabod, south of Lake Balaton. A detailed site description of the research area is given by Madarász, B. *et al.* 2003 and in Tóth, A. and Szalai, Z. 2007.

In the winter of 2003 a field survey was carried out using a laser reflectance total station (Trimble 3305 DR). The survey was performed within the framework of the Unified National Mapping System of Hungary. The aim of the survey was to determine morphometric properties of two gullies running next to each other. More than 1000 points were surveyed following a network of 20 by 20 meters grid, plus some representative points of the gullies (Jakab, G. 2009).

For the estimation of the elevation of the surface between the surveyed points the kriging method was used. The digital elevation model (DEM) thus created is far from being perfect in case of banks, sharp relief forms and headcuts. Using the kriging method these forms appear rounded without edges. If the number of surveyed points is sufficient a better representation can be provided via linear interpolation, namely by applying the Triangulated Irregular Network (TIN) method (Marzolff, I. *et al.* 2002). In this case the edges and breaks are better recognizable but the shapes of other parts of the surface are better approched by the kriging method. For a better representation of the terrain a more accurate DEM is needed and this can be achieved by the increase of the surveyed points via remote sensing (Ries, J.B. and Marzolff, I. 2003; Malzorff, I. and Poesen, J. 2009) or surface scanning methods. As these gullies formed under forest remote sensing is hardly applicable. Accuracy without additional measurements can be achieved by the combination of the above interpolation methods. Following this procedure the gullies are well presented and the DEM is useful for the morphometric comparison of the gullies.

In 2009 the faster developing gully was surveyed again using the same method. The creation technique of the DEM was the same as well. With the comparison of the DEMs of various dates the dynamics of gully development can be estimated.

Gully development investigations at field scale were carried out in the Galga River valley next to the town of Galgagyörk to check the field scale investigations at Somogybabod (Jakab, G. *et al.* 2010). Since the cross section of the Galga valley south of Galgagyörk has similar topographic and soil conditions (Marosi, S. and Somogyi, S. 1992) to those at Somogybabod it can be considered as an analogy of the Somogybabod site. Analyzing the available maps and remote sensing databases of the area the dynamics of gully development could be followed.

At regional scale a gully database was created. 1:10,000 topographic maps from the 1980s were digitized. Land use categories were simplified into three classes of forest, pasture and arable land.

Results and discussion

Large scale investigations revealed the morphological differences between the two gullies. The differences are related to spatial and temporal changes of the geomorphic processes in the gullies (Jakab, G. 2008). The DEM shows that the northern gully is a rapidly developing one with quickly eroding vertical slopes and sharp edges *(Figure 1),* meanwhile the slopes of the southern gully are not so steep and covered with vegetation. The latter is less active in spite of having similar topographic and land use characteristics as the northern gully and disposing of a twice larger drainage area.

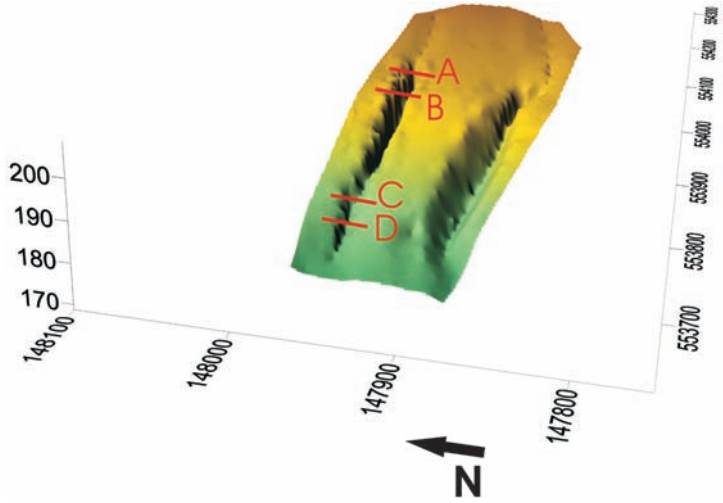

Fig. 1. Digital Elevation Model of the investigated gullies at Somogybabod. The letters refer to the cross section locations in *Fig. 2.*

There are remarkable differences in the development of the two gullies. The topographic survey demonstrates that the southern gully is more or less inactive while the northern one retreats rather rapidly and deepens, too. The morphological changes during the investigated six years can be analyzed on the basis of selected cross sections *(Figure 2).* The heaviest material loss took place along cross section "A", just below the headcut. Here the deepening was roughly 2.5 m and the retreat of the northern slope accounted for 1–1.5 m. Downwards along the gully the sides are less and less eroded while gully incision seems to be constant (ca 2 m). The same tendency can be seen on the soil loss map *(Figure 3).*

Since slope steepness, land use and vegetation cover are the same in both gullies (Jakab, G. 2009) the morphological differences can probably be explained by the variation in lithological properties. Investigating gully development at large scale the interactions of the environmental conditions affecting gully formation and development have to be identified.

