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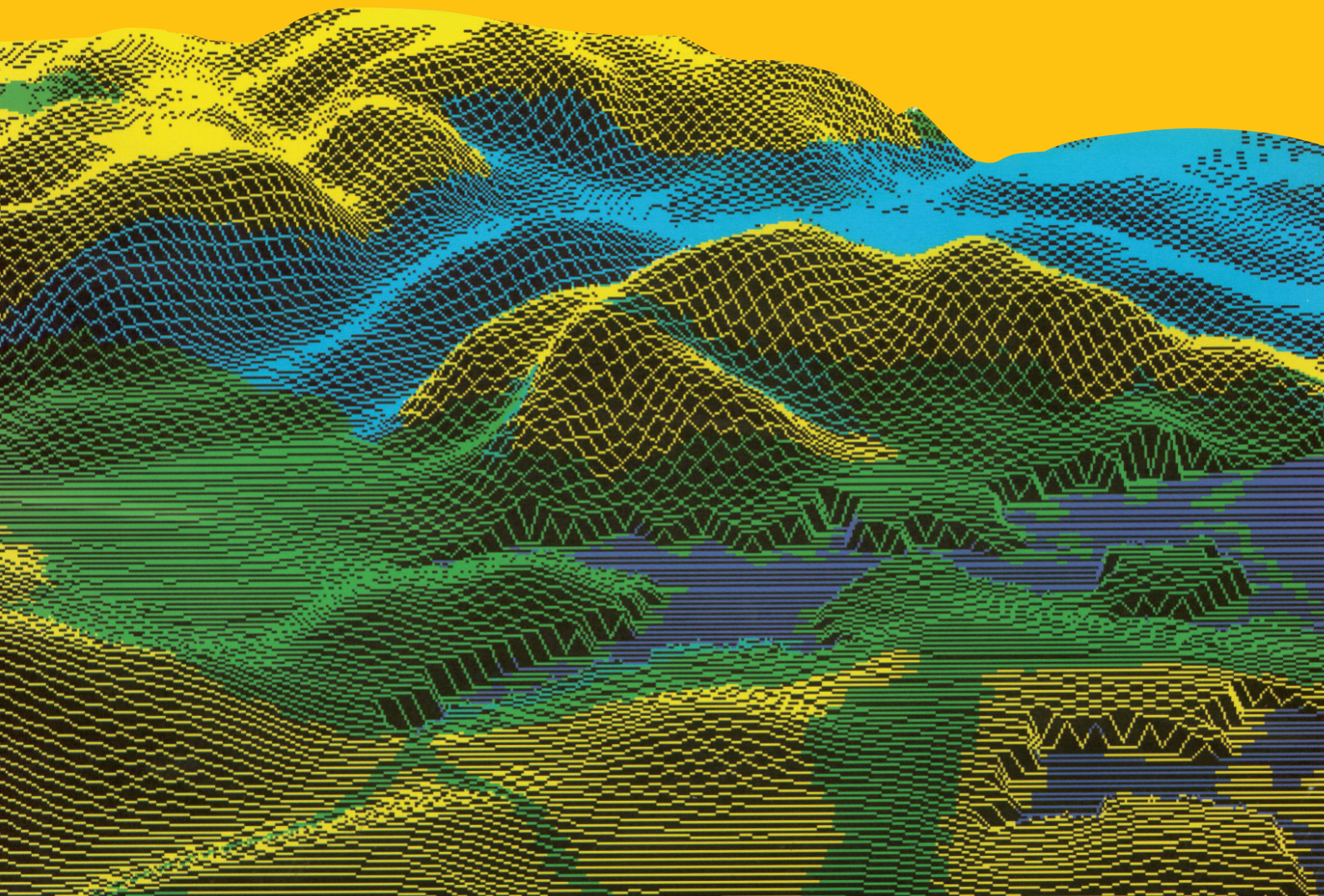

Fig. 3: Landscape of Czech-Polish borderland in the Rychlebské hory Mts. area
Photo A. Vaishar

Fig. 4: Small Czech town Vejprty in conjunction with the German small town Bärenstein en face are situated in the valley of Polava Brook. Vejprty town is to the fore, panel block of flats behind belong to the Bärenstein
Photo A. Vaishar

Illustrations related to the paper by A. Vaishar, J. Zapletalová and P. Dvořák

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IMPACT OF POLAND'S INTEGRATION WITH THE EUROPEAN UNION ON THE SOCIO-ECONOMIC STATUS OF POLISH REGIONS

Waldemar RATAJCZAK

Abstract

Poland's integration with the European Union countries has had a variety of consequences: political, economic and other. They can be observed most readily at the national level. But from a spatial point of view, the Polish economy is not homogeneous - it varies regionally. The identification of the impact of the integration with the EU on the Polish regions in its socio-economic aspects is the research problem addressed in this paper. One of its findings is that the Structural Funds have had a positive impact on the national and regional economies. Still, the regions of Poland's so-called Eastern Belt (or Wall) need special operational programmes designed to help them catch up with the rest of the country.

Shrnutí

Vliv integrace Polska do Evropské unie na socioekonomický status polských regionů

Integrace Polska do EU má řadu politických, ekonomických a dalších důsledků. Na národní úrovni jsou tyto důsledky snadno identifikovatelné. Ale z regionálního pohledu není polská ekonomika homogenní a existují regionální rozdíly. Tento příspěvek je věnován dopadu integrace do EU na polské regiony s ohledem na sociálně ekonomické aspekty. Jedním ze závěrů je, že strukturální fondy mají pozitivní vliv na národní i regionální ekonomiky. Polské regiony nazývané „Východní pás" (či zeď) však stále potřebují speciální operační programy zaměřené tak, aby jim pomohly dohnat zbytek země.

Key words: integration, impact of Structural Funds on regional economy, regional competitiveness, socio-economic status of Polish regions.

1. Introduction

In historic times, each region of Poland evolved at a different pace, influenced by an array of external (political) and internal (legislative, national-strategy related, and other) factors. None of these, however, will be the focus of this paper.

Its aim is to identify the socio-economic changes that have been occurring in the Polish regions after the country joined the European Union on 1 May 2004. With EU membership, Poland and its individual regions acquired new growth opportunities, which may, and should, accelerate the country's socio-economic convergence with the EU members.

It should be added that Poland, like other Central European countries (CECs), has participated in various EU programmes (e.g. PHARE) which supported their economies after 1989 - the year of political, societal and economic transition.

Another point to remember is that Poland has acquired a new spatial structure after its administrative division was changed on 1 January 1999: in place of the old 49 subregions, the country now has 16 regions (voivodeships). This means that the identification of the full impact of EU funds on Poland's regional economy before the year 1999 is somewhat difficult.

2. Impact of integration on macroeconomic factors in Poland

Joining the Community has opened up new development opportunities for both Poland as a whole and its individual regions. If used wisely to their benefit, EU membership may well speed up Poland's socio-economic convergence with other member states, as is the common expectation.

Note that Poland and its individual regions[1] vary significantly in the extent to which they have benefited from the use of regional development funds between

[1] For the purposes of this paper, the word region is used to describe voivodeships. A voivodeship (or a province) is Poland's largest administrative unit (followed by the powiat or county and the gmina or municipality). Poland comprises a total of 16 regions.

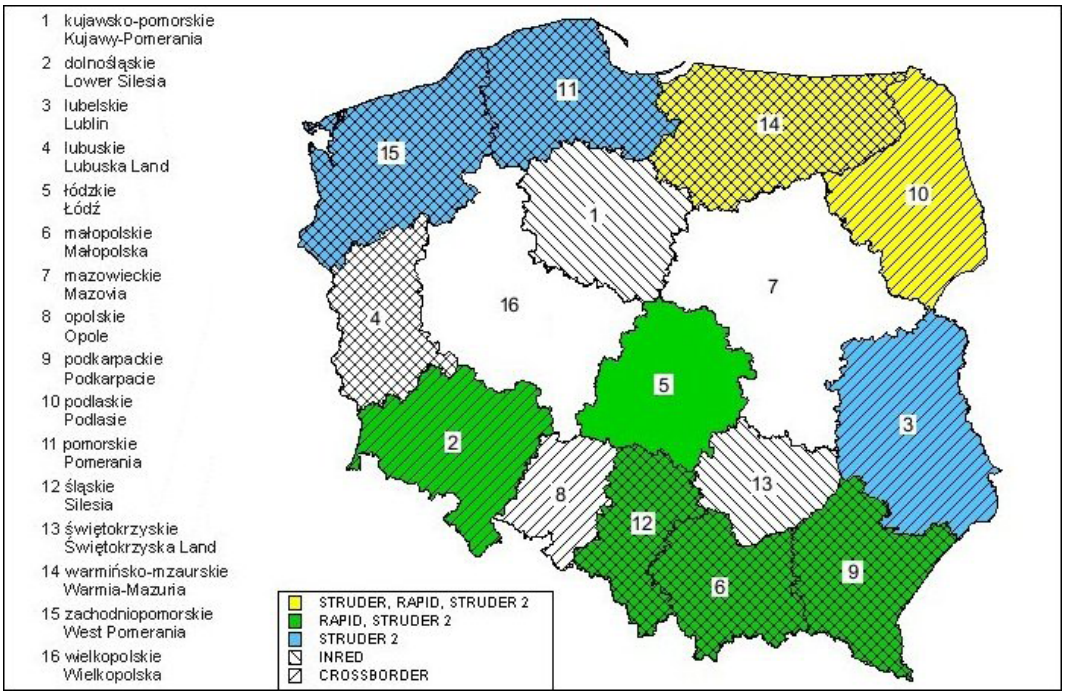

Fig. 1: Participation of Polish regions (voivodeships) in European Union programmes supporting regional development in the years 1989-2000
Source: Głębocki (2005)

1989 and 2004. Figure 1 shows the degree to which such funds have been absorbed in each region.

Note also that, surprisingly enough, Poland's most socially and economically developed regions of Masovia and Greater Poland did not benefit from any EU regional development programmes during the above period.

Disparities are also evident in the impact that Community aid has had on the strategic planning in individual regions (voivodeships)[1], cf. Fig. 2. Strategic planning in the four most developed regions of Masovia, Silesia, Lower Silesia and Greater Poland has turned up to be least affected by EU funding (Głębocki, 2005).

Conversely, the least developed Podlachian and Subcarpathian Voivodeships have made fairly extensive use of the Community aid.

Following its accession, Poland joined seven operational programmes: 1) Sectoral Operational Programme of Fisheries and Fish Processing, 2) Sectoral Operational Programme of Transport, 3) Sectoral Operational Programme of Restructuring and Modernization of the Food Sector and Rural Development, 4) Sectoral Operational Programme of Improvement in the Competitiveness of Enterprises, 5) Sectoral Operational Programme of Human Resources Development, 6) Integrated Regional Operational Programme, and 7) Technical Assistance Operational Programme.

The country has also benefited from two Community Initiatives: 1) Interreg, a programme designed to promote cross-border, supra-national and international cooperation, and 2) Equal, a scheme financing supra-national cooperation to promote new ways of combating all forms of discrimination and inequity on the labour market. Substantial injections of aid have also come from the Cohesion Fund.

From 2004 to 2005, Poland absorbed a total of € 12.8 billion in structural funds, of which € 4.2 billion came from the Cohesion Fund (transport, environment, etc.), and € 8.6 billion from the above seven operational programmes and two Community Initiatives (Gęsicka, 2006).

The major aid beneficiaries are listed in Fig. 3. The majority of the aid money ended up in the hands of sub-central authorities, including regional governments (48%), followed by the central government, state agencies and budget-funded organizations (35%).

Overall in Poland, the funds have: 1) helped to complete over 60 thousand projects of various kinds, 2) involved government authorities in furthering 4,958 projects, 3) provided support to 8.5 thousand enterprises (1.4 thousand of which were micro-enterprises; Gęsicka, 2006).

The impact of structural funds included less tangible advancements such as the development of a modern

[1] The drafting of a regional development strategy is required by law - the duty has been relegated to regional authorities.

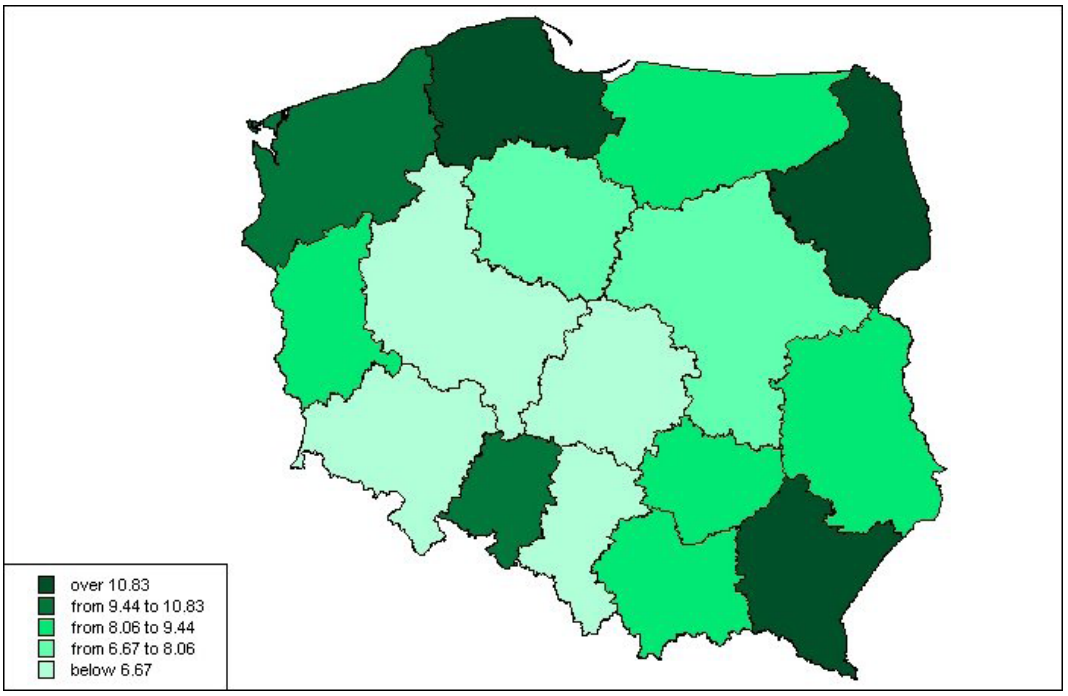

Fig. 2: Effect of EU funds on the strategic planning of development in regions in the years 1989-2000. Source: own compilation based on Głębocki (2005)

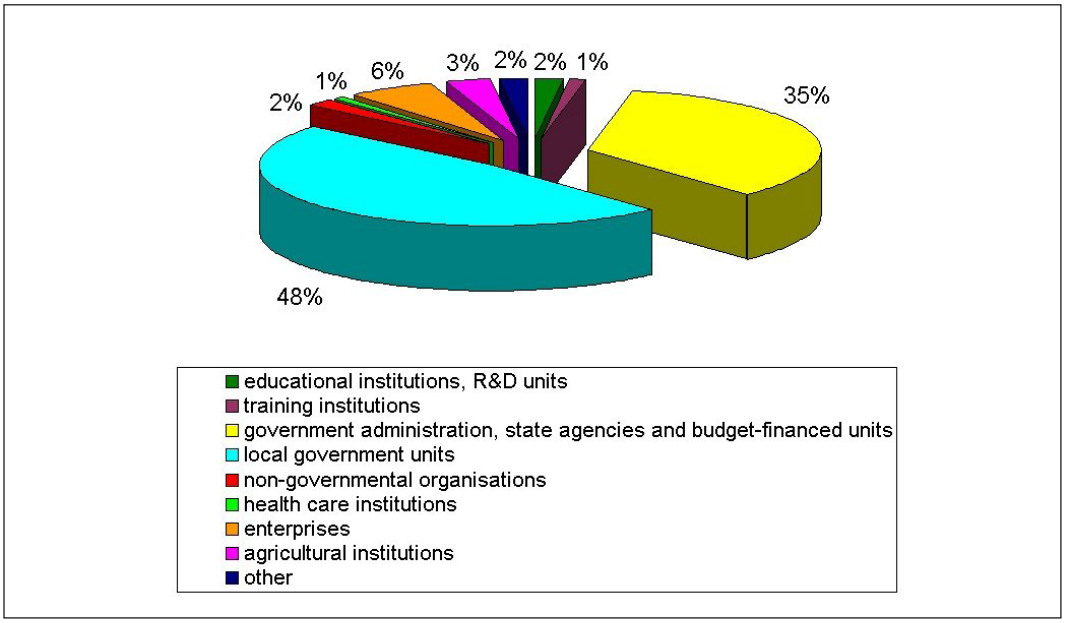

Fig. 3: Entities (beneficiaries) aided from the EU funds in the years 2004-2006 Source: Gęsicka (2006)

society. Effects in this area include the development of civil society, improvements in the management of public funds and an enhanced structure of modern state administration.

Poland's next structural fund programming period extends from 2007 to 2013. Its priorities are laid down in the National Development Strategy for 2007-2015 and in the National Cohesion Strategy.

The prime strategic objective is to "create an environment conducive to boosting the competitiveness of the Polish economy based on knowledge and entrepreneurship to create more jobs and ensure greater social, economic and spatial cohesion in Poland within the European Union and domestically" (Gęsicka, 2006).

The National Cohesion Strategy has included a number of detailed objectives formulated on the basis of the Lisbon Strategy, the New Lisbon Strategy (NLS), Strategic Community Guidelines, and a report on the state of Polish society and economy.

The National Cohesion Strategy for 2007-2013 comprises:

1) 16 Regional Operational Programmes (RDP), 2) Operational Programme for Infrastructure and Environment, 3) Operational Programme for Human Capital, 4) Operational Programme for Innovative Economy, 5) Operational Programme for Development of Eastern Poland, 6) Operational Programme for European Territorial Cooperation and 7) Technical Assistance Operational Programme.

The operational programmes will be financed with a € 59.5 billion package of Community structural funds[1]. Added to this will be € 9.7 billion in matching funds to be provided by the state as well as € 16.3 billion expected to come from the private sector. All in all, a total of € 85.6 billion will support the National Cohesion Strategy from 2007 to 2013.

In their capacity as public institutions, the Ministry of Regional Development[2] and, independently of its funding, the Institute for Market Economy Research[3], have analysed the social and economic impact on Poland of the country's European Union accession.

Research shows that the structural funds extended to Poland following its EU accession have had and continue to have a positive effect on the country's national and regional economies. In fact, this effect has been sought as the purpose of integration is to harmonize the economies of new member states with those of more developed EU countries.

The Polish economy noticeably improved its performance between 2004 and 2005. The country's GDP rose by 5.3% in 2004, 3.4% in 2005 and 6.1% in 2006. The economy benefited from exports, which grew faster than imports. Meanwhile, inflationary pressures and other similar factors subsided considerably.

In assessing the impact of structural funds on the GDP and unemployment, the Ministry of Regional Development relied on the HERMIN[4] econometric model. Fig. 4 shows a rise in GDP from 2004 to 2015, as projected by means of the HERMIN model. This is seen as a consequence of the joint financing of investment projects with EU funds.

Structural funds have markedly elevated Poland's GDP by 0.01% in 2004 and 0.86% (or approximately € 2.15 billion) in 2005. Such funds are expected to contribute to a record GDP rise by 6.53% by 2013. This translates into from some dozen to tens of billions of euros.

The HERMIN model has also been used to estimate unemployment reductions and job creation driven by the structural funds used to co-finance investment projects.

Fig. 5 shows changes in unemployment rates and job creation between 2004 and 2015. For example, in 2005 structural funds contributed to a 0.47% drop in the unemployment rate increasing the employed population by 79.1 thousand.

Structural funds are foreseen to reach peak impact in 2013. The rate of unemployment will then fall by 2.16 (by conservative estimates) as 375,000 new jobs will have been created.

As mentioned earlier, the effect of EU integration on the Polish regions has also been studied by the Institute for Market Economy Research (Nowicki, 2003).

An in-depth analysis carried out by Nowicki (2003) showed that at a time immediately following accession, benefits were more likely to appear in regions that were better off in terms of social and economic development and those more capable of stimulating private capital and raising the appropriate funds.

A classical econometric model has been used to predict the response of regional economies to EU accession. The projections included the mean annual increase in employment from 2004 to 2012 in individual regions resulting from the application of: 1) domestic funds only (the base scenario), 2) structural funds (effect of accession) and 3) both types of funds (the total effect).

Fig. 6 confirms that structural funds reduce unemployment and will continue to do so in the foreseable future, particularly in the least-developed regions (such as Kuyavia-Pomerania, Świętokrzyski, and Warmia-Masuria). On the other hand, well-developed regions (such as Masovia and Lower Silesia) have used structural funds to accelerate their growth.

The pattern of how structural funds influence regions appears to be mirrored in the geographical distribution of value added. The sharpest growth in the value has been foreseen to take place in 2004-2012 in the most developed regions of Masovia, Lower Silesia and Lesser Poland.

On the other hand, the least developed Kuyavian-Pomeranian, Świętokrzyskie, and Opole Voivodships

[1] 52% of the funds will come from the European Regional Development Fund, 33% from the Cohesion Fund.

[2] Gęsicka, 2006.

[3] Nowicki [ed.], 2003, Kalinowski [ed.], 2006.

[4] Models such as the HERMIN were used in the EU to research cohesion levels in the outlying areas of Northern Ireland, Greece, Spain and Portugal, cf. Zaleski et al., 2004. See also Bradley et al., 2006, and Bradley, Untitled, 2007.

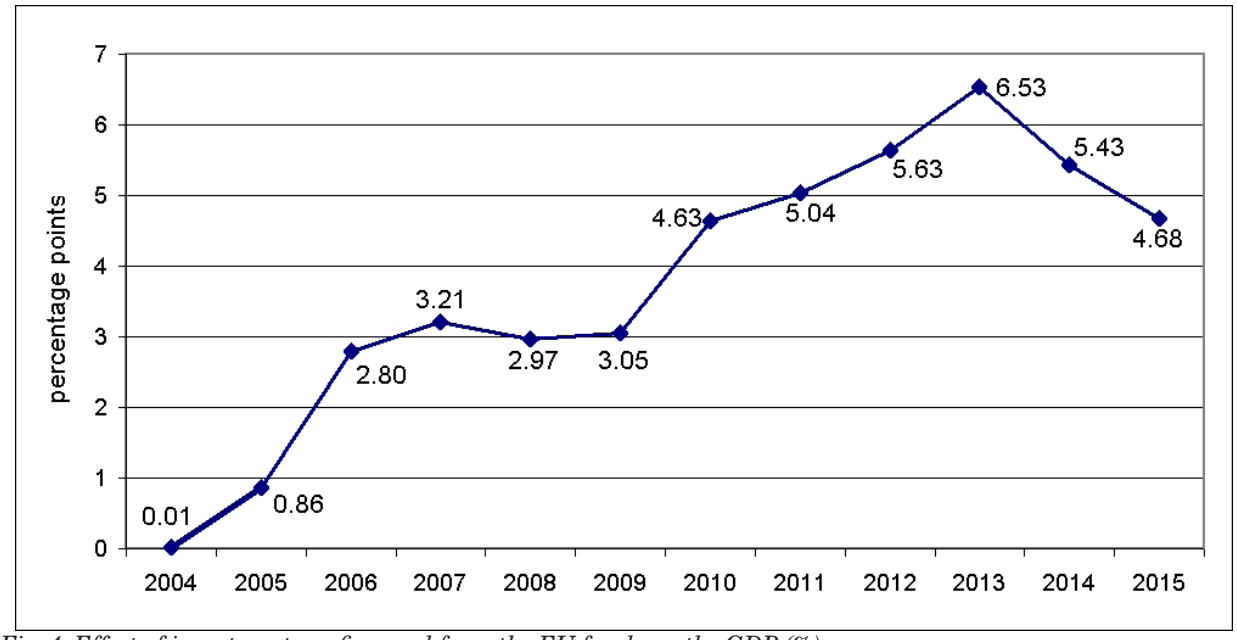

Fig. 4: Effect of investments co-financed from the EU funds on the GDP (%)
Source: Gęsicka (2006).

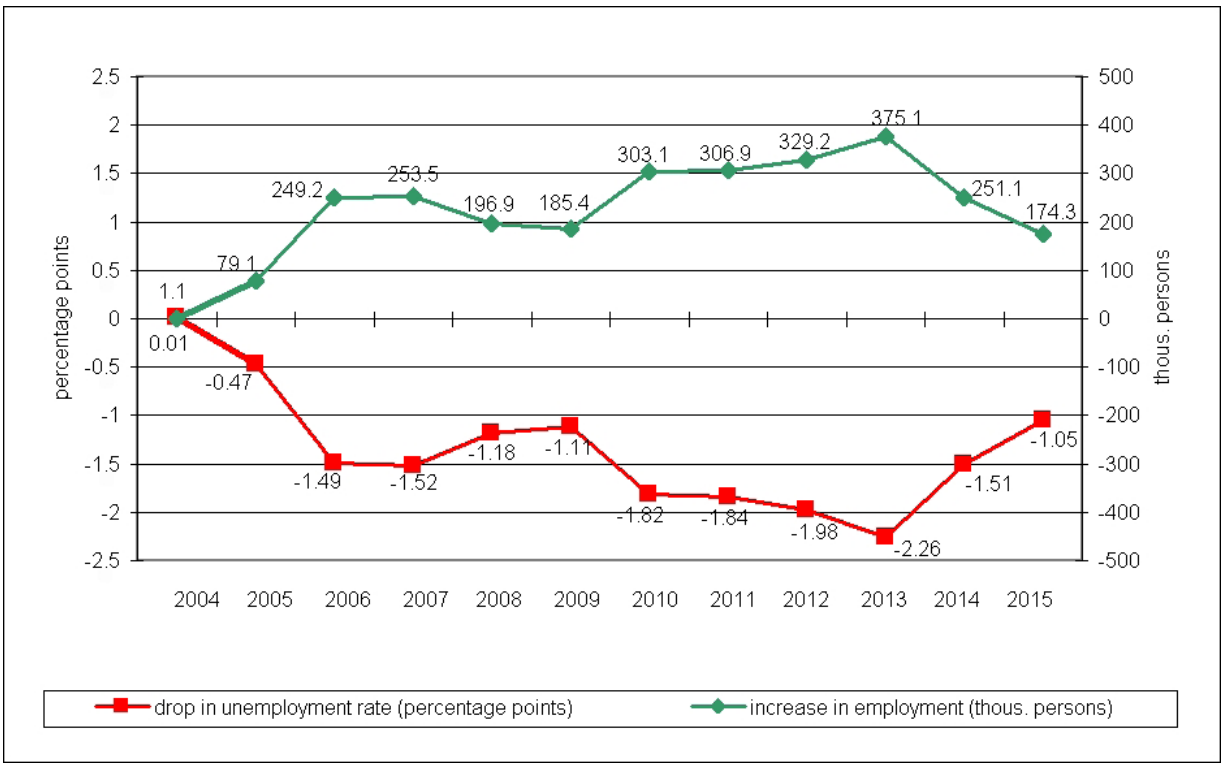

Fig. 5: Effect of investments co-financed from the EU funds on the labour market (unemployment rate in percentage points and employment in thous. persons)
Source: Gęsicka (2006)

have successfully used structural funds to counteract a slowdown in value added growth.

Surveys show that regions well poised to absorb structural funds are better positioned for a dramatic improvement in their social and economic standings.

The Institute for Market Economy Research has predicted the amounts of mean annual EU funds to be made available to Polish regions from 2004 to 2012. (Tarkowski [ed.], 2003). A 2003 forecast was found to be significantly consistent with the actual performance in 2006 as reported by the Ministry of Regional Development (Tab. 1). The consistency, however, only concerns small regions and regions poorly developed in social and economic terms. As it turned out, the well-developed regions, which are home to such major cities as Warsaw, Cracow, Wrocław, Poznań and Gdańsk, displayed a better capacity to absorb funds during the 2004-2006 period than was originally assumed by forecasters.

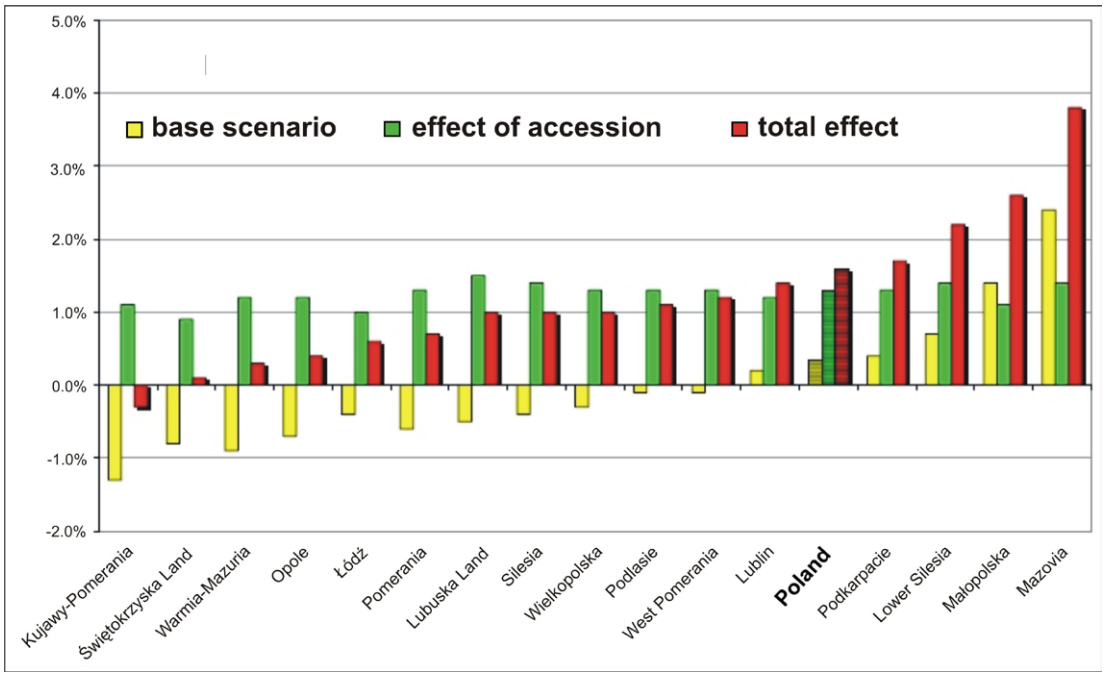

Fig. 6: Mean annual increase in employment in the years 2004-2012 (%)
Source: Nowicki (2003)

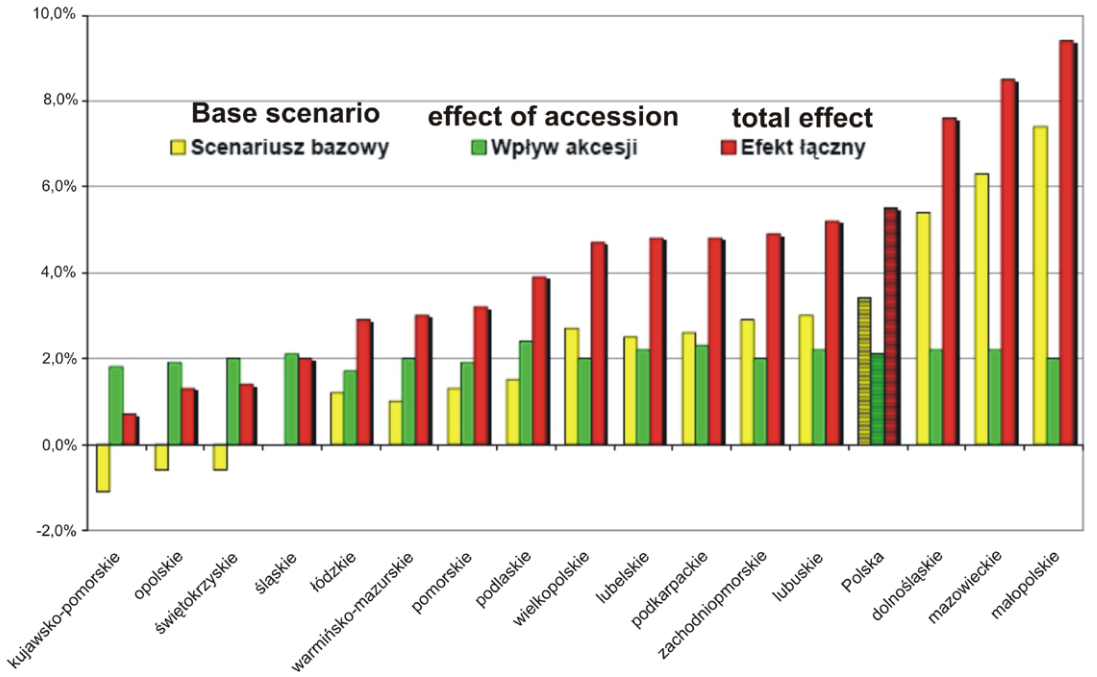

Fig. 7: Mean annual increase in value added in the years 2004-2012 (%)

All this goes to prove that stronger regions stand to benefit the most during the time immediately following accession and that the poorer ones are in pressing need of special operational programmes. The pattern has been factored into the planning of Poland's spatial development for 2007-2013.

3. Structural funds and regional economy

The main purpose behind integration is to eliminate developmental disparities across EU member states and regions. A key role in the process is played by structural funds and, in particular, by the way in which they are distributed geographically. It is essential to bear in mind that stronger regions are better positioned to attract structural (and other) funds.

This pattern holds true in Poland, too. Tab. 1 summarises regional-level statistics for the project financing contracts carried out as part of operational programmes.

The statistics were used in the present paper to classify regions by Hellwig's (1968) taxonomic method based on the so-called development pattern. The method has

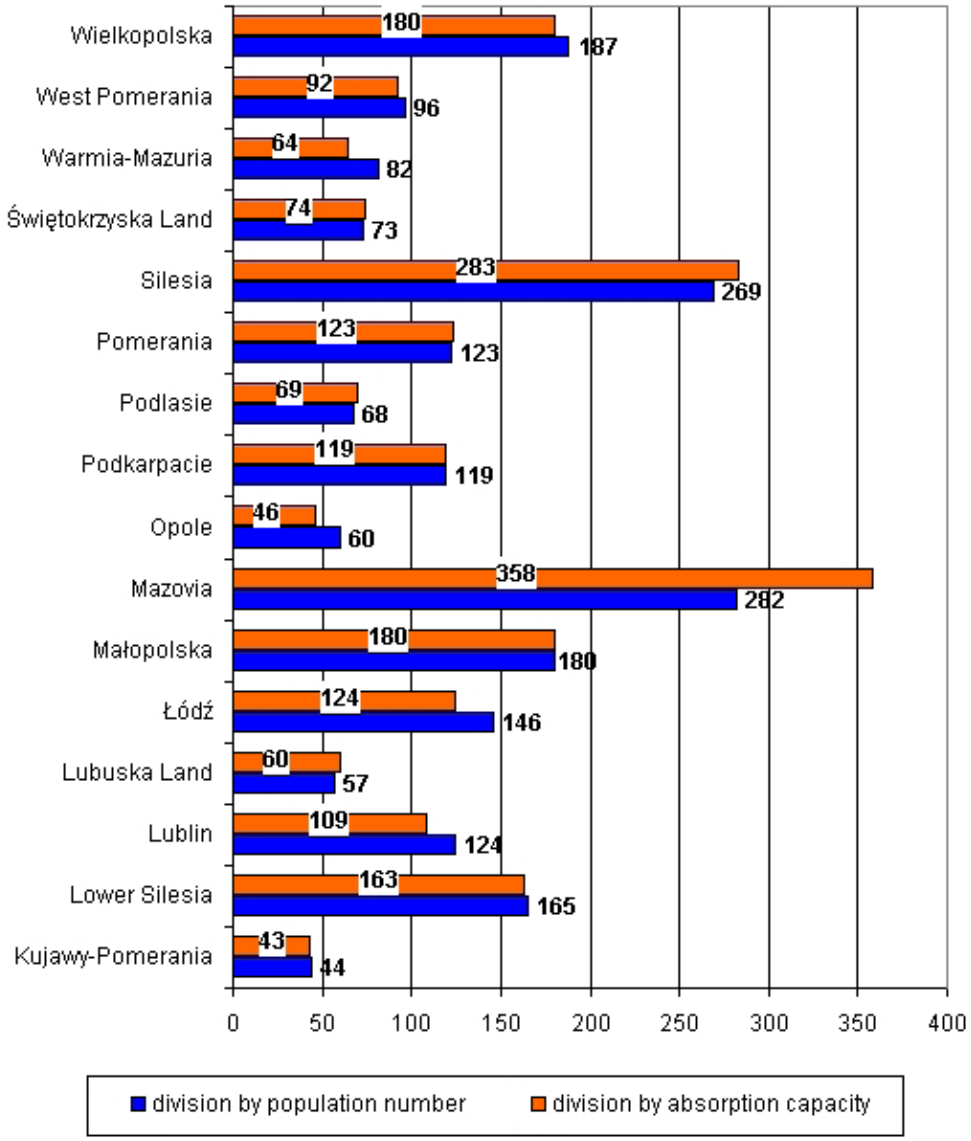

Fig. 8: Prediction of mean annual Community assistance accessible to regions over the years 2004-2012, million euros
Source: Tarkowski (2003)

No.	Voivodship	Number of contracts	Contract value (in € million)	Aid per capita (in €)	Contract value (in €) per sq. kilometre	Proportion of country-wide value (%)
1	Greater Poland	4,263	907.3	269.6	30,417.1	96.1
2	Kuyavian-Pomeranian	2,770	446.0	215.6	24,814.8	76.8
3	Lesser Poland	2,452	547.1	167.9	36,035.8	59.8
4	Lower Silesian	1,856	1,221.5	422.2	61,237.3	150.4
5	Lublin	3,342	284.5	130.2	11,325.7	46.4
6	Lubusz	943	190.4	188.7	13,610.3	67.2
7	Łódź	2,818	404.9	156.5	22,225.5	55.8
8	Masovian	5,533	1,711.7	332.7	48,140.3	118.5
9	Opole	1,233	189.8	180.5	20,160.5	64.3
10	Podlachian	2,813	160.4	133.4	7,946.2	47.5
11	Pomeranian	2,940	610.5	178.3	33,334.1	99.1
12	Silesian	2,111	1,346.3	186.4	109,154.8	102.1
13	Subcarpathian	1,785	317.2	151.2	17,773.6	53.9
14	Świętokrzyskie	2,140	192.3	149.2	16,419.8	53.2
15	Warmian-Masurian	1,882	232.7	162.9	9,628.4	58.0
16	West Pomeranian	2,304	623.7	368.0	27,245.7	131.1

Tab. 1: Number and worth of contracts for financial support of projects implemented under the operational programmes in Polish regions over the years 2004-2005
Source: Gęsicka (2006)

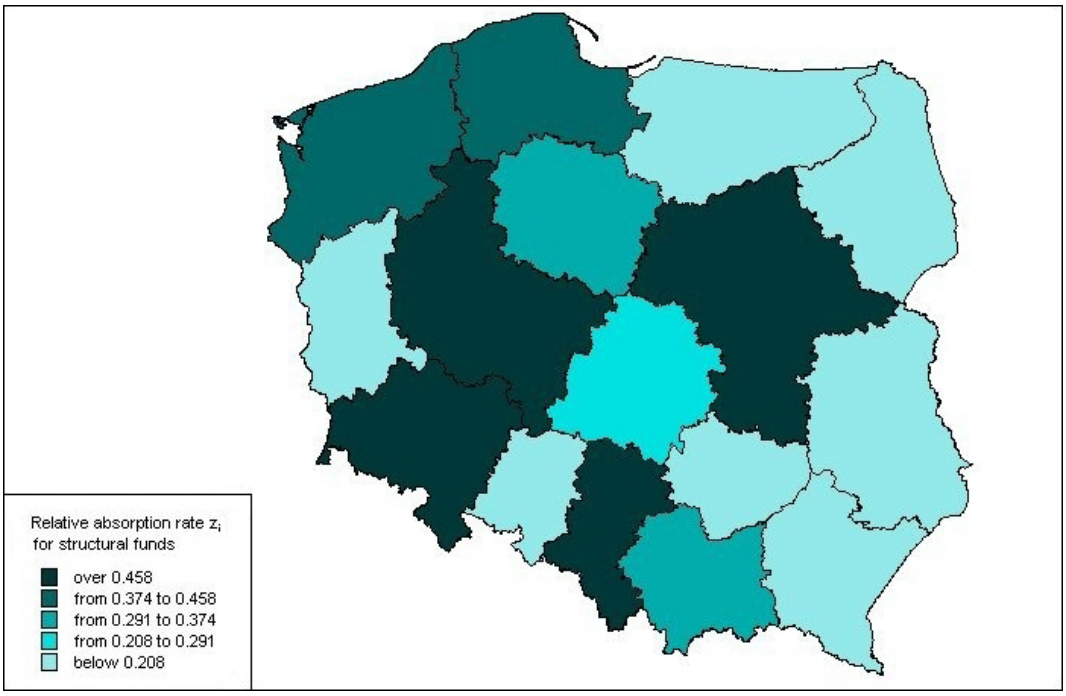

Fig. 9: Geographical distribution of the relative structural funds absorption rate z_i
Source: Author's compilation

helped to produce taxonomic relative absorption rates zi for structural funds offered to individual regions. Its values, which fall within the range of <0 to 1>, are shown in Fig. 9.

The map sets out clearly those regions whose absorption rates are either very high and high or low. The former include Masovian, Silesian, Greater Poland, Lower Silesian, Lesser Poland, Pomeranian, West Pomeranian, and Kuyavian-Pomeranian Voivodeships, and the latter: Warmian-Masurian, Podlachian, Lublin, Subcarpathian, Świętokrzyskie, Łódź, Opole, and Lubusz Voivodeships. An analysis suggests pronounced disparities between regions with high and low absorption capacities. Its graphic presentation in Fig. 10 confirms the prior presumption that economically poorer regions are less capable of absorbing structural funds than stronger regional economies. In Figure 10, poor structural-fund absorbers are located in Poland's easternmost border regions known in the literature as 'the Eastern Wall'.