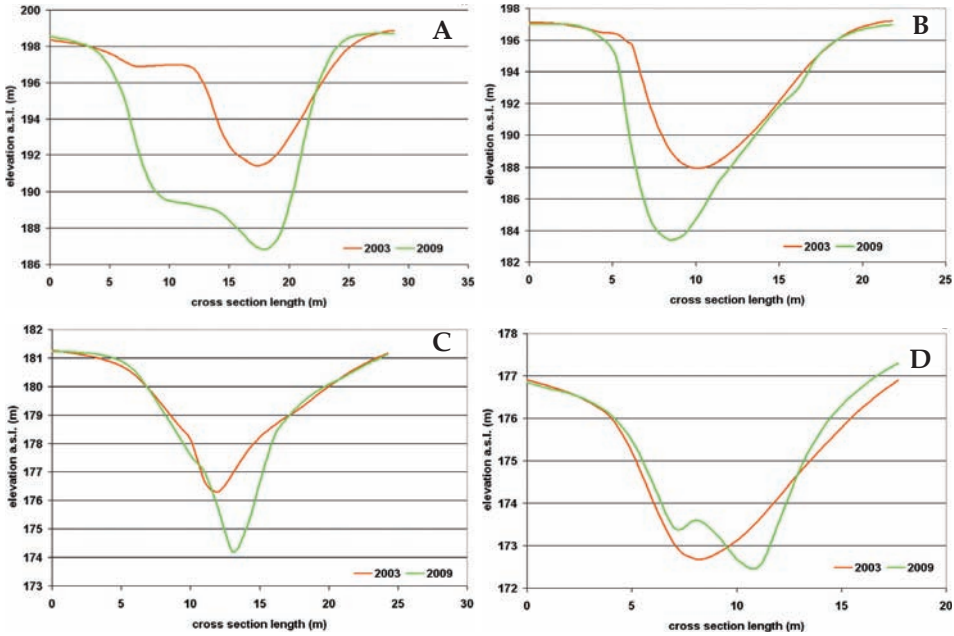

Fig. 2. Four cross sections from 2003 and 2009 of the rapidly developing gully at Somogybabod

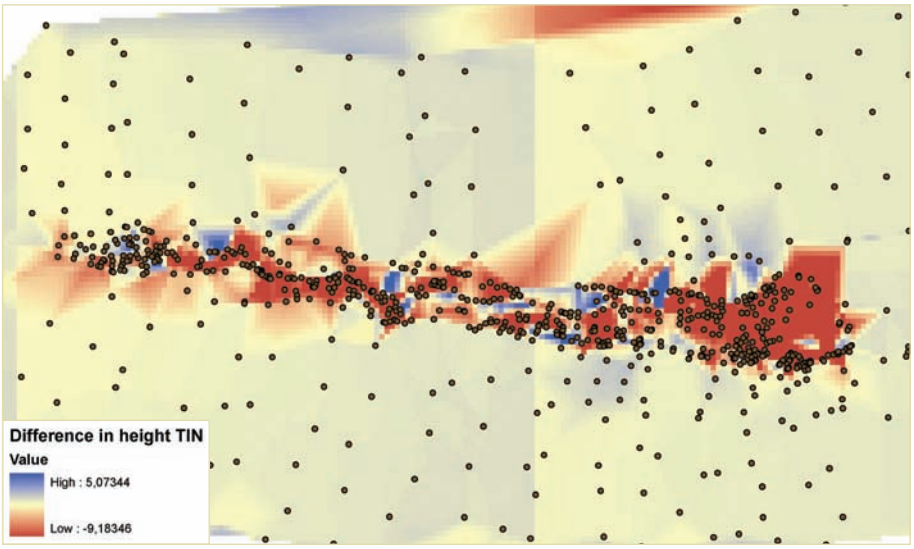

Fig. 3. Soil loss map of the rapidly developing gully at Somogybabod prepared using the TIN method. Decrease in surface height refers to soil loss between 2003 and 2009

The next dimension of the investigations is the catchment scale. At this scale gully development should be investigated in the context of catchment processes. Jakab, G. *et al.* (2010) carried out investigations in a hilly country (Somogybabod, Tolna County) covered by forest at the end of the eighteenth century. The appearance of gullies is due to the forest clearance at the turn of the 18–19th centuries. In those areas where agricultural activities had been carried out prior to 1780 when the first Military Survey of Hungary commenced, gully initiation and development started earlier. The evidence of this can also be detected on the first military maps of Galgagyörk, Northern Hungary *(Figure 4).* In the surroundings of Galgagyörk the valley bottom was occupied by arable fields in the 1780s. On both sides of the river there are roads and gully-like forms running up on the hill slopes towards the divides. On the eastern slope there is a thin forest strip extending to the river bank. This strip used to be probably an abandoned part of the arable field because its cultivation was hindered by the presence of a gully there. At the end of the 18th century huge areas were covered by vineyards mainly on the slopes with western and south-western exposures.

The analysis of the Galgagyörk map drawn during the 2nd Military Survey in the 1840s (B) showed that the arable land/forest ratio of the areas has not changed significantly since the end of the 18th century. The opposite of this is true in Somogy county. Due to the better illustration of topographic forms on the second military survey maps gullies and ditches indicated by the gully bottom line can be well identified. In the investigated section of the Galga valley there are more than ten gullies shown on the map. They must be either ephemeral gullies or deep cut tracks. Two inscriptions refer to gullies developed long before the surveying. In the north-eastern part of the valley a gully name suggests a deep and wide landform. In the other valley of the sample site there are also several gullies in arable fields and vineyards.

On the map of the third military survey (C) gullies are represented by the same symbols as today. Gullies are well recognizable from the contour lines and from the indication of the gully bottom line.

Looking at the map prepared 100 years after the third military survey (D) no major changes can be identified. Gullies are represented more precisely and even the gully bottoms are recognizable on the map. Some of the ephemeral gullies became permanent ones, some of them had transformed into valleys. This development is typical for ephemeral gullies formed on arable fields pointing to the dominant contribution of ephemeral gullies in the total soil loss at catchment scale (Poesen, J. *et al.* 2003; Jakab, G. 2009). The most remarkable land use change is the decrease of vineyards as a consequence of the Viteus vitifolii infection between 1875 and 1890.