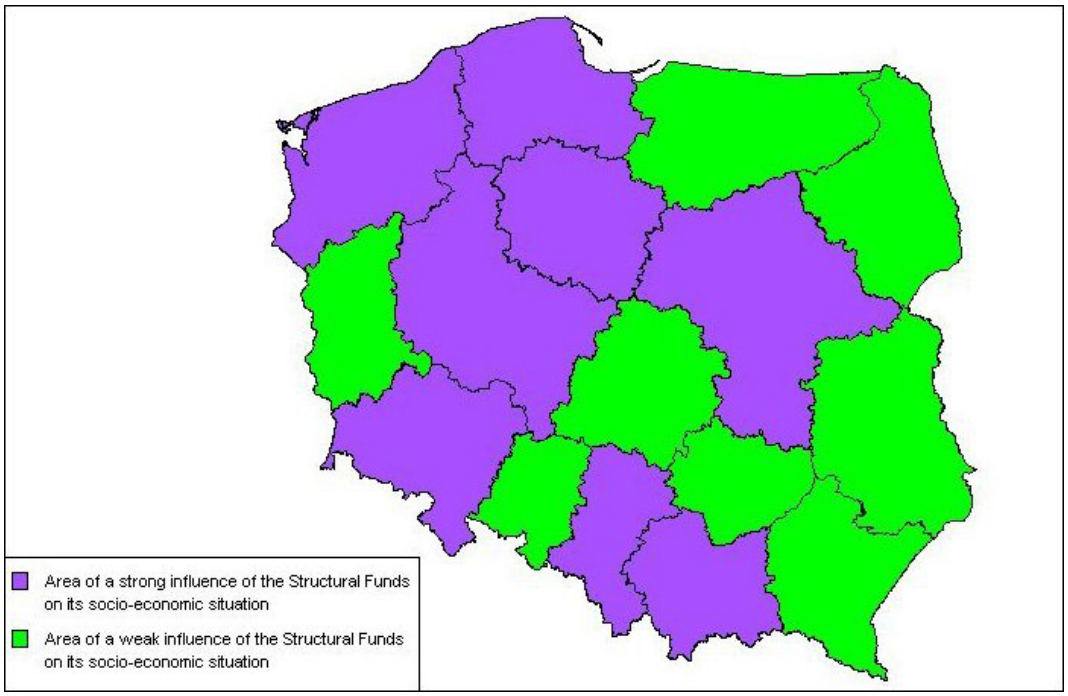

Fig. 10: Poland's dichotomous breakdown into regions well and poorly capable of absorbing EU structural funds
Source: Author's compilation

The geographic distribution of the absorption capacity was compared with per capita GDP and GDP per square kilometre by region in 2005 (Tab. 2).

No.	Voivodeship	GDP per capita (in €)	GDP per square kilometre (in €)
1	Greater Poland	6,868	774,898
2	Kuyavian-Pomeranian	5,714	657,608
3	Lesser Poland	5,460	1,172,440
4	Lower Silesian	6,506	943,672
5	Lublin	4,432	385,537
6	Lubusz	5,716	412,408
7	Łódź	5,884	835,661
8	Masovian	9,677	1,400,427
9	Opole	5,490	613,384
10	Podlachian	4,769	284,086
11	Pomeranian	6,238	747,326
12	Silesian	7,179	2,735,955
13	Subcarpathian	4,460	524,359
14	Świętokrzyskie	4,943	544,003
15	Warmian-Masurian	4,960	293,161
16	West Pomeranian	5,942	439,907

Tab. 2: GDP by region, 2005
Source: Gęsicka (2006) and author's calculations

The author resorted again to Hellwig's taxonomic method to compute the relative rate of economic growth in regions. The resulting geographic distribution maps are given in Figs. 11 and 12.

The distributions appear to closely resemble those shown in Figures 9 and 10. The most developed regions are Masovian, Silesian, Lower Silesian, Greater Poland, Lesser, Łódź, Kuyavian-Pomeranian, and Pomeranian Voivodeships. The least developed regions include Warmian-Masurian, Podlachian, Lublin, Subcarpathian, Świętokrzyskie, Opole, Lubusz, and West Pomeranian Voivodeships.

The correspondence of geographic distributions shown in Figures 10 and 12 can be quantified by applying the metric PWR = $|V_1| + |V_2| - 2V^{(1,2)}$ (Palka et al., 2001), where V_1 denotes the number of regions in classification 1, V_2 the number of regions in classification 2, and $V^{(1,2)}$ the number of regions that fall into the same classes in both classifications.

In the concerned case, PWR = 32 - 2·14 = 4. Hence, both distributions are nearly identical. The geographic variance of the relative absorption rate may thus be explained by reference to the geographic distribution of the relative GDP rate.

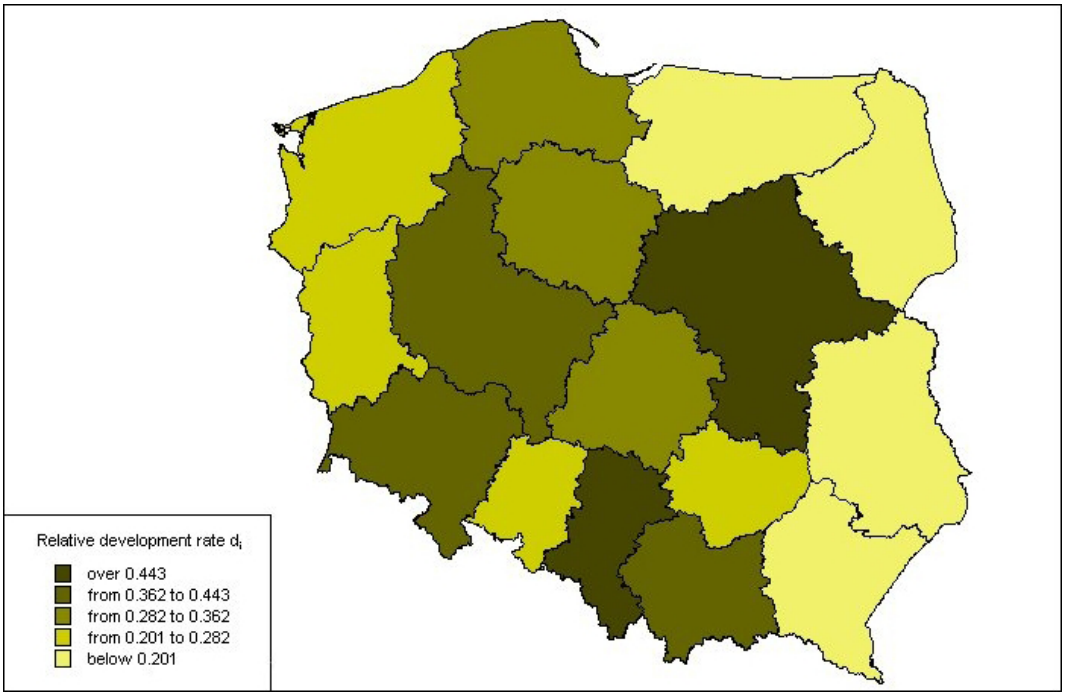

Fig. 11: Geographic distribution of the relative economic development rate d_i by region
Source: Author's compilation

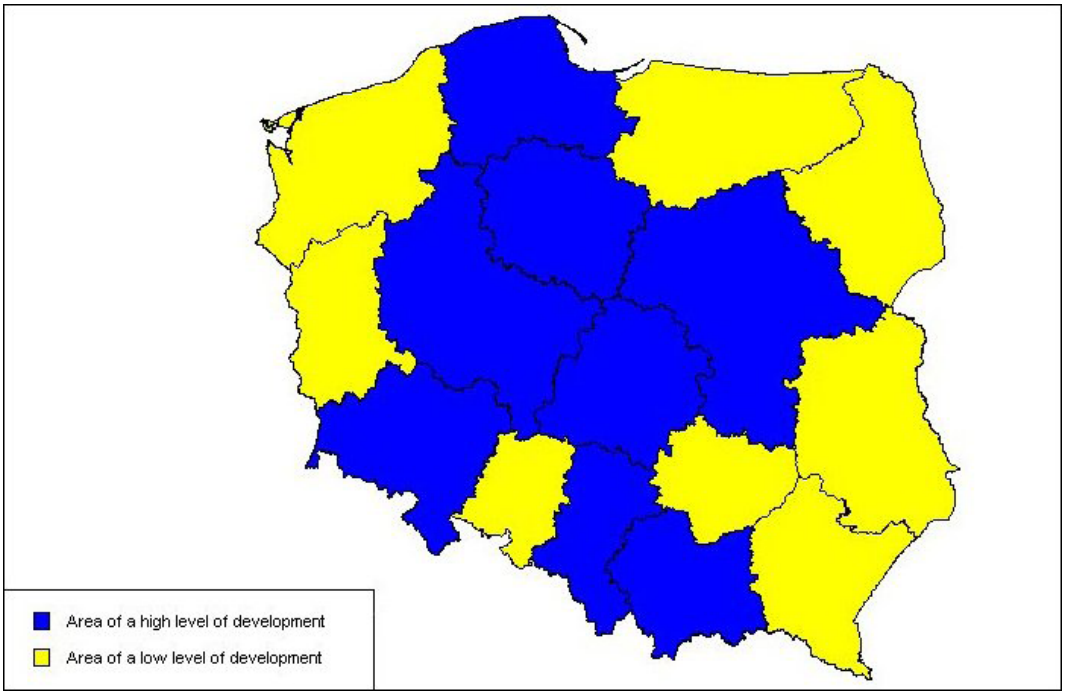

Fig. 12: Dichotomous division of Polish regions by rate of economic development
Source: Author's compilation

No.	Voivodship	Labour costs and resources	Region activeness towards investors	Accessibility by modes of transport	Absorption capacity of regional market	State of business infrastructure	State of social infrastructure	Public safety
1	Greater Poland	0.54	1.76	1.79	0.98	0.70	0.54	1.70
2	Kuyavian-Pomeranian	0.46	0.00	1.22	0.58	0.21	0.73	1.25
3	Lesser Poland	0.99	1.06	1.47	1.91	1.39	2.94	1.06
4	Lower Silesia	0.60	2.07	1.77	1.65	1.43	1.99	1.03
5	Lublin	0.09	0.00	0.37	0.52	0.03	0.00	2.59
6	Lubusz	0.23	0.89	1.77	0.31	0.44	0.21	1.37
7	Łódź	0.70	0.81	1.48	1.11	0.37	0.85	1.11
8	Masovian	0.15	2.74	1.70	3.26	1.18	1.38	0.67
9	Opole	0.18	0.49	1.54	0.83	0.70	0.29	2.06
10	Podlachian	0.04	0.06	0.00	0.62	0.00	0.28	2.40
11	Pomeranian	0.43	0.52	1.10	1.92	0.86	1.12	0.00
12	Silesian	2.10	0.82	1.70	2.71	1.72	2.91	0.68
13	Subcarpathian	0.26	0.45	0.44	0.37	0.54	0.29	3.39
14	Świętokrzyskie	0.29	0.05	0.90	0.00	0.08	0.44	2.33
15	Warmian-Masurian	0.00	0.49	0.66	0.31	0.64	0.41	1.79
16	West Pomeranian	0.30	0.89	1.77	1.18	0.27	0.99	0.89

Tab. 3: Converted base variables used to assess the relative aggregate rate of attractiveness to investors a_i in 2005
Source: Author's calculation based on data in Kalinowski [ed.] (2006a)

The modified values of these variables are provided in Tabs. 3 and 4. The variables were used as inputs for the taxonomic analysis performed in this article using Hellwig's method.

The result are relative rates of attractiveness to investors ai, i=1,...,N for 2005 and 2006, cf. Table 5.

As the numerical values of ai fall within the range of <0 to 1>, a region's shift in attractiveness to investors from 2005 to 2006 was estimated by the graphical method relying on the zero change datum line.

No.	Voivodship	Labour costs and resources	Region activeness towards investors	Accessibility by modes of transport	Absorption capacity of regional market	State of business infrastructure	State of social infrastructure	Public safety
1	Greater Poland	0.56	2.02	1.79	0.98	0.83	0.52	1.73
2	Kuyavian-Pomeranian	0.43	0.33	1.22	0.58	0.34	0.62	1.13
3	Lesser Poland	0.98	0.80	1.47	1.91	1.00	3.00	0.90
4	Lower Silesia	0.57	2.96	1.77	1.65	1.78	1.99	0.82
5	Lublin	0.06	0.09	0.37	0.52	0.17	0.00	0.42
6	Lubusz	0.26	0.97	1.77	0.31	0.49	0.20	1.35
7	Łódź	0.71	0.78	1.48	1.11	0.55	0.80	0.86
8	Masovian	0.20	2.82	1.70	3.26	1.40	1.37	0.47
9	Opole	0.19	0.93	1.54	0.83	0.54	0.30	1.99
10	Podlachian	0.00	0.13	0.00	0.62	0.00	0.21	2.33
11	Pomeranian	0.39	1.18	1.10	1.92	1.19	1.16	0.00
12	Silesian	2.08	1.11	1.70	2.71	1.95	2.89	0.38
13	Subcarpathian	0.28	0.24	0.44	0.37	0.41	0.27	3.23
14	Świętokrzyskie	0.28	0.00	0.90	0.00	0.06	0.43	2.13
15	Warmian-Masurian	0.03	1.24	0.66	0.31	0.49	0.39	1.67
16	West Pomeranian	0.31	1.04	1.77	1.18	0.34	0.90	0.75

Tab. 4: Modified base variables for assessing the aggregate rate of attractiveness to investors a_i for 2006
Source: Author's calculation based on data given in Kalinowski [ed.] (2006a)

No.	Voivodeship	2005)	2006
1	Greater Poland	0.336	0.365
2	Kuyavian-Pomeranian	0.157	0.184
3	Lesser Poland	0.473	0.438
4	Lower Silesian	0.465	0.488
5	Lublin	0.105	0.033
6	Lubusz	0.166	0.189
7	Łódź	0.275	0.272
8	Masovian	0.420	0.438
9	Opole	0.230	0.261
10	Podlachian	0.113	0.117
11	Pomeranian	0.215	0.288
12	Silesian	0.477	0.485
13	Subcarpathian	0.190	0.173
14	Świętokrzyskie	0.121	0.118
15	Warmian-Masurian	0.155	0.202
16	West Pomeranian	0.253	0.263

Tab. 5: Relative aggregate rate of attractiveness to investors
Source: Author's calculations

Fig. 13 reaffirms the trend of improving regions' attractiveness to investors from 2005 to 2006, that is, immediately after Poland first received structural funds. As can be seen, out of the 16 regions, only three: Lublin Voivodship (3), Subcarpathian Voivodship (9) and Lesser Poland Voivodship (6), fall under the identical distribution line. This shows that their attractiveness to investors in 2006 fell relative to 2005. Of the three regions, two (Lublin Voivodship and Subcarpathian Voivodship) are among Poland's easternmost border regions. The other thirteen eastern border regions fall above the identical distribution line. In the first case, this shows an improvement in attractiveness to investors in 2006, often quite substantial. The sharpest attractiveness gains were recorded by Pomeranian Voivodship (11). Nine other regions made slightly lesser but still noticeable headway. The fact of the matter is that there is never a 100% certainty that structural funds are the only factor behind such improvements. This doubt notwithstanding, one may cautiously claim that the structural funds did play a significant role in boosting the attractiveness of regions to foreign investors.

4. Programme for Eastern Poland ('the Eastern Wall')

The Eastern Wall regions show not only a lower level of socio-economic development, but also a poorer capacity for absorbing the EU structural funds. Even worse, the distance between them and the more advanced regions keeps growing.

With this problem in mind, in 2005 the Luxembourg Presidency, invoking the solidarity principle, initiated the establishment of a special fund for the years 2007-2013 for the five poorest EU regions, which at that time were Lublin Voivodship, Subcarpathian Voivodship, Podlachian Voivodship, Świętokrzyskie Voivodship,

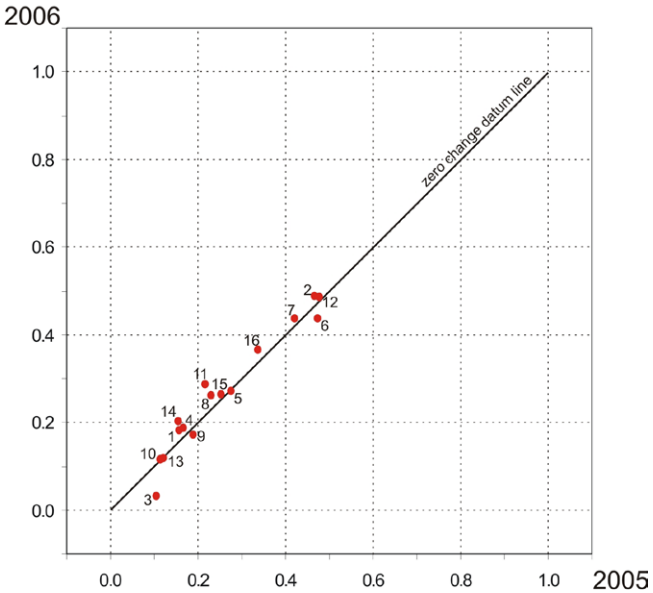

Fig.13: Change in a region's attractiveness to investors from 2005 to 2006 assessed on he basis of the aggregate attractiveness rate a_i.
Data: based on statistics given in Kalinowski [ed.] (2006a)

and Warmian-Masurian. These are regions forming the 'Eastern Wall'. On the strength of a decision of the European Council of December 2005, Poland was granted an additional sum of euro 992 million (euro 120 per head) under the European Regional Development Fund.

Moreover, in January 2007 the Polish Government adopted "The Operational Programme for the Development of Eastern Poland, 2007-2013" (OPFDEP 2007-2013), for which it earmarked euro 1,281.6 billion. Thus, the total fund for eliminating the existing disparities equals euro 2,273,793,750.

The primary aim of the Programme is "to accelerate the rate of socio-economic development of Eastern Poland". Its accomplishment will be possible through the implementation of the following principal targets (PT):
(1) stimulating the development of a competitive knowledge-based economy,
(2) development of selected metropolitan functions of the voivodship capitals,
(3) improvement in accessibility by various modes of transport,
(4) optimisation of the process of implementation of "The Operational Programme for the Development of Eastern Poland".

The recently prepared and implemented projects within the framework of the Operational Programme for the Development of Eastern Poland, 2007-2013, are divided into two groups:
- group 1: large projects embracing 9 detailed projects addressing the first, second and third principal targets outlined above, and
- group 2: pivotal projects; they total 112 with an asymmetric distribution among the principal targets (target 1 - 63, target 2 - 11, and target 3 - 38).

The implementation of the OPFDEP 2007-2013 is extremely important for the Polish economy. It can reduce the historical disparities between central-western Poland and its north-eastern parts. It has also got a societal dimension because it confirms regional solidarity in Poland.

5. Conclusions

The author has demonstrated that although structural funds have only been used in Poland for a relatively short time, they have had a clearly positive impact on the national and regional economies.

Macroeconomic indicators such as the GDP and the unemployment rate improved from 2004 to 2005.

Optimistic forecasts (made with the use of the econometric HERMIN model) have come from the Ministry of Regional Development.

The impact of structural funds on regional economies appears to be slightly more complex. The author's analysis conducted for the purposes of this paper confirms that at this stage of the game, the most pronounced benefits of using structural funds can be seen in the very-well and well developed regions. Such regions offer the clear advantage of having a greater absorption capacity thanks to the operation of a variety of complex factors.

Poland's eastern belt of poorer developed regions requires the use of special operational programmes designed to help them catch up with the rest of the country. Even here, however, positive developments could be seen from 2004 to 2005. This is particularly true for attractiveness to foreign investors.

Poland has been able to make effective use of structural funds thanks to well-prepared absorption instruments. In this respect, a particularly strong positive influence has been contributed by the Ministry of Regional Development.

A number of independent non-governmental scientific institutions monitor and forecast in real time the impact of structural funds nationally and regionally. A leading role among such institutions is played by the Institute for Market Economy Research.

References:

BRADLEY, J., MITZE, T., MOVENGROTH, E., UNTIEDT, G. (2006): How can we know if EU cohesion policy is successful? Integrating micro and macro approaches to the evolution of Structural Funds. GEFRA Working paper, March 2006.

BRADLEY, J., UNTIEDT, G. (2007): The COHESION system of HERMIN country and regional models: Description and operating manual. Contract No. 2005 CE 16 O AT 027, GEFRA, Muenster, April 10, 2007.

GŁĘBOCKI, K. [ed.] (2005): Wpływ funduszy strukturalnych Unii Europejskiej na planowanie rozwoju województw. (Effect of the European Union Structural Funds on the planning of voivodeship development). Częstochowa, Sekcje Wydawnictwa Wydziału Zarządzania Politechniki Częstochowskiej.

GĘSICKA, G. (2005): Pierwszy okres wykorzystania funduszy strukturalnych w Polsce. Raport IZ PWW. Rodzaje projektów, typy beneficjentów, rozkład przestrzenny udzielonej pomocy UE. (The first period of absorption of structural funds in Poland. IZ PWW report: Kinds of projects, types of beneficiaries, spatial distribution of assistance granted). Warszawa, Instytucja zarządzająca Podstawami Wsparcia Wspólnoty. Ministerstwo Rozwoju Regionalnego. http://www.funduszestrukturalne.gov.pl/NR/rdonlyres/315D55D6-0E26-455B-938F-9059AB2B7F43/14455/pww_raport_rodzproj_1okres.pdf.

GĘSICKA, G. (2006): Wstępna ocena pierwszych efektów europejskiej polityki spójności w Polsce 2004-2005. (Preliminary assessment of the first effects of the European cohesion policy in Poland, 2004-2005). Warszawa, Instytucja zarządzająca Podstawami Wsparcia Wspólnoty. Ministerstwo Rozwoju Regionalnego. http://www.funduszestrukturalne.gov.pl/NR/rdonlyres/315D55D6-0E26-455B-938F-9059AB2B7F43/20848/raport2lataefekty.pdf.

HELLWIG, Z. (1968): Zastosowanie metody taksonomicznej do typologicznego podziału krajów ze względu na poziom ich rozwoju oraz zasoby i strukturę wykwalifikowanych kadr. (Application of the taxonomic method to a typological division of countries by level of development as well as resources and structure of qualified labour). Przegląd Statystyczny No. 4, pp. 307-327.