On the aerial image (E) the recent status dominated by an extended ephemeral gully system can be seen. Some parts of former ephemeral gullies

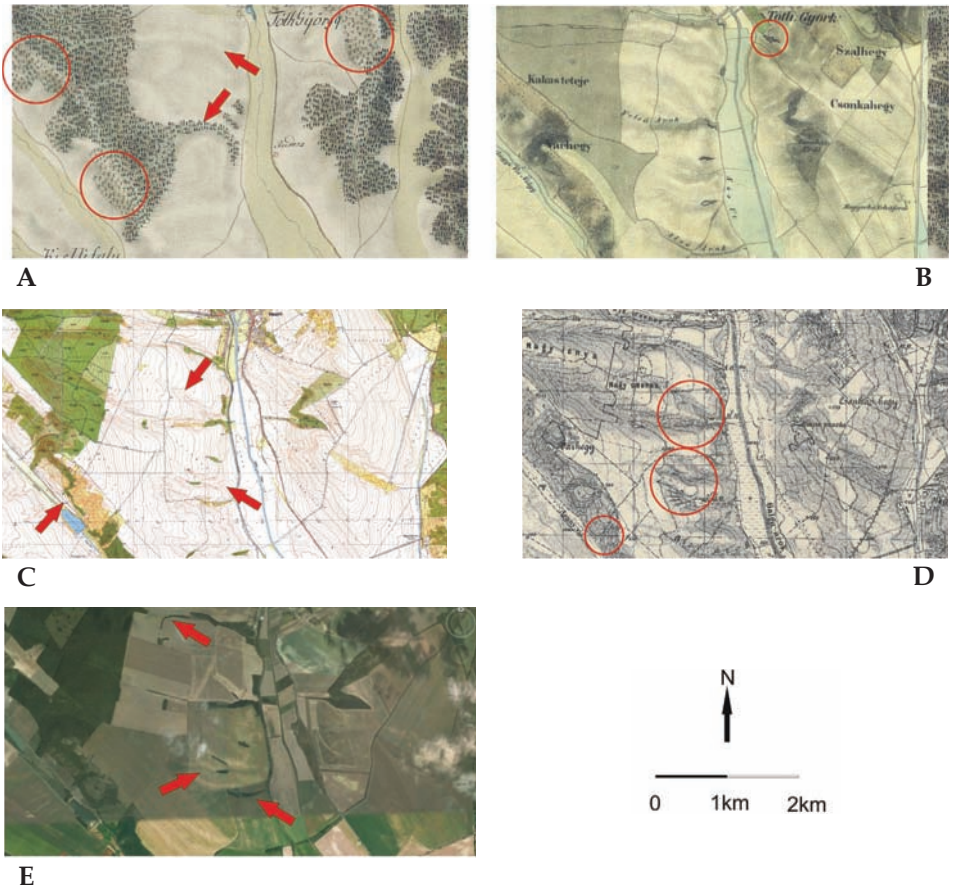

Fig. 4. Changes in topography and land use at Galgagyörk during the last 200 years. A = 1st military survey (1780s), B = 2nd military survey (1850s), C = 3rd military survey (1870s), D = 1:10.000 map (1960s), E = aerial image (2006, Google Earth). Arrows and circles indicate areas of intensive gullying and those of land use change

on certain spots became permanent. In these cases the deepening had been so effective and rapid, that tillage was not possible any more. Accordingly this gully cannot be classified into a definite group as a whole but it has to be divided into parts.

Looking at the Galgagyörk area one could think to deal with a similar situation as in Somogy county, namely that gully initiation started after deforestation when woodland was converted into arable land (Jakab, G. *et al.* 2010). The Galga valley gullies are much older and they are probably active since the arable fields nearby were tilled. Judging from the age of the gullies a huge amount of fertile soil must have been eroded since their appearance.

Land use types are of primary importance from the point of view of erosion (Centeri, Cs. *et al.* 2009). This statement is confirmed by the results obtained at the sites of Somogybabod and Galgagyörk where the main factor of gully initiation has been land use change. If there had not been land use change gully development would have been negligible and new gullies would not be formed. Under such circumstances gully erosion is manifested in a relatively slow development of the existing gullies.

The next dimension is the regional scale and the question arises how the above statements can be generalized at this scale. A national survey of gullies was launched in 2009 in order to build up a gully database. In the 1960s the whole country was surveyed in order to compile an up-to-date 1: 10.000 topographical map series of Hungary.

Gullies and land use were also represented on these maps. The map offers a possibility to analyze the spatial distribution of gullies. A simple ratio, i.e. total gully length/km^2, suggested by Stefanovits, P. and Várallyay, Gy. (1992) can be calculated. The classification system proposed by the authors is applied in this study, i.e.

(a) weakly gullied area: < 200 m/km^2;

(b) moderately gullied area: 200–500 m/km^2;

(c) strongly gullied area: > 500 m/km^2.

Further data layers of the national gully database include topographic parameters (slope gradient, slope exposure, derived from the Shuttle Radar Topography Mission /SRTM/ database), recent land use given in the CORINE database and soil characteristics (soil type, soil texture, parent material etc.) from the AGROTOPO database of Hungary (Várallyay, Gy. *et al.* 1998). The database allows for the identification and analysis of the areas endangered by gully erosion. Sample areas will be selected and temporal change will be revealed based on the database and on remote sensing materials. The detailed investigation of the sample areas allows for the identification of present-day trends in gully development and for the estimation of its rate in the future.

Up to now gullies and land use types of five map sheets of the 1960s were digitized (*Figure 5).*

Preliminary results of the analysis of the database are as follows:

1. Ephemeral gullies are difficult to identify because they are often shown as valleys on the map and the distinction of gullies from valleys is difficult.

2. It is hardly possible to give the exact length of a gully because it is difficult to define independent gullies from those which belong together. The general statement about gully length is that the average gully on arable land is longer than on pasture and in most cases also in forest *(Table 1).*

3. Most of the gullies (85–90%) can be found in forests. The percentage of gullies outside the forest has increased only on less dissected areas.

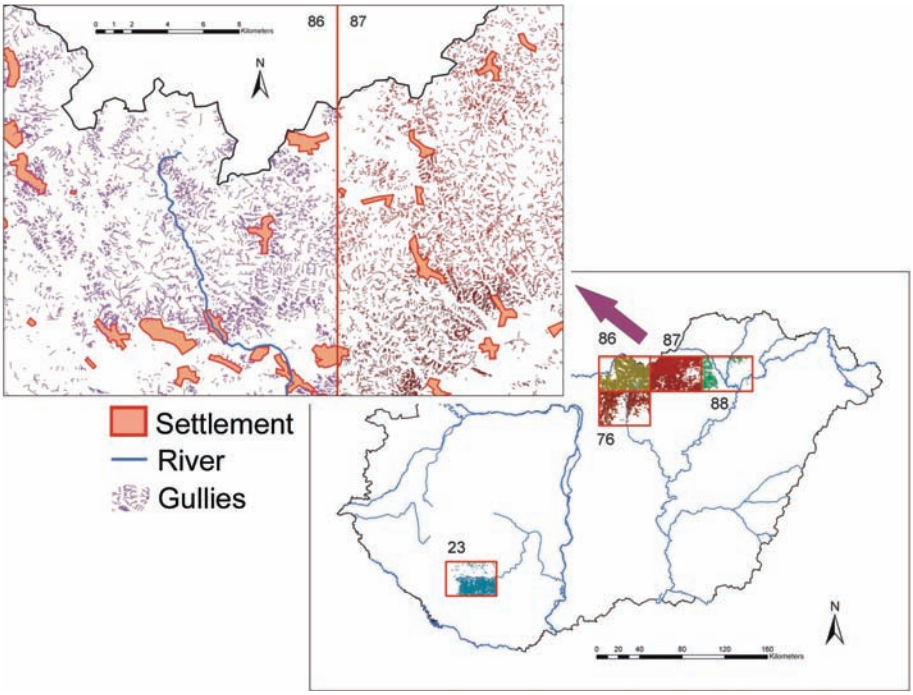

Fig. 5. Digitized map sheets with the indication of the gullies

4. The areas presented in *Figure 5* are highly dissected (500 m km^{-2} <) with the exception of the area shown on map sheet 88 which is partly lowland, i.e. part of the Great Hungarian Plain *(Table 2).*

5. In this study the classification system of Stefanovits, P. and Várallyay, Gy. (1992, see above) was applied. Values within the strongly gullied category vary widely therefore the classification system has to be changed.

Conclusions

Gullies determine the development and material flux of the landscape. Gully formation is triggered by the given environmental conditions, but an already existing gully will remain in the landscape for a long time.

Our investigations carried out at distinct scales had different objectives and the applied methods were different, too. At local scale the role of gully morphology, parent material, soil properties and energy transport determine the processes. Along with the decreasing scale the importance of topographical and lithological factors and of land use increases. The gully classification system has to be improved by adding a new category of "extremely gullied" (1,000 m km^{-2} <).

Table 1. Main statistical parameters of the gully length classified by land use types in the late 1960s

Statistical parameters of gully length (m)	Number of map sheet														
	23	76	86	87	88	23	76	86	87	88	23	76	86	87	88
	Arable land					Pasture					Forest				
Mean	198	258	256	170	220	153	169	127	116	154	292	229	186	222	225
Median	164	180	234	149	180	120	105	76	80	106	154	100	83	104	121
SD	139	214	151	119	240	122	184	211	121	155	431	485	386	402	413
Max.	665	1,015	631	632	1,773	778	1,440	2,994	1,746	1,180	5,970	9,740	7,713	8,636	7,141
Min.	2	34	70	28	27	7	17	8	1	1	3	10	7	1	1

Table 2. Distribution of gullies according to land use types

Number of gullies	Gullies				Land use (late 1960s)								
	Total length	Mean length	Gully density		Arable land			Pasture			Forest		
	m		m km^{-2}	category	No.	Total length, m	%	No.	Total length, m	%	No.	Total length, m	%
3,369	930,930	276	606	strongly gullied	123	24,340	2.6	284	43,335	4.7	2,962	863,255	92.7
4,536	1,023,816	226	667	strongly gullied	86	22,203	2.2	292	49,284	4.8	4,158	952,329	93.0
13,385	2,471,455	185	1,609	strongly gullied	23	5,885	0.2	344	43,743	1.8	13,018	2,421,827	98.0
13,322	2,702,770	203	1,760	strongly gullied	61	10,382	0.4	2392	278,476	10.3	10,869	2,413,912	89.3
1,489	304,788	205	198	weakly gullied	70	15,416	5.1	420	43,335	14.2	999	246,037	80.7

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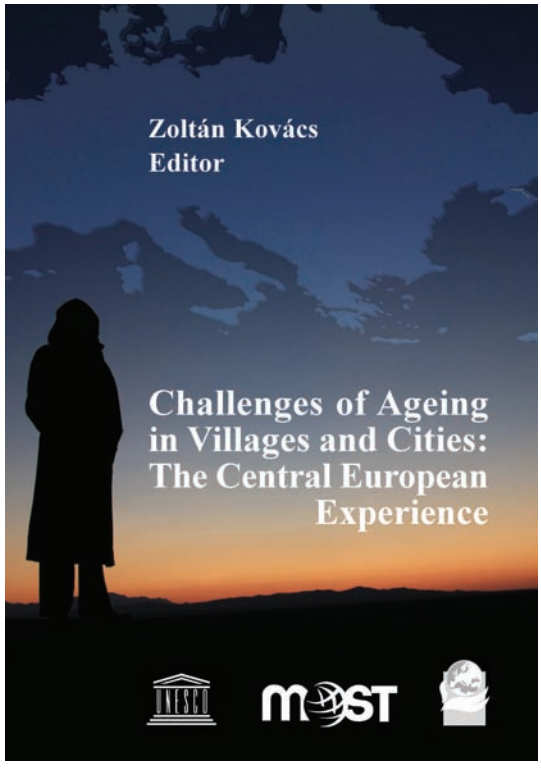
Hungarian Geographical Bulletin 59 (3) (2010) pp. 331–332.

Kovács, Z. ed.: Challenges of ageing in villages and cities: the Central European experience. Department of Economic and Social Geography, University of Szeged, Szeged, 2010, 208 p.