KALINOWSKI, T. [ed.] (2006a): Atrakcyjność inwestycyjna województw i podregionów Polski 2006. (Investment attractiveness of voivodeships and subregions in Poland, 2006). Gdańsk, Instytut Badań nad Gospodarką Rynkową.

KALINOWSKI, T. [ed.] (2006b): Sukces rozwojowy polskich województw. (Growth success of Polish voivodeships). Gdańsk, Instytut Badań nad Gospodarką Rynkową.

NOWICKI, M. [ed.] (2003): Jak integracja z Unią Europejską wpłynie na polskie regiony? (How is the integration with the European Union going to affect Polish regions?). Gdańsk, Instytut Badań nad Gospodarką Rynkową.

PALKA, Z., RATAJCZAK, W., WELTROWSKA, J. (2001): Wyznaczanie odległości pomiędzy grafami (Determination of distance between graphs). In: Rogacki, H. [ed.]: Koncepcje teoretyczne i metody badań geografii społeczno-ekonomicznej i gospodarki przestrzennej. (Theoretical conceptions and research methods of socio-economic geography and spatial management). Poznań, Bogucki Wydawnictwo Naukowe, p. 147-158.

TARKOWSKI, M. [ed.] (2003): Profil wrażliwości gospodarki regionalnej na integrację z Unią Europejską. Województwo wielkopolskie. (Sensitivity of regional economies to integration with the European Union: Wielkopolska voivodeship). Gdańsk, Instytut Badań nad Gospodarką Rynkową.

ZALESKI, J., TOMASZEWSKI, P., WOJTASIAK, A., BRADLEY, J. (2004): Modyfikacja i uaktualnienie wersji modelu HERMIN dla Polski. (Modification and updating of the version of the HERMIN model for Poland). Wrocław, Wrocławska Agencja Rozwoju Regionalnego.

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DEVELOPING THE CAPITAL CITY FUNCTIONS OF BRATISLAVA

Vladimír SLAVÍK, Robert GRÁC

Abstract

Bratislava – along with ten other cities – is one of the European capitals that came into existence most recently after the formation of new States at the end of the 20th century. Following the dissolution of Czechoslovakia and the birth of the Slovak Republic in 1993, Bratislava became the capital of an independent State entity for the third time in its history. The objective of this paper is to analyze the process of developing capital functions, not only in the past but primarily after 1993. In previous research, several authors have dealt with the issue but, in most cases, questions regarding the spatial location of institutions were capital-related and the administrative function was neglected. After a brief recapitulation of the function of the capital in the past, we examine the process of developing a network of all central authorities and other public administration institutions, at regional and lower levels.

Shrnutí

Formování funkce hlavního města Bratislavy

Bratislava patří spolu s deseti dalšími velkoměsty k evropským hlavním městům, která vznikla teprve nedávno po vytvoření nových států na konci 20. století. Po rozdělení Československa a zrodu Slovenské republiky v roce 1993 se stalo město Bratislava hlavním městem nezávislého státního subjektu po třetí v dějinách. Cílem tohoto příspěvku je analyzovat proces vývoje funkce hlavního města nejen v minulosti, ale zejména po roce 1993. Doposud se uvedeným tématem zabývalo několik autorů, avšak ve většině případů byl aspekt týkající se prostorové lokalizace institucí dáván do souvislosti s kapitálem a správní funkce byla opomíjena. Po stručné rekapitulaci funkce hlavního města v minulosti, zkoumáme proces rozvoje sítě ústředních orgánů a dalších veřejně-správních institucí na regionálních a nižších úrovních.

Key words: *Bratislava, capital, administrative function, central authorities, public administration, Slovakia*

1. Literature review

We have registered an increased interest in issues concerning Bratislava since 1993. One of cardinal reasons is a re-emerged function of the capital city. Most of previous works dealt with selected present and planned changes in the city (Beňuška et al., 1993; Divinský, 2000; Korec, Galasová, 1994; Korec, Husárová, 1994; Strapec, 1994, etc.). The historical development of the above mentioned function of Bratislava was chiefly addressed by J. Buček (1995). Comparative analyses of Bratislava with chosen capitals (Divinský, 2001a, 2001b) or evaluation of its position within the pan-European system of capitals (Slavík, 2003) are rarity up to now. Several authors attempted to demonstrate the current position of Bratislava in the system of largest Slovak cities (Divinský, 2001c; Korec, 2005; Korec, Rochovská, 2003; Slavík, Kožuch, Bačík, 2005) or to compare Bratislava with the neighbouring capital of Vienna (Matznetter, 2004; Mládek, Buček, Korec, 1996; Mládek, Šimko, 1998; Wolf, 2005). The new position of Bratislava after the birth of Slovakia and its gradual incorporation into the system of European capitals was a reason to assign by the author of this contribution more theses works to students (Bačík, 2001; Katonová, 2005; Lilko, 1994; Oleárnik, 2000). The spatial analysis of public administration institutions – their development, location, relocation, distribution and the like in the territory of the city – has hitherto been least covered out of all topics related to the administrative function of Bratislava. Therefore, most recently, it has been discussed in a thesis work elaborated by R. Grác (2007). In this context, some non-Slovak titles dedicated to comparative analyses of European capitals may definitely be interesting for the reader. One may more often meet with comparative analyses of a chosen group of capitals (Grimm, 1994; Häusermann, 1997; Newman, Thornley, 1994 and so on). Examples of analyses of all European capitals are rare (Vandermotten, Vermoesen, De Lannoy, De Corte, [eds.], 1999). Effort to present a hierarchization of examined capitals is a positive phenomenon. Several works try to analyze new developmental trends in the concerned cities (Häusermann, 1997; Musil, 1992; Wusten, 1994, etc.). The development of administrative function, creation of the

capital and resulting changes in the spatial structure are fundamental subjects of a model publication about the Czech capital Prague, also with examples of other European cities (Barlow, Dostál, Hampl, 1994).

2. Geographic position of Bratislava

Favourable geographic position is one of essential prerequisites for the successful function of the capital. The geographic position of Bratislava was important and strategic in the past, as well as is at present. These attributes are most often considered to be the main assets within the geographic position of Bratislava: its gateway position, the position on the Danube River, the position at the boundary lines of three States, and the position close to neighbouring capitals. Contrast to these, the eccentric position within Slovakia is taken for a negative feature; however, it is today unambiguously overshadowed by the above mentioned pros.

C. Votrubec (1980) defined four kinds of urban position from the socio-economic viewpoint. Most of European capitals are characterized by dominant defensive or transport positions, which are often complementary. Bratislava belongs exactly to this group of cities. Particularly ports are cities with an extraordinary favourable transport position. As many as 14 European capitals are seaports (London, Amsterdam, Lisbon, etc.). Bratislava belongs to river ports, which benefit also from the fact that they lie at the confluence of two rivers (similarly to Kiev, Beograd). Really unique is the position of Bratislava in the vicinity of two other capitals (Vienna – just 67 km, and Budapest). This is a very good precondition for multilateral cooperation (besides fulfilling the function of the capital).

3. Historical aspects of making Bratislava a capital

The objective of this text part is not to provide an exhausting view of Bratislava's historical development, but rather to point out in a brief form crucial periods and events that influenced most decisions leading to the establishment of Bratislava as a capital city. According to several authors dealing with the history of the city (Buček, 1995; Horváth, 1990; Šášky, 1992, Špiesz, 2001), it is possible to identify three periods when Bratislava fulfilled the role of the capital:

a. the capital of the Hungarian Kingdom during the Turkish wars;
b. the capital of the Slovak State during WWII;
c. the capital of the Slovak Republic after the split of Czecho-Slovakia.

For the first time, Bratislava became the capital of the Hungarian Kingdom in 1536. In that year, the then capital city – Buda – was conquered by Turks and its function was transferred to Bratislava. The Hungarian Parliament declared Prešporok (the then name of Bratislava) the provisional capital of the Hungarian Kingdom, the seat of the Parliament, central authorities, and the Primate. The Royal Council of Governor-General and the Hungarian Court Chamber were the most significant central authorities at those times. In 1563, Prešporok became also a coronation town of Hungarian kings and thus joined the list of European coronation cities (Aachen, Speyer, Vienna, Cologne, Cracow, and others). In the course of almost 3 centuries (1563-1830), altogether 19 coronations were held in Prešporok. This function was before fulfilled by Székesfehervár (Fundárek, 1971; Holčík, 1986; Horváth, 1982).

The Royal Council of Governor-General was established in 1526; it operated in Bratislava from 1530. Its role was to decide on the internal affairs of the Kingdom, to supervise the defense of the country, the activities of the Chamber and the whole system of jurisdiction. The Council's seat was in the very city center (today the building is used by the Slovak Republic Government Office).

The Hungarian Court Chamber (Fig. 1) fulfilled the tasks in the area of State economy management, kept files on royal and provincial properties, and supervised tax collection. It may be stated that the Chamber was an analogy to the Ministry of Finance and the National Property Fund. Currently, the University Library has its seat in the original Chamber's building.

Moreover, Bratislava hosted sessions of the Hungarian Parliament as a legislative assembly of privileged classes in the Hungarian Kingdom. Therefore, numerous Hungarian nobilities used to come to the city in parallel with the given central Hungarian authorities. Because of frequent sessions and the resulting need to sojourn in Bratislava, these nobilities bought up estates and built own residencies in the town (Šášky, 1992). More of them were quite large and luxury palaces that are today of historical significance and some serve as seats of important institutions. Typical examples are: the Kutscherfeld Palace – now the seat of the French Institute and French Embassy; the Pálffy Palace – the seat of the Austrian Embassy, the Grassalkovich Palace – during 1939-1945 the seat of the then president Jozef Tiso, later renamed to the House of Pioneers and Youth, and since September 1996 once again the seat of the President of the Slovak Republic; then Lafranconi Palace – at present the seat of the Ministry of the Environment, and many others. Thus, as demonstrated, in the historical context, right this period may be characterized as crucial from the viewpoint of making Bratislava a capital and, simultaneously, an administrative center.

Fig. 1: The Hungarian Court Chamber (Photo R. Grác).

Bratislava was the capital until 1783 when the central Hungarian authorities were transferred back to Buda; however, the Hungarian Parliament worked in the city until 1848. "Decision on Bratislava as the capital was substantiated by not only external factors (Turkish raids), but also by internal geopolitics of the State. The position of Bratislava between the two wings of Hungaria was apparent, thereby the city played an important integrating role for the whole Hungarian Kingdom" (Buček, 1995). Bratislava took advantage of its position – proximity of Vienna, the strategic position protecting it against the invasion of enemies from the west, control over the Danube River, safe distance from peripheral pressures.

For the second time, Bratislava became the capital during World War II. According to J. Buček (1995), sovereignty was achieved under the influence of external pressures (the Munich Dictate, the Vienna Arbitrage) and related territorial transformations. But this time, Bratislava was perceived as a full-valued capital city of the new State. The relevance of this fact is evident from the viewpoint of potential territorial changes in Slovakia in the case of non-accepting the function of the capital; if Bratislava had not been recognized as the capital city, Slovakia would have likely lost the city's territory and even the access to the Danube R.

For the third time, Bratislava became the capital city in 1993, after the split of Czecho-Slovak Federation and the establishment of a new country in Central Europe – Slovak Republic. J. Buček (1995) assessed the qualitative aspect of Slovak statehood formation. According to him, it was diametrically opposite compared to the preceding periods with regard to international détente, non-interference of other countries, respecting interior affairs and decisions, the peace situation and the continuity of capital city function in the past periods. The location of the capital was not challenged at this stage at all.

4. Making Bratislava a capital and an administrative center since 1993

Following the division of Czecho-Slovakia, Bratislava as a capital of the Slovak Republic and a regional centre of European significance concentrates important administrative functions. This fact is reflected in the current extent and sensible growth of administration which is represented by a wide range of international, national, regional, local and urban facilities.

Within public and State administration, facilities of central authorities of State administration have a special position; this results from the position of Bratislava as

a capital of the Slovak Republic. Bratislava is naturally a representative centre of the State, diplomatic missions, government authorities, municipal and district authorities. It is also a prominent administrative and executive centre with the seat of the President of the Slovak Republic, the National Council of the Slovak Republic, and the Government of the Slovak Republic with individual Ministries. Bratislava is at present also a financial centre of Slovakia with agencies of financial institutions from abroad. The city is the seat of representation, management, administration and operation of important economic subjects, design agencies, social organizations of local and national significance. It is thus an economico-political and socio-cultural centre.

With respect to the contemporary lack of representative rooms and representative and fully equipped administrative buildings to rent, many administrative functions are located notably in the historical zone of Bratislava with potential negative impacts on the surroundings and social structure. Both diplomatic representative offices and central organs of State administration have high demands on the high quality of rooms, therefore only some of them meet high criteria for dignified representation.

4.1 Creating a network of central authorities, State administration bodies with national competencies, and local authorities in the city's territory

Prior to performing a spatial analysis of the mentioned administrative institutions, it is necessary to explain the current territorial-administrative division of Bratislava. Since 1996, the capital has been divided into 5 administrative districts (Bratislava I to V) and 17 town districts (Fig. 2). As to the location of public administration related to the capital, the most important city part is the Old Town that is simultaneously territorially identical with the administrative district Bratislava I.

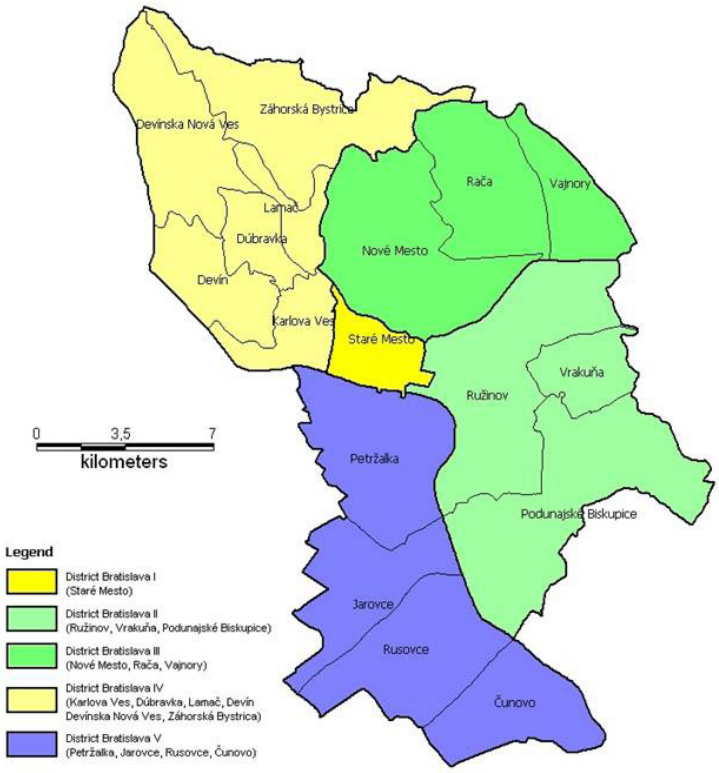

Fig. 2: Territorial-administrative organization of the Bratislava city (2008)

The first prerequisite for fulfilling the function of the capital in the Slovak Republic was an optimum seat for its President. The selection of an adequate locality took some time. Particularly two localities – that played such an important role already in the past – were carefully considered. One of the proposals was to place the seat of the President in the Bratislava Castle which was during the period, when Bratislava became the capital of the Hungarian Kingdom, the seat of Kings (Fig. 3 – see cover p. 4). Finally, this idea was abandoned because the Castle premises do not comply with requirements of high-quality representation. (Today, the Castle serves as a museum and its large and a long-term reconstruction is planned.)

The second variant suggested to place the seat of the President in the Grassalkovich Palace that already fulfilled such a function. This palace partly assumed the role of the Castle Palace at the end of the period when Bratislava was the capital for the first time (Holčík,

1986). During 1939-1945, the building served as a seat of the then President of the Slovak State Jozef Tiso. Later, the Palace of Grassalkovich was used by pioneers and renamed to the House of Pioneers and Youth. Since September 1996 – after a reconstruction – it became once again the seat of the President of the Slovak Republic (Fig. 4 – see cover p. 4).

The Parliament was another significant institution to be considered. Since 1945, the seat of the then Slovak National Council was several times changed. At first, the Council was located in the Trebišov town, later in the city of Košice where the Council structures were completed – the Presidium, the Plenum, and the Board of Commissioners – and, finally, in Bratislava. Towards the end of the Czecho-Slovak Federation, the seat of the Slovak National Council was situated at the former Zhupa House in the contemporary Zhupa Square (not far from the present Presidential Palace) (Fig. 5 – see cover p. 3). After the erection of a new building close to the Bratislava Castle (Fig. 6 – see cover p. 3), the Parliament moved to new premises, but it retained also the old ones. With regard to the fact that the new building was originally intended and partially built for other purposes (the Central-European University), it does not have all qualities of a modern parliament. Later, new office spaces for the Members of Parliament were rebuilt on the premises of the Bratislava Castle.

The Government of the Slovak Republic was situated in the former Summer Archbishop's Palace, which housed the Government already in the communist period and which is located not far from the Presidential Palace.

4.2 Development of ministries in the Slovak Republic during 1990-2008

It is natural that Ministries and other central bodies of State administration had the greatest spatial demands – because of their number. In this case, the most rational variant was chosen, at least in the first years – single ministries were located in those buildings where ministries worked also in the period of the Czecho-Slovak Federation. At searching new localities, priority was given to those ministries, which were missing in the system in Bratislava under communism. These were, for example, the Ministry of Defense, the Ministry of Justice, the Ministry of Transport, Posts and Telecommunications of the Slovak Republic. At the end of the Czecho-Slovak Federation, there were 18 ministries in Bratislava. After the birth of an independent Slovakia, some of them were abolished, some merged, some were renamed, and some new ones were established. A total number of Slovak ministries finally stabilized in 1995 was fifteen. The last change occurred in 2003; the Ministry of State Property Administration and Privatization was abolished and the total number of ministries was reduced to 14.

Regarding the placement of ministries within the hitherto development, we cannot speak of a tendency to concentrate them in selected localities, since their network was assumed from the past. Most of the ministries are situated in areas closely surrounding the historical core of Bratislava, in which large administrative buildings emerged in communist times. In view of the city's administrative division, it is still within the boundaries of the Staré Mesto (Bratislava I) where one may find 9 of currently existing 14 ministries. Three ministries lie in the Bratislava III district and two are located in the Bratislava II district with the latter having a specific position. The Ministry of Economy is currently the largest Slovak ministry as to the number of employees and, above all, the number of competencies. The Ministry of Construction and Regional Development changed its seat as the very last one, moving to new administrative premises. However, the experience from this relocation is rather negative, as the Ministry just rented the premises. A special feature of large ministries is that they are usually located in two or more buildings (Ministry of Economy, Ministry of Interior).

4.3 The phenomenon of "government quarters"

In the recent period, a new phenomenon of "government quarters" or "government towns" begins to appear worldwide. This phenomenon did not avoid Slovakia either. The latest news emerged about an attempt of some current Slovak ministers to enforce in the Government a project of "central government city" to be implemented before 2010. One of alternatives is to move at least four ministries into one complex. As a matter of fact, the objective of the idea is to integrate these ministries at one place with a new, global, comprehensive infrastructure. And another minor alternative is taken into account and investigated – to unite the headquarters of the Ministry of Finance and the Ministry of Defense. Implementation of such a project should curtail the costs related to operation. The idea of the project meets with a positive response so far, but opinions have been expressed that the "government town" should be established outside Bratislava – e.g. in Žilina, or in Banská Bystrica. It is argued that Bratislava has an eccentric position and that a need exists to locate these institutions in regions located closer to the centre. The described idea of moving the capital city appeared for the first time in the media some 10 years ago.

The idea of creating the "government towns" is currently a relatively often discussed topic and it was debated also in the past. The phenomenon of "government towns" has been recently discussed in Budapest where the Hungarian Government plans to create a "government quarter" right in the city center. It is planned to transfer all ministries to this place and other central State institutions until

1990-1999	2000-2008	The Seat by district in 2008
The Ministry of Economy of the SR	The Ministry of Economy of the SR	Bratislava III
The Ministry of Finance of the SR	The Ministry of Finance of the SR	Bratislava I
-	The Ministry of Transport, Posts and Telecommunications of the SR	Bratislava I
The Ministry of Agriculture and Food of the SR	The Ministry of Agriculture of the SR	Bratislava I
The Ministry of Construction and Building of the SR	The Ministry of Construction and Regional Development of the SR	Bratislava III
The Ministry of Interior of the SR	Ministry of Interior of the SR	Bratislava I
-	Ministry of Defence of the SR	Bratislava II
-	The Ministry of Justice of the SR	Bratislava I
The Ministry of International relations SR	The Ministry of Foreign Affairs of the SR	Bratislava I
The Ministry of Labour and Social Affairs of the SR	The Ministry of Labour, Social Affairs and Family of the SR	Bratislava I
The Slovak committee for Environment	The Ministry of Environment of the SR	Bratislava I
The Ministry of Education, Youth and Sport of the SR	The Ministry of Education of the SR	Bratislava II
The Ministry of Culture of the SR	The Ministry of Culture of the SR	Bratislava I
The Ministry of Health Service of the SR	The Ministry of Health Service of the SR	Bratislava II
Ministry for State Property Administration and Privatization	*Ministry for State Property Administration and Privatization*	-
The Ministry of Business and tourism of the SR	-	-
The Ministry of Forest and Wood Economy of the SR	-	-
The Ministry of Verification of the SR	-	-
The Ministry of Industry of the SR	-	-
Ministry for economy strategy SR	-	-

Tab. 1: Development of ministries in the Slovak Republic during 1990-2008
Notes:
During 1990-1992, Slovak ministries operated within the Czech and Slovak Federative Republic
Ministry of Economy – newly established ministries in 1990
Ministry for State Property Administration and Privatization – abolished as of May 1, 2003

2009. Only the seat of the Prime Minister should be an exception remaining in the existing place.

Similarly as the "government quarters" or the "government towns", artificially created capital cities emerged for instance in Canberra, Australia as a compromise between Melbourne and Sydney since they both argued about the political power. The construction of Canberra began in 1913, and in 1927, all ministries and the Government were moved in. Another example of an artificially created city is Brasil. It officially came to existence in 1960, although the idea was born much earlier. Artificial capitals were established under totalitarian regimes too – for example Duschanbe, the capital of Tajikistan, which arose in the Stalin era.

Another model we can see in the United Kingdom or in Germany. The London and Berlin models represent a natural concentration of ministries and other State institutions. Characteristic of these model is that Prime Minister and several ministries have their seats relatively close to each other. The analogical model we can see in Austria where the seats of President, Chancellor, Ministry of Foreign Affairs and Parliament are situated next to each other. However, in most cases, ministries are located within wider city centers as for example in Prague or Paris.

4.4 Network of other central authorities of State administration

A whole range of other institutions belongs in the network of other central authorities of State administration in Bratislava. In contrast to ministries, the number of these institutions in the city markedly increased after the birth of the Slovak Republic. While at the end of the period of Czecho-Slovakia merely 6 institutions were on the list of other central authorities of State administration, in 2007 their number approached 20. Besides them, a network of other institutions of State administration (of which some with national competencies) was gradually created. Likewise gradually, a network consisting of authorities of judicial power and public prosecution offices was established. In this group of institutions, efforts to situate some of them outside Bratislava and thereby to strengthen the importance of the administrative function in a selected town were enforced. In this way, the Postal Regulatory Office was thus located in Žilina, the Industrial Property Office and the Tax Investigation Office were situated in Banská Bystrica. The identical tendency was also evident in the network of institutions of judicial power and public prosecution offices. Some institutions were moved – or as newly established ones were situated – out of Bratislava. The Constitutional Court of the Slovak Republic was thus transferred to Košice; new institutions – the Special Court and the

Special Prosecutor's Office – were established in the Pezinok town in an area of former barracks after their reconstruction.

Another group is formed by institutions of State administration with national competencies. In this case, their concentration in the Old Town is not so noticeable. Eight institutions of this kind (Central Office of Labour, Social Affairs and the Family, State Treasury, Telecommunications Office and others) have their seats in Bratislava I district, in Bratislava II district even more – 9 such institutions (Customs Directorate, Public Health Authority, Presidium of the Fire Fighting and Rescuing Corps, etc.). The most important institutions of public administration not only in this group, but in general, are least represented in the districts of Bratislava IV and Bratislava V. In Bratislava IV, there are three institutions of this group. In Bratislava V (Petržalka, etc.) one may find in a modern building the Tax Directorate of the Slovak Republic just recently moved back to Bratislava from Banská Bystrica. Besides it, four other institutions have gradually been situated out of Bratislava, namely in Košice, Banská Štiavnica, Nitra and Trenčín.

Concluding this part we may claim that – besides public administration institutions related to the function of the capital – a whole series of institutions ensuring the smooth operation of local State administration and self-government is concentrated in Bratislava. Local State administration is created by a network of regional and district offices (both general and specialized). Self-government has a particular position in Bratislava. It is organized at three levels. The first, regional, covers the city and 3 neighbouring districts (the seat of the self-government region); the second represents the city itself (the City Municipality), and finally the last level is formed by 17 city parts (with 17 Local Offices).

All the mentioned institutions are spread over the territory of Bratislava. Requirements for their location in the city centre have been expressed especially by the regional administration and regional self-government (it struggled for several years for the Zhupa House, but unsuccessfully) and of course by the chief representation of the city administration – Bratislava City Municipality. This institution occupies several historical buildings in the city centre, among others – notably for representation purposes – the Primate's Palace, which is thought of as the most representative palace in the city (Holčík, 1986). This palace, known also at the Winter Archbishop's Palace, entered the history of Bratislava after the fire of the Bratislava castle (1811) as the temporary residence of Hungarian kings during their coronations and the place where the Treaty of Pressburg was signed in 1805.

As regards the spatial organization of local State administration, it is necessary to say that locating two or more offices in one building has been practiced very often. This is the case of several institutions of State administration with national competencies, common institutions at the regional or the local level (e.g., environmental offices, cadastral offices, land offices, courts, public prosecution offices, etc.) or some institutions of specialized State administration with the competency for several districts of Bratislava (tax offices, cadastral branches).

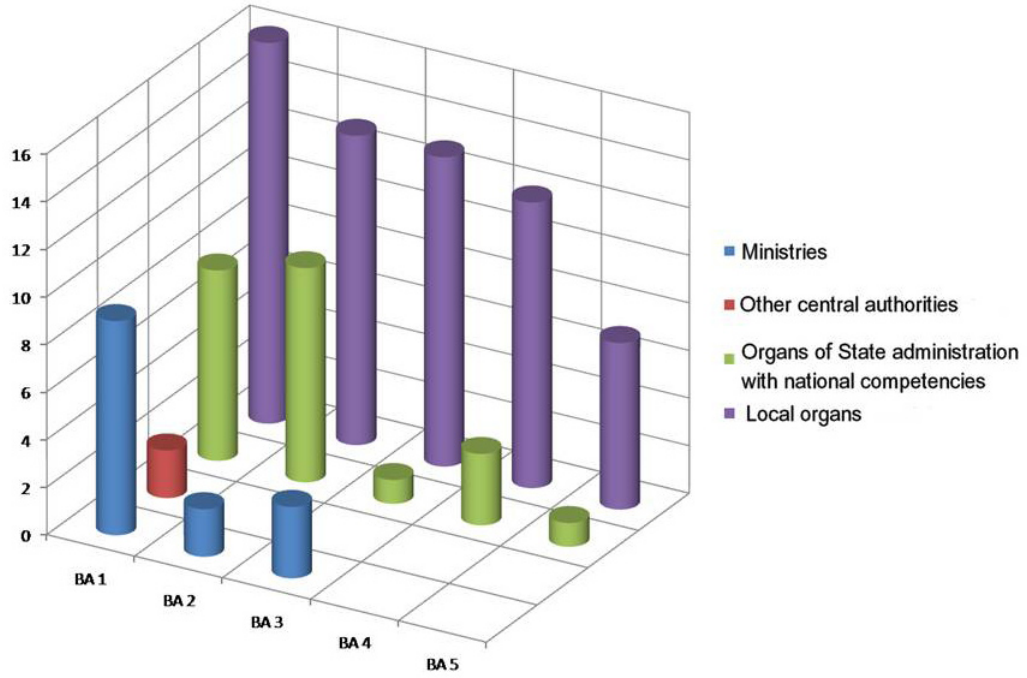

Fig. 7: Network of central authorities, organs of State administration with national competencies, and local organs in the city's territory (2008)

5. Conclusion

The function of the capital returned to Bratislava in 1993. To a great degree, the potential inherited from the rich history of this city function has been used in gradual creation of the network of relevant institutions and in fulfilment of the tasks related to the capital of Bratislava during the recent period. Basically we may claim that most of the national institutions were located in the existing stock of significant historical buildings in the city center (in the case of need, inevitable reconstruction was performed). Central authorities were only exceptionally situated in newly constructed buildings. The capacity of new administrative spaces will quickly grow after the completion of unfinished (or just planned) important investment projects that should radically transform several city parts in zones surrounding the city core in a short time. In the next period, we may expect that the problem will increase of how to make the created network of central administrative institutions more rational and effective, together with looking for reserves for the location of new institutions.

References:

BAČÍK, V. (2001): Vplyv administratívnej funkcie na dynamiku vývoja miest SR. [Diplomová práca]. Bratislava, Univerzita Komenského, Prírodovedecká fakulta. 89 p.p + 56 pp. príloh.

BARLOW, M., DOSTÁL, P., HAMPL, M. (1994): Development and Administration of Prague. Amsterdam, University of Amsterdam, Charles University, Prague, Czech Academy od Science, Prague. 172 pp.

BÁRTLOVÁ, A. (2002): Dvadsaťročie rôznorodých premien: Z tieňa európskych metropol vyrástla moderná Verejná správa, 2002, p. 26-27.

BAŠOVSKÝ, O., PAULOV, J., IRA, V. (1981): Ekonomický rozvoj Bratislavy a problémy jej životného prostredia. AFRNUC Formatio et Protectio Naturae, No. 6. Prírodovedecká fakulta UK, Bratislava, p. 1-21.

BAŠOVSKÝ, O. MLÁDEK, J. (1989): Geografia obyvateľstva a sídiel. 2. vyd. Univerzita Komenského, Bratislava, 221 pp.

BEECHEY, R. (1999): Verejná správa: úvod do miestnej štátnej správy a miestnej samosprávy v krajinách Európskej únie a na Slovensku. Inštitút pre verejnú správu, Bratislava, 32 pp.

BENNETT, J. R. (1997): Administrative systems and economic spaces. Regional Studies, Vol. 31, No. 3, p. 323 – 337.

BEŇUŠKA, P. et. al. (1993): Stratégia rozvoja hlavného mesta SR Bratislavy (Development strategy of the capital of Slovakia – Bratislava). Útvar hlavného architekta hlavného mesta SR Bratislavy a Aurex pre magistrát hlavného mesta SR Bratislavy, Bratislava.

BEŇUŠKA, P. et. al. (1997): Stratégia rozvoja hlavného mesta SR Bratislavy (Development strategy of the capital of Slovakia – Bratislava). Bratislava : Útvar hlavného architekta hlavného mesta SR Bratislavy, 1997.

BUČEK, J. et al. (1993): Geoekonomická pozícia Slovenskej republiky a niektoré jej dôsledky (Úvod do problematiky podkladová štúdia). 230 pp.

BUČEK, J. (1995): Mesto, štát a územie (City, state and territory). Doctor´s dissertation. Univerzita Komenského, Prírodovedecká fakulta, Bratislava, 74 pp.

DIVINSKÝ, B. (2000): Koncepcia morfologického mesta a jej aplikácia na Bratislavu. Urbánne a krajinné štúdie, No. 3. Prešovská univerzita, Prešov, p. 39-47.

DIVINSKÝ, B. (2001a): Bratislava within the System of Selected Central European Metropolities – A population Analysis. European Spatial Research and Policy, Vol. 8, No 1, p. 91-103.

DIVINSKÝ, B. (2001b): Postavenie Bratislavy v stredoeurópskom metropolitnom systéme z populačného hľadiska. Geografický časopis, Vol. 53, p. 171-190.

DIVINSKÝ, B. (2001c): K hodnoteniu pozície Bratislavy v urbánnom systéme Slovenska na základe populačného potenciálu. Acta Facultis Rerum Naturalium Universitatis Matthia Belii, Geografické štúdie No. 8. Univerzita Mateja Bela, Banská Bystrica p. 82-90.

FALŤAN, Ľ. (1997): Pozícia Bratislavy v regionálnom rozvoji Slovenska. In: Aktuálne problémy regionálneho rozvoja (zborník z medzinárodnej konferencie). Banská Bystrica, p. 155-161.

FRANCU, D. (1984): Porovnanie Bratislavy s inými hlavnými mestami. Architektúra a Urbanizmus, Vol. 18, No 2, p. 91-109.

FUNDÁREK, J. (1971): Bratislava – hlavné a korunovačné mesto starého Uhorska. Bratislava VII, p. 115-181.

GRÁC, R. (2007): Bratislava ako administratívne centrum v kontexte medzinárodnej politiky. [Diplomová práca]. Univerzita Komenského, Prírodovedecká fakulta, Bratislava. 140 pp. + 13 pp. príloh.

GEENHUIZEN, M., NIJKAMP, P. (1999): Regional Policy Beyond 2000:learning as device. European spatial research and policy. Vol. 6, No. 2,. p. 5-21.

GORZELAK, G., JALOWIECKI, B., KUKLINSKI, A., ZIENKOWSKI, L. (1994): Eastern and Central Europe 2000. Final report of research project. Warsaw.

GRIMM, F.-D. [ed.] (1994): Zentrensysteme als Träger der Raumentwicklung in Mittel- und Osteuropa. Beiträge zur Regionalen Geographie, Vol. 37, 154 pp.

HARENBERG, B. (1995): Kronika 20. storočia. Fortuna Print, Bratislava, 1568 pp.

HÄUSERMANN, H. (1997): Von der sozialistischen zur kapitalistischen Stadt. In: Kovács, Z., Wiesner, R. [eds.]: Prozesse und Perspektiven der Stadtentwicklung in Ostmitteleuropa. Münchener geographische hefte, Vol. 76, p. 21-31.

HOLČÍK, Š. (1986): Korunovačné slávnosti Bratislava 1563-1830. 1. vyd. Tatran, Bratislava 1986, 84 pp.

HORVÁTH, V. (1982): Bratislava hlavným mesto Uhorska. In: Horváth, V., Lehotská, D., Pleva, J. [eds.]: Dejiny Bratislavy. 3. vyd. Obzor, Bratislava, p. 92-105.

HORVÁTH, V. (1990):. Bratislavský topografický lexikón. 1. vyd. Tatran, Bratislava, 403 pp.

HORVÁTH, V., RÁKOŠ, E., WATZKA, J. (1977): Bratislava, hlavné mesto Slovenska. Obzor, Bratislava, 421 pp.

HROMÁDKA, J. (1933-1935): Zemepis okresu bratislavkého a malackého. Nakl. Učiteľstva, Bratislava, Vol. I - 212 pp., Vol. II - 274 pp.

KACZMAREK, T. (2005): Struktury terytorialno-administracyjne i ich reformy w krajach europejskich.Wydawnictwo Naukowe UAM, Poznań, 392 pp.

KATONOVÁ, M. (2005): Európske metropoly. - [Diplomová práca]. Univerzita Komenského, Prírodovedecká fakulta, Bratislava, 83 pp. + 62 pp. príloh.

Kolektív (2001): Dejiny Bratislavy. 1. vyd. BIS, Bratislava.

KOREC, P. (2005): Regionálny rozvoj Slovenska v rokoch 1989-2004. Geografika, Bratislava 227 pp.

KOREC, P., GALASOVÁ, S. (1994): Geografická poloha Bratislavy v nových hospodársko-politických podmienkach. Geografický časopis, Vol. 46, No. 1, p. 75-86.

KOREC, P., HUSÁROVÁ, K. (1994): Územie Bratislavy z hľadiska perspektívy jeho využívania. Geographia Slovaca, Vol. 7, p. 61-73.

KOREC, P., ROCHOVSKÁ, A. (2003): Big Cities of Slovakia, the law and specific features of their development after 1989. In: Geographical space at the turn of the century. Theoretical and methodological challenges. Warszaw University, Warszawa, p. 65-73.

LEHOTSKÁ, D., PLEVA, J. [eds.] (1966): Dejiny Bratislavy. 1. vyd. Obzor, Bratislava.608 pp., + príl.

LILKO, P. (1994): Nové hlavné mestá Európy. - [Diplomová práca]. Univerzita Komenského, Prírodovedecká Fakulta, Bratislava. 103 pp. + mapové prílohy.

MATZNETTER, W. (2004): The Vienna and Bratislava Urban Regions: Comparing Urban Development under (Welfare) Capitalism and (Post-) Comunism. European Spatial Research Policy, Vol. 11, No 1, p. 61-77.

MLÁDEK, J., ŠIMKO, D. (1996): Cooperation between Vienna and Bratislava: development and new possibilities. AFRNUC, Geographica, No. 38. Univerzita Komenského, Bratislava, p. 109-121.

MLÁDEK, J., BUČEK, J., KOREC, P. (1998): Historical aspects and current development of Relations in the Bratislava – Vienna space. In: Borderlands or transborder regions – geographical, social and political problems, Opole-Lodz, p. 264-269.

MUSIL, J. (1992): Změny městských systémú v postkomunistických společnostech střední Evropy. Sociologický časopis, Vol. 28, No. 4, p. 451-462.

OLEÁRNIK, V. (2000): Porovnávacia analýza hlavných miest v Európe. [Diplomová práca]. Univerzita Komenského, Prírodovedecká fakulta, Bratislava. 128 pp. + 49 pp. príloh.

SLAVÍK, V. (1997): Mestá Slovenskej republiky a ich administratívna funkcia. In: Acta Universitatis Matthiae Belii, Geografické štúdie No. 3. Banská Bystrica, p. 93-101.

SLAVÍK, V. (2003): Bratislava in the european capital city system. In: Geographical space at the turn of the century. Theoretical and methodological challenges. Warszaw University, Warszawa p. 151-158.

SLAVÍK, V., KOŽUCH, M., BAČÍK, V. (2005): Big cities in Slovakia: development, planning, contemporary transformation. European spatial research and policy, Vol. 12, No. 2, p. 47-69.

STRAPEC, M. (1994): Príprava nového územného plánu Bratislavy. Projekt, Vol. 36, No. 2, p. 6-7.

ŠÁŠKY, L. (1981): Kamenná krása našich miest. 1. vyd. Osveta, Martin, 408 pp.

ŠÁŠKY, L. (1992): Bratislava/Mesto na Dunaji. 1. vyd.: Rada ÚNV v Bratislave vo vyd. Osveta. Bratislava 200 pp.

ŠPIESZ, A. (2001): Bratislava v stredoveku. 1. vyd. Perfekt v spolupráci s Mestským múzeom v Bratislave Bratislava. 232 pp.

VAISHAR, A. (2000): Globalizace a její vplyv na rozvoj Brna. Geografický časopis, Vol. 52, No 1, p. 77-87.

VANDERMOTTEN, CH., VERMOESEN, F., DE LANNOY, W., DE CORTE, S., [eds.] (1999): Villes d´Europe. Cartographie comparative. Bruxelles, Bulletin du Crédit Communal, 53e anné, No 207-208, 1-2, 408 pp.

VEREŠÍK, J. (1974): Geografická charakteristika väčších miest Slovenska. in: PLESNÍK, P. et. al.: Slovensko 3: Ľud – 1. časť. Obzor, Bratislava p. 579-636.

VEREŠÍK, J. (1974): Geografia sídiel. In: Plesník, P. et. al.: Slovensko 3: Ľud – 1. časť. Obzor, Bratislava, p. 459-644.

VOTRUBEC, C. (1980): Lidská sídla, jejich typy a rozmístění ve světě. 1. vyd. Academia, Praha, 396 pp.

WOLF, S. (2005): Wien und Bratislava: Starke Nachbarn im Zentrum Europas. Pressburger Zeitung,. März-April, p. 14-15.

WUSTEN, H. (1994): Capital cities: a node, a hinge and a focus. In: Barlow, M., Dostál, P., Hampl, M. [eds.]: Development and Administration of Prague. Amsterdam, University of Amsterdam, Charles University, Czech Academy of Sciences, 1994, p. 141-148.

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ECOLOGICAL ASSESSMENT OF LANDSCAPE DEVELOPMENT AND CHANGES IN THE IVANČICE MICROREGION (CZECH REPUBLIC)

Tereza STRÁNSKÁ, Marek HAVLÍČEK

Abstract

An assessment of the development and changes in the landscape of the Ivančice region over the period 1837-2006 is presented in this article. The monitoring of changes in this landscape was based on old topographic maps, in combination with other historical materials (photographs, chronicles). Analysis of landscape development was based on land use changes in five time periods. The results revealed a distinct simplification of landscape structure and, in particular, a radical shrinkage of permanent grassland stands since the 1950s.

Shrnutí

Ekologické hodnocení vývoje krajiny a její změny v mikroregionu Ivančicko (Česká republika)

Příspěvek se zabývá hodnocením historického vývoje krajiny Ivančicka v letech 1837-2006. Sledování změn krajiny bylo hodnoceno na základě starých topografických map v kombinaci s dalšími historickými prameny (fotografie, kroniky). Vývoj zájmového území byl sledován v 5 časových obdobích. Výsledky analýz ukázaly výrazné zjednodušení krajinné strukutry a především radikální úbytek trvalých travních porostů po roce 1950.

Keywords: *old maps, land use changes, coefficient of ecological stability, microregion Ivančice (Czech Republic)*

Introduction

Landscape changes in the Ivančice microregion were monitored within the framework of the long-term research programme MSM 6293359101 – Research into sources and indicators of biodiversity in cultural landscape in the context of its fragmentation dynamics, Part 1 Quantitative analysis into the dynamics of landscape development in the Czech Republic in the last 250 years (landscape fragmentation dynamics).

Detailed topographic old maps are a good information source for ecological studies into the land use development of the cultural landscape. Land use changes are caused by changes in the society, which together with the environment have interacted in a long term effect on the landscape. These changes can be quantified in terms of various characteristic and indices and analysed using Geographic Information Systems (Palmer, 2004; Milanovat et al., 1999; Skaloš, 2007). In recent years, numerous case studies have focused on both ecological and socioeconomic aspects of the transformation of natural landscapes and respective land use changes (Cousins, 2001; Petit and Lambin, 2002; Kolejka, 1985).