During the recent decades there have been two main trends of demographic challenges in our planet: over-population and ageing. The coincidence of these processes are without precedence during the population history. In global view the phenomenon of demographic bomb is over at its height. The process of ageing is developing strongly and it is impossible to forecast when and at what level it will culminate. In these respects there are enormous regional differences in our planet, too. The wealthier part of the world suffers from the process of ageing, while the poorest countries make a bitter attempt to combat over-population. But spreading development and welfare cause that the age structure of developing countries are getting increasingly older in the future. Ageing is anticipated to become one of the principal global problems.



Ageing and its consequences represent serious challenges heretofore never seen in Europe and more particularly in Central Europe. For instance, the effect on health condition of population (Daróczi, E. 2007), pension system and intergenerational transfers (Gál, R.I. *et al.* 2008), consumption behaviours (Illés, S., Végh, K. 2010) are the hottest topics of most recent studies in Hungary. Undoubtedly, the book edited by Zoltán Kovács contains current issues including perspectives on ageing, spatial spreading of the process in Europe, determinants of ageing (first of all the declining fertility), and international comparison of the specific housing conditions among the elderly in some selected post-socialist cities. The second part of the book consists of case studies on Moscow, Bratislava, Prague, nine large Hungarian urban regions, Switzerland and on a small village in Romania.

The authors of the book have different disciplinary background:

geography, demography, demogeography, geodemography, sociology, economics, and ethnography. The aim of this book is to provide a platform for scientists to exchange ideas on different aspects of ageing in an effort to find potential answers how the challenges triggered by the process of ageing would be handled on different territorial levels. The volume was sponsored by the Hungarian National Commission for UNESCO.

After the preface by the editor and the welcoming address by György Enyedi, the first research paper is that by Joos Droogleever Fortuijn entitled "The challenges of ageing: towards an inclusive perspective". The author of the second contribution is László Hablicsek who provides a broad scale picture on "Population ageing in Hungary and Europe". Ewa Fratczak and Iga Sikorska analyse the "Relationship between fertility and population ageing". In the followings Zoltán Kovács emphasizes one of the partial results of an international research with special attention to the "Housing conditions of elderly in post-socialist cities". The unit of case studies is introduced by Irina Molodikova and Alla Makhrova with the paper "Ageing population in Moscow: Does the capital city suffer differently from the rest of Russia?" Branislav Bleha and Ján Bučeк depict the capital of Slovakia: "Theoretical issues of local population and social policy in 'shrinking' cities – some findings from Bratislava". Czech Republic was represented by two geodemographers, namely Boris Burcin and Tomás Kucera with the meaningful research material: "Changing age structure of population as a challenge for local authorities: Population prospects for city district Prague 3". The Hungarian case study is a slice of the huge project. Viktória Szirmai, Zsuzsanna Váradi, Szilvia Kovács and Júlia Schuchmann deal with "The issue of ageing in large Hungarian urban regions". Three scientists from Switzerland, Doris Wastl-Walter, Sabin Bieri and Andrea Ch. Kofler combine a theoretical question (abled ageing) with a practical one (the need for flexible living conditions) in their article. Only one publication written by Tünde Turai tackles the problems of ageing in the countryside: "Strategies in the care for the elderly in a Romanian village".

This book is the first in the row of future publications concerning the spatial aspects of the phenomenon of ageing, its causes and consequences. Unfortunately, a highly relevant aspect did not appear in this book: migration. Internal elderly migration and mainly international retirement migration could be a topical section of the book.

All in all, the reviewer recommends this book for those scientists and university students alike who are interested in the ageing process from the spatial viewpoint.

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Sándor Illés

CHRONICLE

Hungarian Geographical Bulletin 59 (3) (2010) pp. 333–341.

György Enyedi 80

György Enyedi the world famous Hungarian geographer celebrates his 80th birthday this year. He was born in Budapest on the 28th of August 1930. After graduating from the Budapest University of Economics in 1953 he became a lecturer in his mother school, later he moved to the University of Agriculture in Gödöllő where he was assistant professor until 1960. In the first part of his academic career he concentrated mostly on regional problems of Hungarian and world agriculture. In 1960 he became researcher at the Geographical Research Institute of the Hungarian Academy of Sciences and was appointed Deputy Director in 1962. With the change his research gained a new dimension in that socio-economic issues of the development of rural areas became the centre of his interest. His studies revealed many of the negative consequences of socialist modernisation in the Hungarian settlement system and more specifically in rural space.

This was also the period when his work became internationally known and renowned. György Enyedi played an outstanding role in connecting Hungarian geography with the international mainstream of our discipline. In 1966 he spent a year in Berkeley (US) with the scholarship of the Ford Foundation. Between 1972 and 1984 he was chairman of the Commission of Rural Development of the International Geographical Union (IGU). He organised and attended several international conferences and published a great number of papers in top quality scientific journals. In 1984 the Union's General Assembly elected him – against the candidate nominated by the Hungarian National Committee – Vice President of the IGU and he served two terms until 1992. In August 2008 at the 31st Congress of the International Geographical Union in Tunis he received the highest recognition by the IGU the *Laureat d'Honneur.* Ron Abler president of the Union summarised the recognition in the following way: "For decades Prof. György Enyedi has been the voice and the face of Hungarian geography in the worldwide community of geographers. This position was built first and foremost on the quality of his own work, but also on his skills at team building. Secondly, because of his untiring efforts at maintaining international academic contacts, he

has brought many colleagues from abroad in contact with their Hungarian counterparts and this cross-pollination has born rich fruit." Indeed, he built wide range of scientific contacts in geography and beyond all around the world, and he helped and encouraged his younger colleagues to set up international relationships with the same enthusiasm. Both as a colleague and as a mentor he has touched the professional lives of many colleagues across the world of geography.

The 1980s brought new challenges for Professor Enyedi. In 1984 he founded an interdisciplinary research institute specialised in regional science, the Centre for Regional Studies of the Hungarian Academy of Sciences in Pécs. Working together with economists, sociologists, geographers, lawyers and representatives of other disciplines he proved again his extraordinary capacities and skills in team building. As director of the Centre he played a decisive role in the long-term development of regional science as an independent and integrative discipline. Most recently his scientific research focused mainly on the socio-spatial aspects of urbanisation and urban development at the global and national level. He left his imprint on the academic literature of urban geography forever.

During his creative and successful career Professor Enyedi has authored 18 and edited 26 scientific books, and published over 300 scientific papers. He was editor-in-chief of the Series Geography of World Agriculture (nine volumes between 1972 and 1984). He founded the journal *Tér és Társadalom* (Space and Society) in 1987 and he has been the chairman of its editorial board ever since. He was editor in chief of the journal *Magyar Tudomány* (Hungarian Science) and he is honorary editor-in-chief of Hungarian Geographical Bulletin. His versatile scientific work received a lot of recognitions and awards. György Enyedi is honorary member of seven geographical societies, member of the Academia Europaea in London. He became corresponding member of the Hungarian Academy of Sciences in 1982 and full member in 1990. He was Vice-President of the Hungarian Academy of Sciences in 1999–2002.

Professor Enyedi lived most of his life throughout the exciting but otherwise troublesome 20th century, with world war, revolutions, oppression and systemic changes. What helped him to cope with all the difficulties in his professional and personal life was his extraordinary sense of humour. Recently he recalled his first visit to Paris in a friendly talk in this way: *"I planned to attend an IGU conference in Paris in late 1962. In those years very few were allowed in Hungary to travel to the West on official business. If permit was given by the authorities we were obliged to fly by the Hungarian Airlines (Malév). With the help of my doctor I managed to arrange that instead of flying to Paris I could take the train and travel through the continent, visit several cities and meet colleagues. Once I arrived to Paris I went to my hotel. The portiere in the hotel was shocked when I turned up. He informed me that the flight I was originally supposed to arrive crashed. In that very moment I decided not to take any flight in the future that would crash. This is the secret of long-life".*

In the name of all colleagues in Hungary and abroad who know him personally we wish Professor Enyedi on this special occasion light-hearted optimism and good health for the coming years:

Walk on, walk on, with hope in your heart,
And you'll never walk alone…

Zoltán Kovács

4th Hungarian Conference on Landscape Ecology

Kerekegyháza, Hungary, May 13–15, 2010

Although landscape ecology has long traditions in Hungary the first national congress was held at Szirák only in 2004, Success of that meeting underlined the importance of the topic both for research and practice. Since 2004 the Hungarian Conferences on Landscape Ecology were organised in the springs of every even year. For the fourth time such an event was held at Varga-tanya, Kerekegyháza in the heart of the Kiskunság region and organized by the Geographical Research Institute, Hungarian Academy of Sciences (MTA FKI).

Since landscape ecology is an interdisciplinary field the national conference is always an appropriate occasion to discuss the topics with the representatives of various studies. Most of the participants came from geography, but there were several experts on GIS, botany, pedology, climatology, and management staff from the national parks.

Ádám Kertész, head of the organizing committee opened the conference. In his speech the emphasis was put on the role of water and water management in the landscape, with a special reference to the Kiskunság region. After the opening ceremony the first day was devoted for plenary lectures. Many of the presentations have dealt with the climate change and related problems. The keynote speakers of the plenary session tackled the present state of Hungarian landscape ecology, analysed the professional composition of researchers and outlined the possible research directions. On the second half of the first day both literature reviews and case studies were presented.

On the second day parallel sections were held on the following topics:

- Landscape forming, land use change, and the role of climate change
- Riparian habitats, floodplains and water management
- Landscape architecture, landscape planning and regional development
- Landscape protection and conservation
- Biodiversity in the landscape
- Cultural landscape
- Agricultural management and policy
- Landscape ecology in earth sciences

In addition to the paper sessions two poster sections were organised to display the summarised results. During the conference altogether 37 oral presentations were made and 15 posters exhibited. A volume of abstracts of papers were issued by the conference. The organizing committee decided to request all the authors to submit their results in an enlarged form. The full text conference proceedings are presumed to be published by the autumn of 2010.

On the third day an excursion was planned to observe the most valuable natural landscapes of the Kiskunság. The field trip was organised and guided by the staff of the Kiskunság National Park. The first stop was at Strázsahegy to enjoy the superb panorama of the landscape. The following sight was next to Fülöpháza where the participants could observe the one and only moving sand dune in Hungary. The lack of vegetation due to grazing and to hoeing is that keeps the dune drifting. Meanwhile a heavy shower started accordingly the rest of the sights were viewed only from the coach. However during the first two days of the congress there also occurred storms with extreme intensities both the alkaline ponds visited (Szívós-szék and Szappan-szék) were totally dried out. The last episode of the excursion and of the whole conference as well was the rich and delicious lunch at Fülöpszállás.

Field symposium at Kiskunság National Park. Among the participants: profs Á. Kertész, D. Lóczy and P. Csorba. (Photo by G. Király)

To sum up the experiences of the meeting: interesting and important research results could be heard followed by fruitful and profitable discussions. Éva Konkoly-Gyuró on behalf of the Faculty of Forestry, University of West Hungary announced that the 5th Hungarian Conference on Landscape Ecology would be held at Sopron in 2012. Hopefully it will be as intriguing as the fourth was.

Gergely Jakab

Report on the Annual International Conference of Regional Studies Association

The 16th annual international conference of Regional Studies Association was held in the city of Pécs, Hungary between May 24 and 26, 2010. The city is the European Capital of Culture in 2010 and thus the meeting has acquired a specific atmosphere. The motto of the conference was "Regional Responses and Global Shifts: Actors, Institutions and Organisations". Almost 600 experts gathered from more than 50 countries of the world, and this exceeded the previous expectations thoroughly. They basically represented the regional science, although besides regionalists, there were the representatives of other disciplines (geography, sociology, economics etc.) in a large number too. The conference venue was the Faculty of Law and Economics of University of Pécs, but the host institute was the Centre for Regional Studies of the Hungarian Academy of Sciences. In spite of that the number of participants was much higher than it had been expected, the rooms at the university provided space enough. Moreover, the relatively favourable weather has also promoted this as the gardens and parks of the campus could also be used during the conference breaks. However, what was not favourable at all that the beginning of the conference coincided with the church holiday Whitsun. But it could not be taken into account two years ago, when it had been decided about the date and venue of this conference. At that time it seemed that by 2010 a new conference centre would have been built and connections of air traffic of the city were to be established to make the accessibility of Pécs easier. Regretfully, these investments were not to be realized in time, thus there were participants, who rent a car or took a taxi to travel from Budapest to Pécs. On the eve of the conference, on Sunday afternoon a walking sightseeing tour was organized.