There are several reasons why the Ivančice microregion was chosen. First, the female author of the paper is familiar with the area under study (she conducted many surveys there, Dissertation, Ph.D. Thesis). Second, the model microregion consists of two different areas, which was the point of interest. The first area includes a harmonical cultural landscape in the sourroundings of Jihlava R., Oslava R. and Rokytná R. The second part is situated in the southern part of the model microregion and it is a typical intensive agricultural landscape in the alluvial plain of the Jihlava R. Thus, it was possible to compare land use changes in two very different areas.

Main objectives of this part of the research programme are as it follows:

- the cartographic and statistic comparison of changes in the use of individual landscape types in the last 250 years
- evaluation of main trends in the dynamics and development of the main types of the cultural landscape of the Czech Republic in the last 250 years based on the compilation of land use maps for the respective periods, and on the basis of analytical maps of landscape changes within the whole country. Department of GIS Applications and Department of Landscape Ecology, Silva Tarouca Research Institute for Landscape and Ornamental Gardening, s.v.i. work jointly on this part of the research programme.

There is also a range of detailed studies on landscape changes in smaller areas. One of them is the Ivančice microregion. Results from the analyses and land use maps can be used not only for various scientific and expert purposes but also in practical landscape management and preparation of concrete measures in the landscape.

Methods

The monitoring of landscape changes dwells on old topographic maps in the digital form. The office in Brno uses digital maps from the First Austrian military mapping on a scale 1:28 800 (1764-1768). Scales of the second and third Austrian military mapping were 1:28 800 (1836-1852) and 1:25 000 (1876-1880), respectively. Reambulated maps from the 1920s-1930s are on a scale 1:25 000, Messtichblätter of Moravia from the 1940s on a scale 1:25 000, military topographic maps of the S-1952 system from the 1950s on a scale 1:25 000, military topographic maps of the S-42 system from the 1970s, 1980s and 1990s at 1:25 000. The scale of base maps of the Czech Republic from the present time (2002-2006) is 1:10 000. Only five map sets were used for landscape monitoring in the Ivančice microregion: maps from the 2nd and 3rd Austrian military mapping, military topographic maps from the 1950s and 1990s, and the contemporary base map 1:10 000 (2002-2006).

The old map sets we gained in cooperation with the Laboratory of Geoinformatics, J.E.Purkyně University Most, the Map Collection at Charles University Prague, Institute of Geography at the Faculty of Science, Masaryk University Brno, University of Defence Brno, Military Geography and Hydrometeorology Office in Dobruška, and Ministry of the Environment of the Czech Republic. The old maps georeferencing was worked out jointly by the Brno office with the Department of Geomatics at the University of West Bohemia. The maps from the 1st and the 2nd Austrian military mapping we gained in the digital form, other maps were scanned by the Department of GIS Applications in Brno using the scanner at a resolution of 400 DPI. All map sets with an exception of the 1st military mapping were georeferenced by using the S-JTSK coordinate system at the Brno office and at the University of West Bohemia. Because the first military mapping was not based on geodetic measurements and on the triangulation grid, its georeferencing is very complicated and the map set has not been used for the quantification of land use changes and for detailed GIS analyses so far. In order to monitor the landscape changes, digital maps of land use were created from the individual map sets in the GIS software ArcView. Nowadays, there are many land use development methods and land use changes methods (Kolejka, Marek, 2006; Lipský, 2000). We used the classical method of digitalization in the analyses (each period was digitalized separately). Due to the classical method, some residual polygon emerged. The following basic land use classes were monitored: arable land, permanent grassland, garden and orchard, vineyard and hop-field, forest, water area, rural built-up area, urban built-up area, recreational area and other areas. By comparing the land use maps, main trends in the land use changes can be identified along with permanently used or dynamically changing sites.

The coefficient of ecological stability was calculated for the respective periods and cadastral areas in addition to the analysis of land use changes. It is based on the territorial share of individual land use forms (Lipský, 2000). The coefficient of ecological stability is defined as a ratio of sites relatively ecologically stable to areas relatively ecologically unstable. The relatively stable sites include the following classes: permanent grassland, orchard outside the built-up area, forest and water surfaces. The relatively unstable sites include the classes of arable land, vineyard, rural and urban built-up area, recreational and other areas.

Location of the study area

The area of interest is situated in the South-Moravian region (Jihomoravský kraj), in the southwestern part of the district Brno-Province (Fig. 1) and is formed by the administrative district of the Ivančice municipality with extended competences. The territory includes 25 cadastral areas, which total an area of 17.2 km^2. The share of this territory in the district of Brno-venkov amounts to 13.1%, and the microregion includes three historically important towns (Ivančice, Oslavany and Doulní Kounice) and 14 rural municipalities.

Natural conditions of the Ivančice microregion

A greater part of the Ivančice microregion territory belongs in the Hercynian biogeographical province and its smaller eastern part falls in the Pannonian Province. The axis of the entire microregion is formed by the valley of the middle course of the Jihlava River and its tributaries Oslava R. and Rokytná R. The relief is characterized by dissected flat hilly land with distinctly recessed valleys of the rivers mentioned above. The range of elevations is 30-130 m a.s.l., in the incised valleys up to 200 m. The highest point of the territory is the spot height in the northern part of the Ketkovice cadaster (497.7 m a.s.l.), the lowest point can be found on the Jihlava River (ca. 190 m a.s.l.) in Pravlov. The relief melts into lowland terrains in the eastern part. In geomorphological terms, the Ivančice microregion reaches in the Bohemian Upland in the Southeast, and its smaller area passes into the West Carpathians (Demek, 1987). Geological and soil conditions of the Ivančice microregion are very diverse. The Bobravská vrchovina Highland is formed by granodiorites of the Brno massif.

Fig. 1: Location of the Ivančice microregion in the Czech Republic

The territory has a significant representation of so called Permian-Carboniferous sediments filling the depression of the Boskovická brázda Furrow. Worth mentioning is also the occurrence of serpentines in refuges (the Jihlava River valley above Hrubšice) hosting typical flora and fauna. The diverse geological basement reflects in a wide range of soil conditions with cambisols, rankers, fluvisols etc. With respect to precipitation conditions, the microregion lies in the rain shadow of the Bohemian-Moravian Highland and its total annual precipitation amount does not exceed 600 mm. Temperature ranges from 8.5°C to 9.3°C. Local climatic variances are caused by the articulated relief in deep river valleys and by the variable insolation of slopes with diverse slope aspect. In hydrological terms, the entire territory belongs to the catchment of the Jihlava River as the main watercourse in the area and an axis of the territory. The southern part of the area is drained by the Rokytná R. and the Oslava R., which both empty into the Jihlava River in Ivančice. There are only a few artificial water reservoirs in the microregion none of which fulfils the recreational function and most of them are fishponds.

According to the biogeographical classification (Culek, 1996) nearly the entire territory belongs to the Jevišovice biogeographical region. Forest altitudinal vegetation zones FAVZ (vegetation tiers) represented in the territory are 1, 2 and 3 with the Oak vegetation tier occurring rather in the southern part of the area and on slopes of southern aspect. Prevailing is FAVZ 2 while FAVZ 3 has the lowest share in the area.

The most valuable parts of nature are situated particularly in the valleys of the three aforementioned rivers, which is also where most of 8 particularly protected areas can be found, of which a major part is included in the European system of NATURA 2000.

Brief history of the area under study

The area belonged to the primeval ecumenical settlement thanks to the favourable location in the warm basin of South Moravia. The old settlement is documented by a range of architectural monuments and archaeological findings from the Stone and Bronze Ages. There are three historically important towns in the Ivančice microregion, which played a role in its development – Ivančice, Dolní Kounice and Oslavany.

Ancestor of the present-day Ivančice is considered to be a Great Moravian walled settlement on the Réna Mt., which came to existence in the 9th century. After the walled settlement ceased to exist, an administrative centre was formed in the valley of Jihlava R. in the 12th century. The town of Ivančice was founded in 1212 and the first written record about the town originates from 1221. The town flourished mainly thanks to trade and vine growing. In 1228, it was bestowed royal privileges by King Wenceslas II. In the 16th century, Ivančice became a prominent clerical and cultural centre namely thanks to the Czech Unity of Brethren. At that time, one of its citizens was Jan Blahoslav who established a printhouse there, which was twenty years later moved to Kralice. In

the 19th century, Ivančice was one of the first centres of national revival in Moravia and a workplace of patriot priests (Břečka et al., 2002). Trades gradually became extinct and the town started developing industrial production (textile, mechanical and civil engineering) which has been retained in Ivančice until present. On the contrary, agriculture recorded decline in vine growing as well as in the traditional growing of asparagus. Most important monuments of those times are for example remnants of the precinct of the Czech Unity of Brethren, Church of the Assumption of Virgin Mary, the pilgrimage chapel of St. Jacob or the Romanic church of St. Peter and Paul in Řeznovice.

The Oslavany settlement was founded on the Libická cesta Road connecting the Baltic region with Byzantium. The first written record dates back to year 1104. A remarkable architectural monument, which influenced the historical development in Oslavany is a monastery which was founded in 1225. The town of Oslavany was originally a centre of farming and vine-growing area, which is also documented by historical maps. A milestone in its history was the opening of coalmines in the 18th century. Coal mining entirely changed the character of the commune both constructionally and ecologically. In the 1960s, Oslavany recorded the greatest population increase due to the construction of a new settlement for miners.

The history of Dolní Kounice is connected with the vine growing which flourished there already in the medieval times. The first written record dates back to the year 1183 and the most important historical site – the "Rosa coeli" monastery – originates from that period of time. However, Dolní Kounice is until today also an industrial town in which stone was extracted in the local quarry and brick clays for the local kiln.

Analysis of the historical development

Land use in the respective times

In the period of the **second military mapping**, more than 50% of the area was occupied by arable land rather represented by small fields divided by game refuges and hedges (Fig. 2). Permanent grasslands were reaching their maximum (14.2% of the total area), usually forming a characteristic landscape mosaic together with fields, orchards and vineyards. The greatest share of vineyards we find in the surroundings of Oslavany and Ivančice and in the southern part of the territory (Mělčany, Dolní Kounice, Moravské Bránice and Nové Bránice). Forests occupied less than 30% of the total area and their greatest representation was in the cadastral area of Ketkovice, Senorady, Padochov, Budkovice and Hlína. Urban developments were only in Ivančice and Dolní Kounice (1.39% of total area).

In the period of the **third military mapping**, the share of arable land began to grow (increase by 5.3%) and the shares of permanent grasslands and forests began to decrease (decrease by 3.4% and 1.5%, resp.) with other categories exhibiting only negligible changes. The lowest representation of arable land was recorded in the cadastral area of Budkovice (23.4%) which at the same time showed the highest representation of forest, which occupied 64.4% of the total cadastral area. The highest share of arable land was found in the Trboušany cadaster with 94% of arable land in the total cadastral area. The most diverse landscape mosaic was at that time observed in the surroundings of Dolní Kounice where tiny vineyards alternated with orchards, game refuges and small fields (Fig. 3). The area of vineyards in Dolní Kounice amounted to 97.2 ha which is about 10% of the total cadastral area and nearly 50% of the total share of vineyards in the concerned territory.

The following period under study was the **1950s** during which the progress of collectivization in agriculture stigmatized the local landscape. Arable land reached its maximum (58.4%) which shows that its share increased by about 3% as compared with the third military mapping. Most conspicuous was the decrease of permanent grasslands by 9.4% from 1,861.5 ha to mere 243.9 ha. A larger part of small-sized hedges disappeared (Fig. 4) and even alluvial meadows in the southern part of the territory were converted to arable land. Larger permanent grass stands were preserved in the incised riverine valleys of Jihlava, Oslava and Rokytná, and on margins of the forest complex in Budkovice. Conversely, a positive change was recorded in the increased forest area by about 5%.

From the 1950s, the map sets start to show gradually emerging recreational sites whose area in the 1950s is however less than 3.5 ha. Also, the percentage share of the category Other including first of all industrial and agricultural sites outside the intravillan exhibits a gradual increase. In the 1950s, it occupied merely 37.5 ha and contained the coalmines in Oslavany and some small agricultural facilities outside the built-up area.

In the **1990s**, a gradual trend can be seen towards reduction of arable land whose area amounts to less than 53% in this period of time, which represents a drop by less than 6% as compared with the preceding period. The area of permanent grasslands remains problematic since the military maps hardly took into account the category. Therefore, the area of permanent grasslands was measured during the digitalization of maps from the 1990s, amounting to mere 3.8 ha. An expressive increase (by nearly 400 ha) was recorded in vineyards whose area was 458.8 ha in the 1990s (see Fig. 5). This is however no more the mosaic of small vineyards, orchards, game refuges, hedges and little fields as shown in the periods

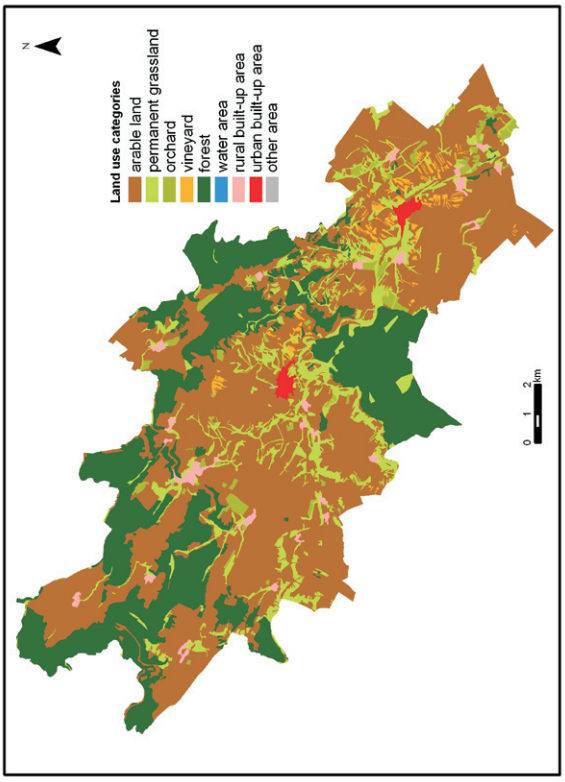

Fig. 3: Land use of 3rd military mapping

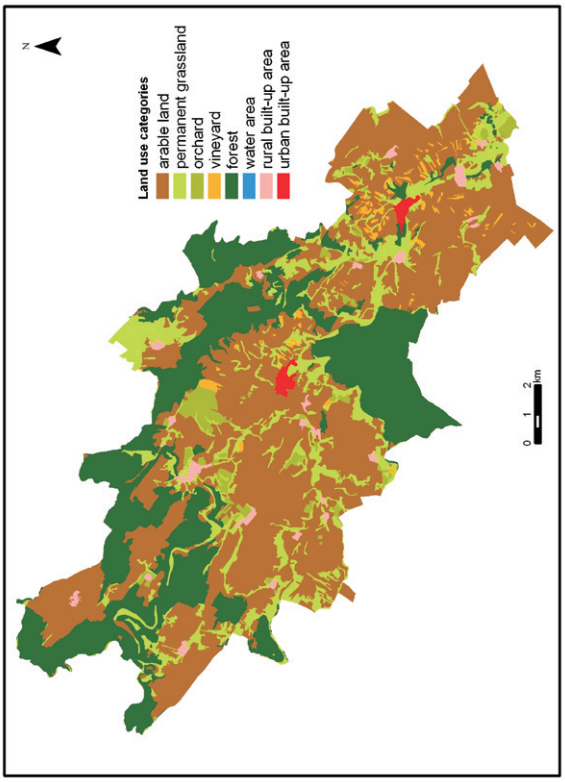

Fig. 2: Land use of 2nd military mapping

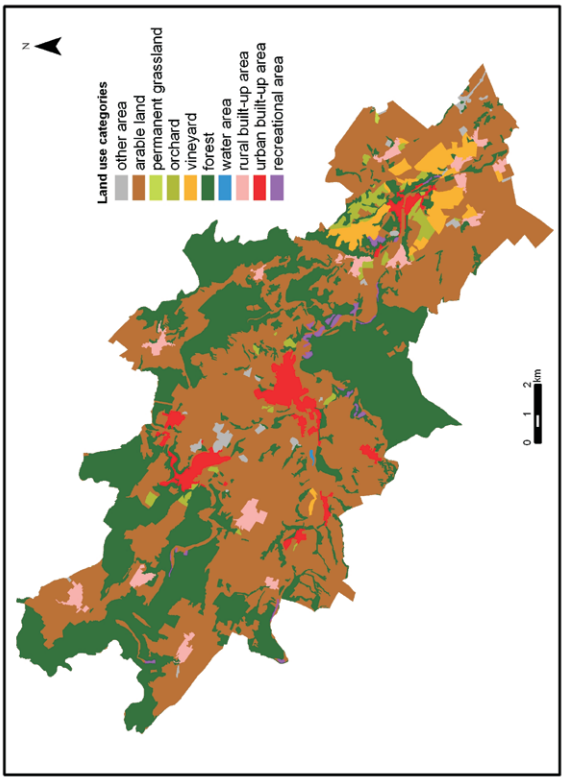

Fig. 5: Land use of 1990s

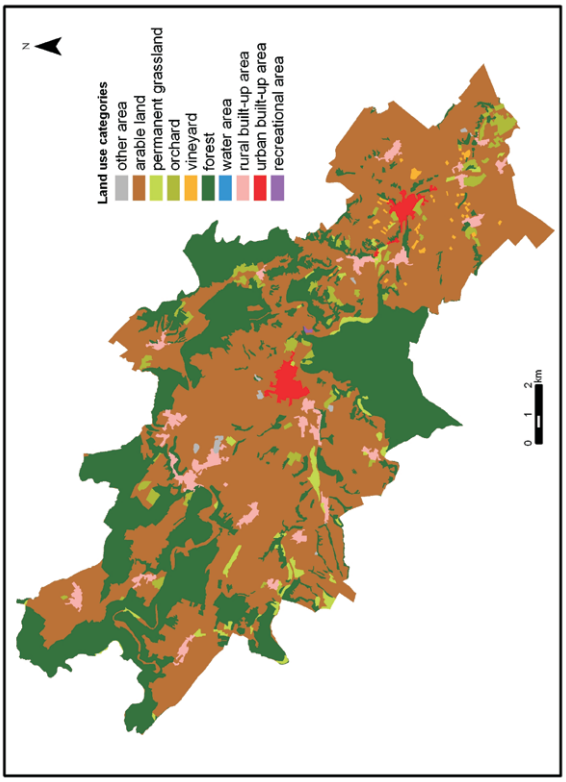

Fig. 4: Land use of 1950s

of the 2nd and 3rd military mapping, which was replaced by large-scale intensive vineyards in the surroundings of Moravské Bránice and Nové Bránice, Dolní Kounice up to Němčičky. The small extensive orchards too were replaced by large-scale orchards situated in the southern part of the concerned territory. Forest area is steadily increasing with the highest forest cover percentage being reached in the Budkovice cadaster and the lowest forest cover percentage recorded again in the southern part of the microregion. As compared with the 1950s, the area of recreational sites increased especially in the valley of the Jihlava River below Ivančice, in the Rokytná R. valley near Budkovice and in the Oslava R. valley near Čučice and Senorady. The urban built-up area recorded a significant increase (by 326.6 ha) because some smaller municipalities joined the town of Ivančice in 1980.

The last period studied was the year **2006**. This period shows a continuing trend of shrinking arable land the area of which is in this period lower than in the period of the second military mapping. Permanent grasslands are increasing. Nevertheless, as compared with the second military mapping, the area of permanent grasslands was reduced by nearly 4-times. Moreover, when looking at spatial distribution, the landscape structure shows a clear and conspicuous simplification (Fig. 6). The area of forest stands is gradually increasing too as compared with the second military mapping (by 7.1%) and a similar increasing trend is shown in the area of rural and namely urban built-up areas, which is given among other things also by the construction of satellite neighbourhoods at the outskirts of Ivančice. The area of recreational object was found in the Trboušany cadaster with 94% of arable land in the total cadastral area. The most diverse is rather stagnating thanks to the construction ban in natural parks. Description of the development of land use categories is a part of Tab. 1, Figs. 10, 11.

Analysis of land use changes

An analysis of land use changes was carried out in addition to digitalization of map works from the respective periods, which resulted in a map of numerous land-use category changes (Fig. 7). Changes between the second and third military mapping occurred on 25% of the area. The changes were particularly due to the increasing share of arable land, the decreasing share of permanent grasslands, extensive orchards, vineyards and forests. Other changes occurred due to the increasing share of rural and urban built-up areas. The highest number of changes was recorded between the map sets from the period of the 3rd military mapping and the 1950s. No changes occurred on 74% of the total area while the remaining part experienced changes. The main reason to these changes we see in the loss of a greater part of small hedges and meadows due to the collectivization of agriculture. The most conspicuous changes affected the space of the southern part of the territory with the originally greatest representation of permanent grasslands. In the following periods, the number of changes was gradually decreasing. Between the 1950s and 1990s, it was already 83% of the area without any change. Changes in this period were caused by the fact that the map sets from the 1990s do not include permanent grasslands. The area affected by changes from the 1990s to 2005 amounted to 14% with main factors being apparently the radical decrease of arable land and the increased area of permanent grasslands.

The facts mentioned above indicate that the number of changes that might have occurred in the five monitored periods was four at maximum. The area without any change amounted to 55% and it was represented either by the large forest complexes and fields or by the cores of built-up sites. Only one change occurred on 18% of the area, similarly as two changes. Three changes occurred on 7% of the area, and land-use category was changed in each monitored period only on 2% of the total area in the microregion. Fig. 8 suggests that the most dynamically developing cadastral area was that of Dolní Kounice. This results from the fact that the cadaster included a majority of permanent grasslands and small game refuges, vineyards and extensive orchards in the period of the 2nd and 3rd military mapping, which became extinct in the period

Category of land use	2nd millitary mapping	%	3rd military mapping	%	1950s	%	1990s	%	2006	%
Arable land	8702.0	50.51	9569.4	55.55	10055.6	58.37	9085.6	52.74	8097.7	47.00
Permanent grassland	2445.7	14.20	1861.5	10.81	243.9	1.42	3.8	0.02	697.2	4.05
Orchard	438.0	2.54	345.5	2.01	389.9	2.26	261.4	1.52	347.0	2.01
Vineyard	212.5	1.23	198.8	1.15	62.1	0.36	458.8	2.66	452.3	2.63
Forest	5094.9	29.57	4881.9	28.34	5757.8	33.42	6242.3	36.23	6323.8	36.71
Water area	0.0	0.00	0.0	0.00	0.0	0.00	4.5	0.03	11.2	0.07
Rural built-up area	239.7	1.39	263.8	1.53	484.6	2.81	417.3	2.42	454.5	2.64
Urban built-up area	4.7	0.55	104.6	0.61	192.7	1.12	519.3	3.01	585.7	3.40
Recreational area	0.0	0.00	0.0	0.00	3.4	0.02	86.7	0.50	95.5	0.55
Other area	0.0	0.00	0.0	0.01	37.5	0.22	147.8	0.86	162.6	0.94
Total	**17227.5**	**100.00**	**17227.5**	**100.00**	**17227.5**	**100.00**	**17227.5**	**100.00**	**17227.5**	**100.00**

Tab. 1: The area of land use categories in the monitored periods

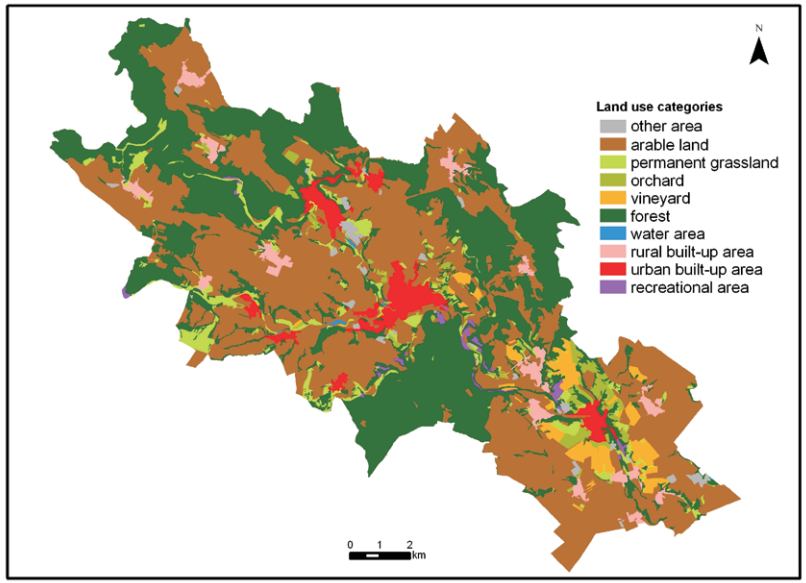

Fig. 6: Land use of 2006

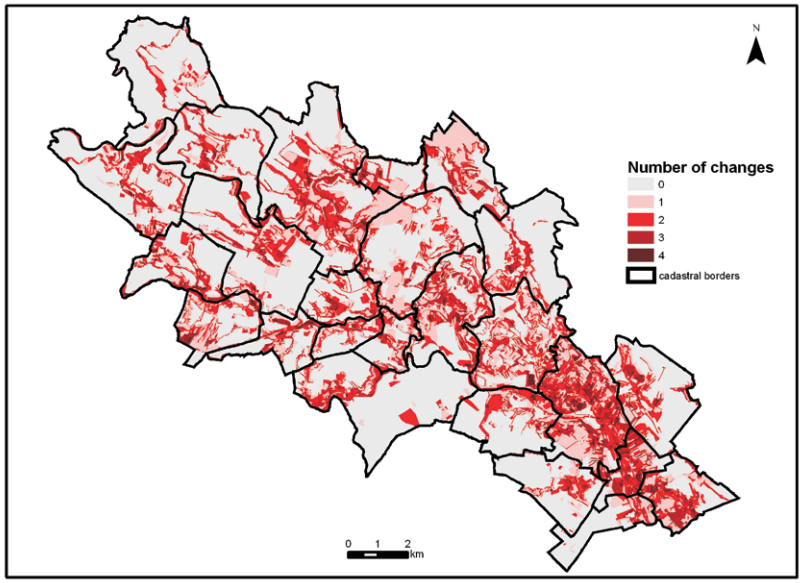

Fig. 7: Number of land use changes

Fig. 8: The most dynamically changing cadaster of Dolní Kounice

Fig. 9: Historical landscape structure in Hlína cadaster

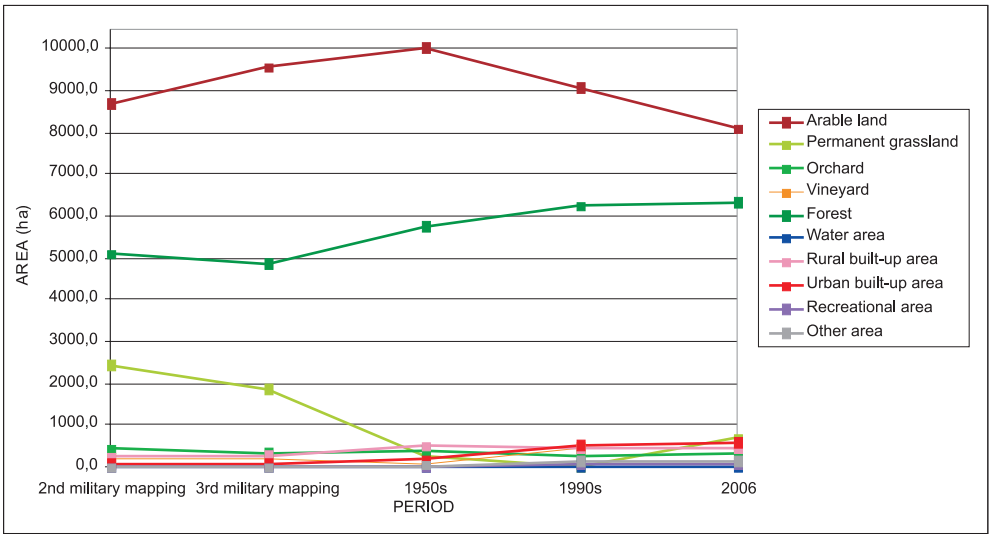

Fig. 10: Land use changes of Ivančice microregion

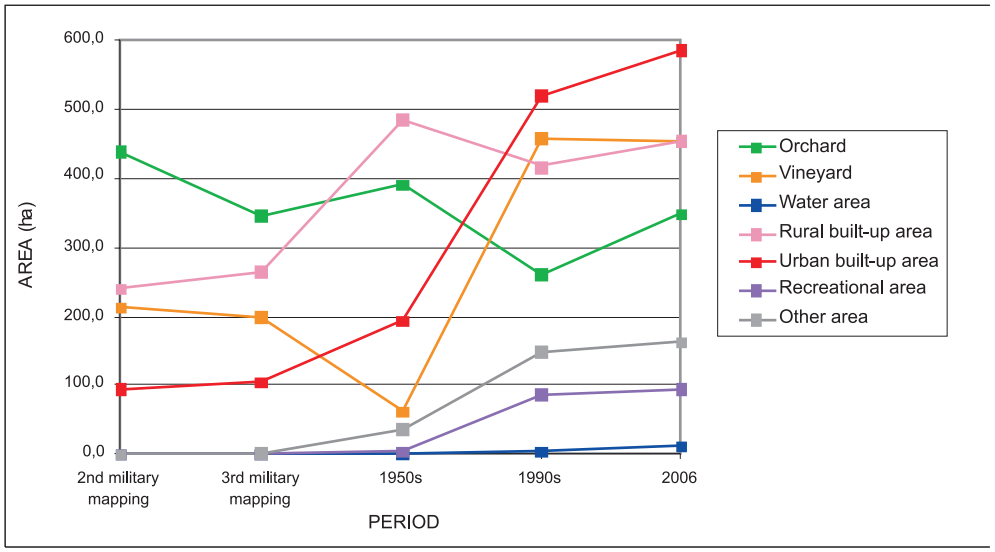

Fig. 11: Land use changes of Ivančice microregion without arable land, permanent grassland and forest

of 1950s and were gradually replaced by large-scale vineyards and fruit orchards. Conversely, the least number of changes was recorded in the northern part of the concerned territory where the original forest complexes and partly also alluvial meadows were preserved thanks to the deeply incised valleys of the Jihlava, Oslava and Rokytná rivers.

Development of the coefficient of ecological stability

It was decided that the ecological assessment of landscape development in the Ivančice microregion would be made according to the calculated coefficient of ecological stability (hereinafter C_{es}) which is based on the proportional area share of relatively stable and unstable sites (Míchal, 1985). Stable sites included the following categories: permanent grasslands, forests, water surfaces and orchards. Unstable sites were arable land, vineyards, rural and urban built-up areas, recreational and other areas. Values of the calculated coefficient are classified by Míchal (1985) as follows:

- $C_{es} < 0.1$ = territory with a maximum disturbance of natural structures
- $0.1 < C_{es} < 0.3$ = territory with above-average use
- $0.3 < C_{es} < 1.0$ = territory intensively used
- $1.0 < C_{es} < 3.0$ = relatively well-balanced landscape
- $C_{es} > 3.0$ = well-balanced landscape

In this benchmark calculation, the value of C_{es} was 0.86 for the period of the 2nd military mapping – thus indicating the landscape intensively used for farming with a considerably impaired autoregulation. The coefficient value was observed to further decrease in the course of historical development (0.7 in the period of the 3rd military mapping) and its minimum was reached in the 1950s upon the ploughing up of small hedges and game refuges. From this period, C_{es} starts to grow again with its value reaching 0.6 in the 1990s and being somewhat higher in 2006 than in the period of the third military mapping. According to this calculation, the landscape in the Ivančice microregion would be in the entire period of survey an intensively used agricultural

landscape with considerably weakened processes of autoregulation requiring high inputs of additional energy. However, this would be a largely simplified interpretation. The calculation was therefore broken down for the respective cadastral areas.

Tab.2 shows the distribution of C_{es} values to the cadastral areas in the individual periods. There are all Ces categories represented in the Ivančice region but a conspicuous difference exists between the northern part with the traditional greater share of forest where the landscape is more equiponderant thanks to the deeply incised valley of rivers Jihlava, Oslava and Rokytná, and the southern part which is already the typical agricultural landscape.

The highest coefficient of ecological stability in the entire period of study was recorded in the cadastral areas of Budkovice and Hlína. The C_{es} value in Hlína was higher than 3 in all periods under study, which indicates a well-balanced landscape. In Budkovice the value of 3 was surmounted in the periods of the 2nd and 3rd military mapping and in 2006 while in other periods its value ranged about 2.5. Nevertheless, the concerned

cadaster/period	2nd military mapping	3rd military mapping	1950s	1990s	2006
Alexovice	0.46	0.44	0.32	0.36	0.41
Biskoupky	1.20	0.75	0.95	0.79	1.13
Budkovice	3.20	3.13	2.51	2.37	3.20
Čučice	1.53	1.51	1.49	1.59	1.79
Dolní Kounice	0.30	0.28	0.16	0.63	0.88
Hlína	4.50	4.26	3.99	3.59	3.94
Hrubšice	0.20	0.19	0.27	0.26	0.65
Ivančice	0.40	0.39	0.25	0.01	0.40
Ketkovice	1.20	1.05	1.08	1.12	1.19
Kounické Předměstí	1.45	1.37	1.01	1.01	1.43
Kupařovice	0.15	0.10	0.03	0.04	0.04
Letkovice	0.35	0.30	0.21	0.15	0.24
Mělčany	0.25	0.24	0.03	0.07	0.06
Moravské Bránice	0.95	0.92	0.69	0.73	0.93
Němčice	0.47	0.46	0.27	0.22	0.37
Němčičky	0.36	0.33	0.11	0.09	0.16
Neslovice	0.50	0.48	0.40	0.36	0.34
Nová Ves	0.55	0.54	0.44	0.44	0.52
Nové Bránice	0.80	0.77	0.51	0.50	0.52
Oslavany	0.87	0.85	0.79	0.84	1.08
Padochov	1.35	1.34	1.04	1.13	1.27
Pravlov	0.27	0.23	0.17	0.09	0.27
Řeznovice	0.24	0.20	0.23	0.13	0.24
Senorady	0.83	0.75	0.60	0.62	0.81
Trboušany	0.07	0.06	0.09	0.06	0.07

Tab. 2: Distribution of coefficient of ecological stability values to the cadastral areas

landscape was relatively equiponderant in all studied periods. The essential positive influence on the landscape ecological stability in Budkovice was exerted especially by the complex of the Krumlovský les Forest and by steep rocky slopes above the Rokytná River, which did not allow any massive use of these sites for farming. Forest stands have been occupying at all times more than a half of the cadastral area whose southern part is dominated by arable land though. The cadastral area of Hlína is the most stable part of the entire Ivančice microregion with the preserved historical landscape structure with stone-paved roads, stone mounds, hedges and small fruit orchards (Fig. 9). An essential influence on the high C_{es} value has the high share of woods, which belong in the Bučín forest district. Forest stands have been always occupying an area of about 70% while the share of farmland is about 20%.

The second group includes cadastral areas with C_{es} values ranging from 1 to 3 thus indicating a harmonical cultural landscape with the size of unstable sites relatively corresponding to the size of stable ones. This group contains a majority of cadastral areas in the northern part of the concerned territory – Ketkovice, Čučice, Padochov, even Biskoupky in some periods. The territory and its landscape structure were expressively affected both by natural conditions and by human activities. While the plateaus and mild slopes were under the influence of human activities already at the time of medieval colonization, valuable forest communities on the steep slopes of the Oslava R. and the Chvojnice R. have survived. The C_{es} values in Ketkovice was again largely contributed to by forests which are situated in the southern and western section of the cadaster and which have occupied at all times an area of about 50%. This

is why the C_{es} value has amounted always to approx. 1. Forests in Čučice have always taken up an area greater than a half and the Ces value was therefore higher in the cadastral area of Ketkovice. In Padochov, the Ces value strongly fluctuated and it was lowest in the 1950s when it reached the boundary of intensive land use.

The third group contains areas strongly affected by agriculture in the past with arable land prevailing. The group includes a greater part of cadasters situated in the central part of the Ivančice microregion and in its southern section. Regarding the favourable relief, most sites were deforested and converted to arable land which was represented by smaller fields separated by hedges in the period of the 2nd and 3rd military mapping, and by large tracts of arable land from the 1950s.

The last group includes sites with a maximum disturbance of natural structures in which the C_{es} value is below 0.1. Although these sites are represented in the Ivančice microregion too, their share is low. All cadastral areas falling in this category occur only in the south of the microregion – Kupařovice, Němčičky and Mělčany. From the 1990s, the category includes the town of Ivančice due to sprawling development. These cadasters have been always dominated by arable land, which represented at least 70% of the total area.

In spite of the fact that the coefficient of ecological stability was calculated only for benchmarking purposes and does not tell anything about the landscape structure, it provides at least a basic information on the development of individual land use categories.

Discussion

Primary problem to be faced by the authors were the map sets from the 1990s, in which the category of permanent grasslands was not at all mapped. The fact distorted results from that period. Reflecting in the carried out analyses of land use changes (thus affecting the number of changes and their surface area), they logically affected also the calculation of the coefficient of ecological stability which is considerably underestimated in some cadasters.

The calculation of the coefficient of ecological stability is another problem. Being very simple and synoptic, it however does not deal with the internal spatial arrangement of individual landscape structures. Furthermore, it does not take into account the ecological value of respective categories in different periods. It is therefore convenient for a benchmark assessment of each individual period rather than for a mutual comparison of the respective periods. Example may be the cadaster of Dolní Kounice whose coefficient of ecological stability in the period of the 3rd military mapping and in 2006 is nearly identical. Nevertheless, looking at the spatial arrangement it is obvious that in the period of the second military mapping it was related to small vineyards amongst orchards, hedges and tiny fields but to large-scale intensively used vineyards in the year 2006.

Conclusions

Detailed topographic old maps are a good information source for ecological studies into the land use development of cultural landscape in the last 250 years. Digital processing of maps in the ArcGIS environment enables a high quality valuation of landscape changes. The subject of research was an ecological assessment of landscape development changes in the Ivančice microregion.

Results of the analyses indicate that 55% of the territory did not experience any change in the surveyed period of time the fact being affected particularly by two land use categories. The first factor is vast stretches of woods on the slopes of Jihlava R., Oslava R. and Rokytná R., the Krumlovský les Forest near Budkovice and Bučín forest district at Neslovice and Hlína. The second – rather negative – factor is arable land in the southern part of the territory, which was agricultural landscape already in the period of the second military mapping.

A significant contribution of these analyses does not consist only in the quantification of changes in the landscape but particularly in their practical application in landscape planning, revitalization of water ecosystems, reconstruction of old roads, or in designing territorial systems of ecological stability.

Acknowledgement

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References:

BENDER, O., BOEHMER, H. J., JENS D., SCHUMACHER, K. P. (2005): Using GIS to analyse 200 years of cultural landscape change in Southern Germany. Landscape and Urban Planning. No. 70, p. 111-125.

BENDER, O., BOEHMER, H. J., JENS, D., SCHUMACHER, P. K. (2005): Analysis of land-use changes in a sector of Upper Franconia (Bavaria, Germany) since 1850 using land register records. Landscape Ecology No. 20, p. 149-163.

BŘEČKA, J. et al. (2002): Ivančice. Dějiny města. Reprocentrum, Ivančice, 671 pp.

COUSINS, S.A.O. (2001): Analysis of land cover transitions based on 17th and 18th century cadastral maps and aerial photographs. Landscape Ecology No. 16, p. 41-54.

CULEK, M. (1996): Biogeografické členění České republiky. Enigma, Praha, 347 pp.

DEMEK, J. (1987): Zeměpisný lexikon ČR, Hory a nížiny. Academia Praha, 476 pp.

HAAREN, C. (2002): Landscape planning facing the challenge of the development of cultural landscapes. Landscape and Urban Planning No. 60, p. 73-80.

HOUGHTON, R. A. (1994): A worldwide extent of land use change. BioScience No. 44, p. 305-313.

IVERSON, L. R. (1988): Land-use change in Illinois, USA. The influence of landscape attributes on current and historic land use. Landscape Ecology No. 2, p. 45-61.

KOLEJKA, J. (1985): Příspěvek ke studiu dynamiky změn struktur kulturní krajiny. Zprávy GGÚ ČSAV, Vol. 22, No. 2, p. 15-61.

KOLEJKA, J., MAREK, D. (2006): Sustainable land use convergence in border area in Central Europe. In: Vogtmann, H., Dobretsov, N. [eds.]: Environmental Security and Sustainable Land Use – with special reference to Central Asia, Springer, p. 183-198.

LIPSKÝ, Z. (2000): Sledování změn v kulturní krajině. ÚAE LF ČZU, Kostelec nad Černými lesy, 71 pp.

MÍCHAL, I. et al. (1985): Ekologický generel ČSR, Terplan Praha a GgÚ ČSAV Brno. 92 pp.

MILANOVA, T. et al. (1999): Land use/cover changes in Russia: mapping and GIS. Land Use Policy No. 16, p. 153-159.

OLSSON, E. G. A., AUSTRHEIM, G., GRENNE, S. N. (2000): Landscape change patterns in mountains, land use and environmental diversity, Mid-Norway 1960-1993. Landscape Ecology No. 15, p. 155-170.

PALMER, F. (2004):Using metrics to predict scenic perception in a changing landscape. Dennis, Massachusetts. Landscape and Urban Planning No. 69, p. 201-218.

PETIT, C.C., LAMBIN, E.F. (2002): Impact of data integration technique on historical land use change: Comparing historical maps with remote sensing data in the Belgian Ardennes. Landscape Ecology No. 17, p. 117-132.

QUITT, E. (1971): Klimatické oblasti Československa. Studia Geographica 16. GÚ ČSAV Brno. 73 pp.

REID, R. S., KRUSKA, R. L., MUTHUI, N., TAYE, A., WOTTON, S., WILSON, C. J. (2000): Land use and land cover dynamics in response to changes in climatic, biological and socio-political forces: the case of southwestern Ethiopia. Landscape Ecology No. 15, p. 339-355.

SKALOŠ, J. (2007): Czech and Swedish intensively utilized agricultural landscapes – patterns and changes during tha last 300 years, retrospective study based on ol cadastral maps and aerial photographs. Ekologie krajiny/Journal of Landscape Ecology Vol. 0, No. 0, p. 135-162.

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AN INVESTIGATION OF THE ENVIRONMENTAL IMPACTS OF TWO SEWAGE DISPOSAL SITES ON SOIL AND GROUNDWATER CONDITIONS IN THE COUNTY OF HAJDÚ-BIHAR (HUNGARY)

Szilárd SZABÓ, György SZABÓ, Csaba FODOR, László PAPP

Abstract

One of the numerous environmental problems in Hungary is the lack of sewage systems at the settlement level and the inappropriate treatment of communal waste water. This problem is apparent especially in small villages with low budgets. An overview of research on the environmental impacts of two sewage disposal sites, constructed without any technical isolation, which were examined for a period of one year, is presented in this report. The aim is to demonstrate the general problems of these sewage disposal lakes, and to indicate some practical experiences with respect to the deterioration of soils and groundwater quality.