The conference started with a plenary session on Monday morning. The large room was jam-packed with participants; some even were sitting on the gallery. First, the chair of RSA, David Bailey greeted the participants, then the host and local organizer professor Gyula Horváth (who is also the director of Centre for Regional Studies) addressed them. He emphasized that Pécs is the traditional centre of the region and the birthplace of regionalism in Hungary. On the other hand, the high number of the participants also indicates that regional science is a dynamically developing one, spreading all over the world rapidly. He expressed an opinion that this conference is an excellent possibility for the development of East–West cooperation.

The next speaker, Dirk Ahner (Director General, European Commission, Belgium) spoke about Cohesion Policy. The key issues of his presentation were the followings:

– What are the main drivers of regional growth?

– What is the place of EU regions in the global environment?

– What are the specific challenges faced by less developed regions?

Ahner demonstrated that Europe has been divided into three parts by regional innovation performance, also emphasizing that "…Cohesion Policy made a major contribution to the economic development of assisted regions".

John Bachtler (University of Strathclyde, UK) also dealt with Cohesion Policy. He outlined future prospects while past morale was also evaluated. In his paper entitled "The future of Cohesion Policy: Lessons from evaluation" he showed the new EU priorities (growth based on knowledge and innovation, an inclusive high employment society, green growth: a competitive and sustainable economy). In the future he feels need the revision of Cohesion Policy and its adjustment to the new challenges. The eligibility criteria have

to be modified and made more effective. In the future the most important key issues are the followings:

– policy goals: classifying the objectives of the policy,
– funding: maintaining a viable EU-wide policy,
– governance: ensuring adequate institutional capacity,
– performance: ensuring that the policy is effective,
– accountability: making the achievements visible.

Peter Heil (Director of Consultancy Services) spoke about the Hungarian experience of Cohesion Policy and about those lessons which Hungary can provide for EU. (The presentation bore the title "Cohesion Policy in the practice, the case of Hungary".) He remarked that although lots of changes are necessary, he hopes that one thing will not be changed by the new government, namely the network of EU institutions, because it is built out in Hungary adequately and operates well.

The second day of the conference started with a plenary session too. Its theme was: International Perspectives on Regional Studies. The four speakers analyzed the role of regional science and regional studies and their future in four continents of the world. Andrew Beer (Flinders University of Australia) summarized the Australian experience. The case of Australia is a special one, because its economy is based on resources. On the one hand, he explained the reasons for which "Australia's pattern of regional development diverges substantially from the European or American experiences." So far, besides the major research themes (divergence or convergence in regional income and growth, spatial centralization of economy, indigenous issues, suburbanization), some others (networks, learning regions, regional innovation system) were neglected. Nowadays, the impacts of an on-going population growth on the economy and the environment are also an important research topic to study. The climate change and adaptation research have merged over the past two decades and the political concerns of climate change's impacts are also dealt with. Finally, he summed up the main characteristics of regional research in Australia, which are the followings:

– focussed on non-metropolitan issues,
– more empirical than theoretically informed,
– small scale,
– grounded in practice,
– aware of and keen to engage with international debates.

Professor Henry Yeung (University of Singapore) examined the contribution of economic geographical studies "in understanding the changing dynamics of capitalism in East Asia during the past three decades. He emphasized that during the 1970s East Asia has undergone tremendous changes and nowadays we can see the different types of capitalist developments, which have produced distinctive geographies of regional economies. In his presentation he has distinguished three waves of flows and networks: first in Japan, then in NIEs and now in China. He also dealt with the theoretical frameworks and epistemological issues of East Asian capitalism.

Professor Mark Partridge (Ohio State University) informed the audience on the regional studies from the viewpoint of America and of the Americans entitled: "Regional Studies – a perspective from North America". He stressed that internal migration is very high in North America; they are very mobile nations. About 30–40% of US population move almost yearly. He guessed that migration is the source of the success or its condition. In the past the main directions of the internal migration were those regions (the coasts, the Sunbelt, and the arid Southwestern US) which were characterized by high natural amenities, but "relatively fewer economic opportunities", because Americans like oceans, mountains

and sunshine. Climate change, however, will alter the landscape and affect the migration pattern. It will reshape the regional pattern of employment opportunities and the quality of life. Thus, new challenges are in front of the researchers, and regional studies can help in the solution of these paramount issues.

Ivan Turok (Human Sciences Research Council, Cape Town) discussed the African perspectives of regional studies. In his presentation, the relationship was analyzed between the urbanization and development. Currently, urbanization is the fastest in Africa, however, it has not been accompanied by greater economic dynamism, and the reasons were also explained. Turok also discussed "…the topical idea of enhanced interregional integration through cross-border collaboration to promote prosperity by overcoming the fragmented political geography of the continent." At the end of his presentation he stated that regional studies in Africa are characterized by several specific features:

- significant regional development challenges,
- many unanswered questions,
- no single growth path,
- economy–geography relationship vital.

On both days the morning plenary sessions were continued into different sessions focused on special themes. The number of sessions has almost reached 140, which were organized around 14 main themes. Their mention is important, because, in fact, they have determined the themes of coordinated sessions:

- Innovative strategies and practices of firms in regional development
- Labour markets and labour organisations and their continued relevance for regional development
- Non-Governmental Organisations (NGO) and Civil Society Organisations (CSO): facilitators of regional development?
- Regional policies: government and quasi-government initiatives
- Reassessing EU Regional Policy
- People in regions: leadership, collective action and regional development
- Financing regions: global financial crisis and beyond?
- Cooperation across borders
- Global environmental change and the future of regional development
- Theory and research in regional studies
- Spatial planning in cities and regions
- Experience economy and experience society; culture, leisure and experiences in spatial strategies
- Creative regions in a creative economy
- Regional policy and development in Southern, Central and Eastern Europe.

Of the major themes, which had been divided then into several smaller topics, the first was the most populous one. Taken altogether, the participants could make a choice of more than 500 presentations. They were usually lasting 20 minutes, followed by questions and remarks. The number of participants in each session was quite different, which depended on various factors. Of the many interesting sessions and presentations only some can be mentioned below. Éva Kiss and Gabor Lux organized the session "Industrial Restructuring and Policy in CEE countries" with a purpose to discuss the connections of the East Central European industrial restructuring and regional policy. Of the four speakers one was Polish and three were Hungarians. Wieslawa Gieranczyk (Nicolaus Copernicus University) spoke on industrial innovativeness, which plays and important role in the restructuring process of Polish industry. It differs ":..from the direction and the pace of the respective processes in Hungary. The high-tech sector in Poland has been growing more

slowly than low-tech sector, while in Hungary has been observed otherwise relations. So, the policies aimed at the restructuring processes in Hungary showed to be quite effective." Gábor Lux (Centre for Regional Studies) sought the response to the question "Path-dependent upgrading or radical restructuring in Central Eastern Europe?" "In the longer-term, a slower and less radical development path mainly based on incremental industrial upgrading and network-building appears to have a greater potential in restructuring than radical change." The presentation of Éva Kiss (Geographical Research Institute) was aimed, on the one hand, to demonstrate the role of industrial parks in the restructuring of industrial space, on the other hand to analyze their transport connections. She demonstrated that industrial parks have played a relevant role in shaping the new industrial space and transport connections are still important factors among those of location choice. Andras Grosz (Centre for Regional Studies) examined the role of regionalization efforts in the innovation policy. The major conclusion was that the influence of the regions on the science, technology and innovation policy is very limited, almost negligible. "In fact, we cannot speak about real innovation policy."

Among the speakers of other sessions there were also several Hungarian colleagues, mostly of them from the Centre for Regional Studies. Professor Gyula Horváth has stressed that "the decentralization of science and R+D has a number of positive effects on the improvement of the regions. …The Lisbon criteria cannot be met without decentralization". Zoltán Gál demonstrated how cross-border financial exposures contributed to the polarization of the post-crisis European financial landscape. Gábor Nagy focused on the major changes in Hungarian urban network in the period of transition based on the theory of uneven development and core-periphery relations and post-socialist studies. The major question he raised was: what are the most important new elements of the renewed spatial and hierarchical structure of the country? Judit Timár and Erika Nagy looked for the answer for the question: "…to what an extent local urban policies are responsible for social imbalances?" Based on the comparison of revitalization programmes of 14 Western and Eastern European small and medium sized towns, they "… have come to the conclusion that the economic and social conditions and opportunities for urban development are partly different in the East and the West".

Presentations of several sessions have also dealt with the social and economic impacts of the current crisis. Of them, the presentation by professor David Bailey is worth mentioning entitled "Regional Responses to Recessions, the West Midlands Task Force". According to him, the recent economic crisis is very different from the previous ones. As a result, the unemployment rose very fast and the output drop was the largest in West Midlands. As a consequence "Task Forces were set up across the English regions in late 2008 in order to support key firms and sectors (car industry, building) and vulnerable places".

Helena Lenihan with co-author (University of Limerick, Ireland) also examined the impacts of the crisis. They tried to respond to the question, namely: "Is a strong indigenous manufacturing base a necessary condition for sustainable economic growth?" They compared the case of Ireland and Sweden by using different factors and have found that the Swedish economy has been impacted to a lesser degree by the crisis than Ireland which has primarily focused on attracting MNEs. The case of Ireland is very similar to the case of Hungary, because Hungarian industry also depends very much on the FDI. It is partly due to this circumstance that the crisis has affected the Hungarian industry, mainly car industry and electronics, to a large extent.

On the third day the conference was closed with a plenary session. First Kevin Richardson (Newcastle City Council) called the attention of participants for the venue of the next annual meeting (Newcastle). He also listed the major planned themes of the

conference. The presentation of Eric Swyngedouw (University of Manchester, UK) was very interesting ("Post-democratic cities: for whom and for what?"). According to his opinion: "…cities are extraordinary laboratories, in which enormous changes have taken place over the past two decades, most dramatically in its modes of urban governing and polic(y)ing. Urban governing today is carried by a wide range of social actors, including private agents, non-governmental organizations, civil society groups, as well as the more traditional forms of local, regional and national government." The presentation by professor Grzegorz Gorzelak (University of Warsaw) also produced an active interest. Based on seven theses he examined the regional patterns of the post-socialist transformation in Central and Eastern Europe. Eventually, Gorzelak argued that the EU membership should be considered the end of transformation. Jonathan Potter (OECD) spoke about the entrepreneurship indicator program, how OECD encouraged the SMEs in the different periods. Then Csaba Ruzsa (Managing Director, Pécs 2010 Management Centre) held a lecture on the relationship of culture and place. He has told how Pécs won the title of the Capital of Culture, what kind of urban developments were carried out and how the public squares and places were renewed. He also listed the major programs of the Cultural Capital in which art events play an important part.

The conference was basically well-organised. The breaks, meals and evening programs provided good opportunities for the improvement of relationship and stimulated further discussion of different thoughts and ideas.

Taken as a whole, this conference was a good, interesting and inspiring event with a very good atmosphere. Hopefully, many of the participants will visit the annual meeting in Newcastle in 2011

Éva Kiss

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