Shrnutí

Výzkum dvou lokalit deponií odpadních vod z pohledu environmentálních dopadů na půdu a kvalitu podzemní vody v okrese Hajdú-Bihar (Maďarsko)

Jedním z četných environmentálních problémů v Maďarsku, které je třeba řešit, jsou nedostatky v kanalizačních systémech sídel a nevhodné čištění komunálních odpadních vod. Problém je patrný především v malých obcích s nízkými obecními rozpočty. Příspěvek se opírá o roční výzkum vlivu likvidace odpadních vod ve dvou lokalitách, kde byl kanalizační systém vybudován bez jakýchkoliv technických izolací. Cílem je ukázat obecné problémy takovýchto jezer odpadních vod a poskytnout některé praktické poznatky týkající se zhoršování kvality půdy a podzemních vod v jejich okolí

Key words: *sewage disposal, pollution spreading, water chemical parameters, heavy metals, Hungary*

1. Introduction and aims

Ones of the most important environmental problems to be tackled in Hungary are the solution of communal sewage treatment and the lack of sewage disposal systems. The establishment of sewage disposal networks and the application of appropriate techniques present problems primarily for small settlements lacking the financial support.

The main problem is that the government initially paid greater attention to the improvement of drinking water network than to public sewage disposal systems. Looking at the annual data of the two networks in a diagram, one can see the opening scissors (today, however, rather the closing scissors due to accelerated investments).

Production of communal sewage is in close connection with the quantity of water used through the system. Inhabitants wasted much drinking water namely before the 1990s. This practice was changed by making the service fees more expensive. Higher fees stimulate savings among the inhabitants. In 1990, the population consumed 579 million m^3 of water while in 2005 it was only 371 million m^3. Water consumption practically has not varied since the beginning of the millennium. Reduction in usage is insignificant and fluctuating.

The produced sewage was disposed unclean in small settlement sewage sites without insulation for several years. This practice has been changed nowadays, as the rate of unclean sewage is around 5%. As to cleaning the sewage water, a rapid change occurred in 2000 thanks to greater investments into environment protection. There are only a few sewage disposal sites properly functioning today (and even those are often operated illegally). Their operation is, however, often questionable with respect to environment protection.

There are two fundamental methods of sewage treatment: the most accepted one is the channelling of settlements and the treatment of collected sewage in sewage plants; the other (much widespread but environmentally less acceptable) method is to apply home defecators.

It should be noted that channelling is not a closed technology: sewage may penetrate into the environment in several ways (infiltration and exfiltration). Beside this, even the sewage treatment plants cannot provide a perfect purification.

In the case of home defecators, the greatest problem is caused by exfiltration. In extreme cases, abandoned groundwater wells are used as defecators, which results in the worst possible environmental impacts. Sewage placed in the well can spread in the groundwater rapidly and in large volumes through the water yielding strata of the well (Kerényi et al., 1995).

There can be numerous potential pollutants found in communal sewage such as compounds of organic material oxidisation (ammonium, nitrites, nitrates), phosphate ions from synthetic washing powders and from the decaying organic material. Sodium can be found in large quantities in communal sewage as various washing and cleaning chemicals are particularly rich in this chemical element. Furthermore, human urine also contains large quantieies of sodium in the form of NaCl (Illés, 1993; Öllős, 1992). Anion active detergents, solvents used in household cleaning and heavy metals may occur too (Oláh et al., 1984). A relatively new problem is the occurrence of endocrine disrupting chemicals that represent a much lesser risk to human health but may much more affect the biosphere (Mills, Chichester, 2005). Main source (3/4) is recycled paper (Gehrings, Tennhardt, 2005). Diseases borne by pathogen micro-organisms (bacteria, viruses and parasites) found in human faeces are one of the most dangerous effects of communal sewage. Bacteria in the sewage represent a potential infection source for a long time (Langergraber, Muellegger, 2005; Oláh et al., 1984).

Without insulation, these pollutants present in the sewage may spread in the groundwater freely deteriorating its quality depending on the characteristics of the soil and the soil forming rocks. Groundwater may become connected to the aquifers of deep subsurface waters along subsurface water wells with no insulation or where the impermeable stratum is disrupted (e.g. due to stratigraphic hiatus, or joints). Thus, the appearance of pollutants in subsurface waters is only a question of time (Csorba, 2001; Kerényi et al., 1995).

The paper investigates the environmental impacts of two sewage disposal sites of a settlement established on sandy and silty deposits. Our aim was to establish the concentration of most frequently occurring contaminating elements characteristic for the sewage at different distances and in different directions from the disposal site. The surveys were carried out for 12 months and it was therefore possible to analyse the concentration of contaminants both in space and time. Apart from these, relations were studied of groundwater table oscillations and groundwater movement.

2. Description of stuied areas

Studies were performed at two sewage disposals (Fig. 1) and in their environments with different soils. Their characteristics and conditions are detailed below.

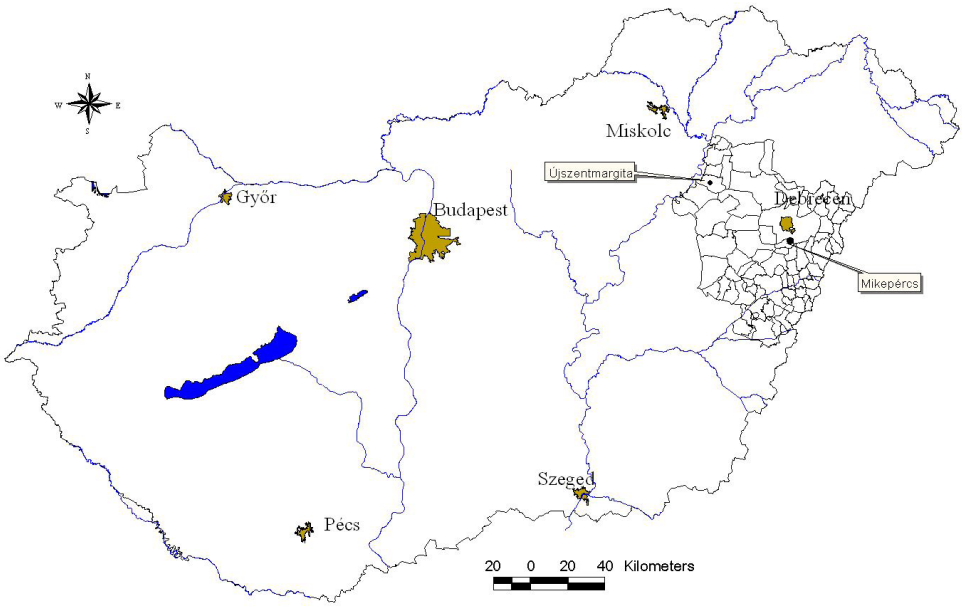

Fig. 1: Hajdú-Bihar County and the investigated disposal sites

2.1 The sewage disposal site in Mikepércs

The study area is situated in the public administrative area of Mikepércs, east of the settlement. The sewage disposal site was built on sediments mechanically considered to be sandy (dominantly coarse sandy) without any technical protection. There is a calcareous sandy clay layer functioning as impermeable layer at a depth between 3 and 15 m. The coarse sand near the surface enables the spreading of polluting materials.

The area functioned as a sand quarry before 1982 and the abandoned pit has been used as a communal sewage deposition site since then. There is no artificial insulation of sewage deposition volume, which amounts to ca. 20,000 m^3. The groundwater base is therefore contaminated by communal sewage deposited there crossing the loose sandy sediments (Szabó, Sz., Szabó, Gy., 2005a).

The sewage network is under construction in Mikepércs (the ISPA application supporting the construction was signed in May 2006). Therefore, the sewage is collected in the disposal site from the whole settlement – however not yet legally. The total population of the settlement is around 3400 people, the majority of whom make their living from agriculture and cattle breeding. The sewage produced in the settlement is around 115,000 m^3 a year, according to the local government. Officially, the sewage is transported from the settlement to the sewage treatment plant of Debrecen.

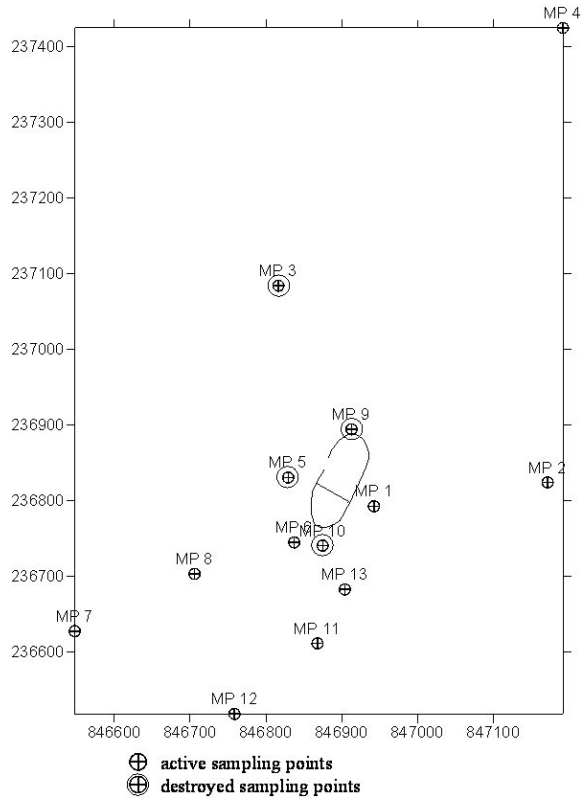

Fig. 2: The distribution of boreholes at the sewage disposal site in Mikepércs

2.2 The sewage disposal site in Újszentmargita

The sewage disposal site is situated within the administrative area of the village of Újszentmargita 2 km west of the settlement. The nearest populated area to the site is Tuka (a small village) as a part of Újszentmargita 1,700 m northwest of the deposition site. It is constructed at surface level surrounded by a 80-100 cm high rim which is presumably composed of material excavated during the site construction.

Earlier records indicate that the area was used as a communal sewage disposal site continuously since 1982 until 2002. The sewage was released into a pre-settling basin. The embankment constructed around the site blocked the sewage spreading on the surface and thus the pollution affected only a relatively small area (Szabó, Sz., Szabó, Gy., 2005b).

Soil conditions of the site do not favour vertical migration of the pollution as the clay mineral content is high and, consequently, filtration coefficients are small. Clay content reaches 40% in the near surface strata and it is 20% at the depth of the reached groundwater table. The rate of silt is also high and a greater sand content is observed only in the southern part of the area under study. Filtration coefficients are ca. 0.1 m/day (assuming continuous water supply). However, they exceed 2 m/day in the southern parts especially in deeper strata.

3. Methods

3.1 Groundwater sampling

In Mikepércs 9 and Újszentmargita 3 shallow groundwater wells were established in the study area with the use of Eijkelkamp type hand driller. The distribution of drillings is shown in Figs. 2-3.

The sampling was made by using a peristaltic pump. Groundwater was continually pumped until conductivity

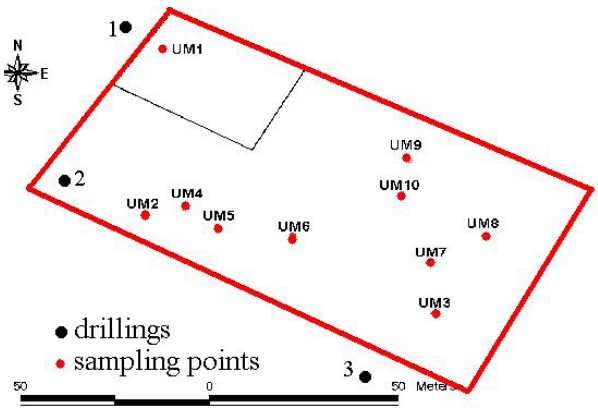

Fig. 3: Drillings and surface sampling points at the sewage disposal site in Újszentmargita

and temperature stabilized. This occurred after producing a water quantity of around 2-3 times higher than the well volume. The depth of groundwater was determined *in-situ* by thready depth measure, while groundwater temperature and electric conductivity were measured by the field instrument of Schott type. The sampling was carried out at monthly intervals for half a year. Samples taken were kept and transported refrigerated.

3.2 Soil (sewage sludge) and plant sampling

In Újszentmargita, the establishment of the disposal site and its state when sampling took place enabled collection of surface soil samples from the area of the site. In order to minimise errors due to microheterogeneity, average samples were taken from 10 points within a circle with a diameter of 2 m and homogenised from about 10-15 subsamples from depths 0-25 cm. Plant samples (nettle [*Urtica dioica*]) were also collected (root and leaf) from the same sampling circles.

In Mikepércs, one average sample (with 10 subsamples) was taken from the sewage sludge under the sewage with using a special sampling equipment (it is a sewage lake so the subsamples were taken from under the water surface in a closed sampler).

3.3 Analysis of water, soil and plant samples

The analysis of groundwater samples was carried out at 24 hours for each case in the laboratory of the Department of Landscape Protection and Environmental Geography at the University of Debrecen.

During the analysis, the following water chemical parameters were determined: temperature; specific conductivity; pH; permanganate chemical organic material content (COD); dissolved inorganic phosphate ion; ammonium ion; nitrate ion; nitrite ion; Na concentration (according to Literáthy, 1973).

In addition to these measurements, heavy metal and TPH contents were established in soils and groundwater.

Total metal content and biologically available metal content (according to the Lakanen-Erviö method) of the soil and sewage sludge samples were determined as well. In the plant samples, the roots and leaves were examined separately. Mn-, Zn-, Cu-, Ni-, Cd-, Pb- and Cr-contents were determined by using the F-AAS technique.

3.4 GIS and statistic analyses

Groundwater table data were recorded for all sampling points, too. Relative depths were transformed to absolute depths at the Baltic base sea level enabling the construction of the hydroisohyps of the data.

From the water table data, maps were produced with using the SURFER for Windows. These maps can be interpreted as statistic surfaces and they are therefore suitable to determine the runoff directions representing in this case the groundwater movement directions. The spatial presentation of water chemical parameters was made by using the SURFER for Windows, too.

4. Results

The disposal site in Mikepércs is not suitable for the establishment of metal load due to its sandy soils. Therefore, the effect on the groundwater is shown instead. In the case of the more silty and clayey disposal site in Újszentmargita, the impacts on the soil are described.

4.1 Mikepércs

Groundwater table is variable: at the time of drilling the wells, it reached to a depth of 3.5-4.5 m (which is the same as the resting groundwater table as these are phreatic waters) while during these measurements the groundwater table increased up to a depth of 1.3-2.8 m. There was inland water in the territory in February-April of 2006. The year 2007 was a draught year, so a decreasing period followed. It is an important observation indicating that groundwater may occasionally come into direct contact with the sewerage.

Groundwater table variation as based on the data measured during 12 months in the drillings is 0.30-0.50 cm and its standard deviation is between 0.09 and 0.18 cm.

Based on the absolute depth of groundwater table, a groundwater dome is formed as a result of sewage volume over 100 m^3 a day arriving into the disposal site. This results in a 0.5-0.7 m high surplus in groundwater around the disposal site, which has a significant effect on the modification of groundwater flow main direction. The original direction is NNE-SSW but due to the presence of the groundwater dome, pollutants can spread into all directions. According to results from the control wells, however, there was no pollution experienced in the boreholes against the movement of groundwater.

Considering the studied chemical parameters of water, in most cases only the immediate surroundings of the disposal site turned out to be slightly contaminated. Tab. 1 shows the 1-year average of the components measured.

The concentration of the studied chemical parameters in water was highest near the disposal site and their quantity rapidly decreased as moving away from the site. Inside a circle with a diameter of 400-500 m, most

ID	electric conductivity (µS/cm)	pH	NO_3^- (mg/l)	NO_2^- (mg/l)	NH_4^+ (mg/l)	PO_4^{3-} (mg/l)	COD (mg/l)	Na (mg/l)
MP1	1813.2±80.2	6.9±0.4	116.3±72.1	0,05±0.03	0,5±0,38	0,2±0,1	8,0±2.5	175.1±80.5
MP2	215.3±16.5	6.5±0.3	18.4±7.9	0,04±0,02	0,5±0,46	0,3±0.1	2.8±2.8	4.9±1.3
MP3	1618.1±106.5	7.5±0.1	5.4±5.0	0,19±0.17	49,2±49.9	6.4±5.7	8.9±5.6	28.1±12.6
MP4	357.9±5.3	7.6±0.2	17.8±6.6	0,05±0,07	0,6±0,4	0,3±0.1	2.9±2.4	6.27±1.2
MP6	6367.8±1445.2	7.3±0.2	28.8±61.7	2,21±4.61	2,1±1,3	0,5±0.4	11.5±5.4	968.9±440.6
MP7	535.8±112.8	6.7±0.1	11.1±4.1	0,34±0,25	0,5±0,42	0,2±0.1	5,7±3.5	21.5±10.9
MP8	354.4±64.6	6.3±0.2	1.6±0,7	0,13±0,08	0,6±0,5	0,1±0.1	4,3±2.7	8.55±1.3
MP12	1747.7±462.5	6.3±0.2	27.3±21.4	0,21±0,25	0,8±0,6	0,5±0.3	7.9±3.3	80.1±34.2
MP13	1474.0±950.1	6.7±0.2	63.0±35.7	0,41±0,33	0,6±0,6	0,4±0.4	6.1±2.6	148.4±142.6

Tab. 1: Average values of groundwater chemical analysis (mean of 10 samples ± standard deviation)

of the contaminants exceeded the "B" (polluted) level of the 10/2000 Co-Decree (declaring the background "A" and polluted "B" values of the important contaminants).

In the borehole nearest to the site (MP6), for example, electric conductivity was 5-8 µS/cm while it was only 500-600 µS/cm 400 meters further away. The same tendency is experienced in the case of nitrate, ammonium, phosphate and especially sodium. Similar circumstances can be found in the case of phosphate, nitrate, nitrite, sodium. But the ammonium does not indicate the highest values in the closest borehole (MP2). MP2 is about 20 meters from the disposal site, but the concentration of nitrate is about 0.37 mg/l. The highest values were recorded in the MP6 borehole, i.e. 1.32 mg/l. It is 50 m from the site, and also in the line of the main groundwater flow.

In the case of the spatial distribution of the contaminants, only one exception was found (borehole MP12), which is situated further away from the disposal site (Fig. 2.) and closer to the settlement. The sewage network has not yet been constructed in the settlement. It is suggested therefore, due to the communal water usage, that another groundwater dome is developed under the settlement so that sewage originating from home defecators is spread radially towards every direction. Our measurements prove that pollutants occurring in the water of this drilling are not from the sewage disposal site but they are in the sewage coming from under the settlement. At the beginning of the research, 13 boreholes were created, but 4 of them were destroyed during the examinations. The MP10 and MP11 boreholes were demonstrated to have smaller concentrations than MP12, MP7 and MP8 had also smaller quantities of the measured compounds. Pollution of the settlement was measured in our parallel research and this statement was confirmed (Szabó et al., 2006).

Of the chemical parameters of water, nitrate and sodium are shown in details. The nitrate may get into the groundwater from several sources: in natural ways as a result of nitrogen activity fixing microorganisms living in the soil, or due to the geochemical composition of lower soil, or from the mineralization of soil humus; in artificial ways from the released sewage or from the leakage water of waste disposal sites, from organic manure and nitrogen containing artificial fertilisers (Bíró et al., 1998; Bujnovský, 2003; O'Neill, 1993).

Two primary nitrate sources can be presumed in the study area. One is the sewage disposal site itself whereas the other is the artificial fertilisers used in farmlands of poor quality. As it is indicated, the nitrate concentration depends only on the deposition. It is modified by agricultural activities in the territory so the spatial distribution is modified by them as well.

Deposition appears to be a sharp spot, which is indicated by the released sewage contamination higher than the "B" limit value determined by the Hungarian regulations (Co-Decree 10/2000 [VI.2.]).

In Figs. 4-6, the spatial distribution of the pollution is shown. The affected area is smaller from August than the situation in September-October-November, which shows about the same area.

Oxidisation of the ammonium is greater in warmer periods while it is reduced during colder autumn months; thus, in September-November, the nitrate concentrations exceeding the limit remained within a distance of 500-600 m around the disposal site. Next year, the trend starts again and the nitrate concentration increases.

Communal sewage contains sodium in large quantities. Also, a large amount of sodium is found in food remains and in washing powders and moreover, human urine contains a high amount of NaCl as well (Gadallah, 1996). Sodium as an easily moving cation is a good indicator of the spreading of contaminated water. The advantage of using sodium as an indicator is that other parameters may originate from several sources, but when the groundwater has a low background value (and not alkalic), the only source of Na ion is the sewage occurring in the vicinity of the disposal site. The result well corresponds with that experienced in the case of conductivity and nitrate. Corresponding

to groundwater flow directions, the maximum of contamination concentration occurs in the MP6 drilling. The distance between the isoconcentration lines increases towards the south due to the diluting effect of groundwater (Figs. 7-8).

There were no signs of metal or hydrocarbon (TPH) contaminations above the hygienic limit neither in the sewage sludge nor in the groundwater. Besides, these components did not exceed the limit values given for the sewage sludge in the subsurface geology by the 10/2000 Co-Decree. Based on this, it can be concluded that only communal sewage was released in the sewage disposal site.

4.2 Újszentmargita

In the case of this disposal site, the dominant direction of groundwater movements is NE-SW which means that the potentially exfiltrating pollutants do not reach the populated area. The nearest settlement in this direction is more than 10 km away.

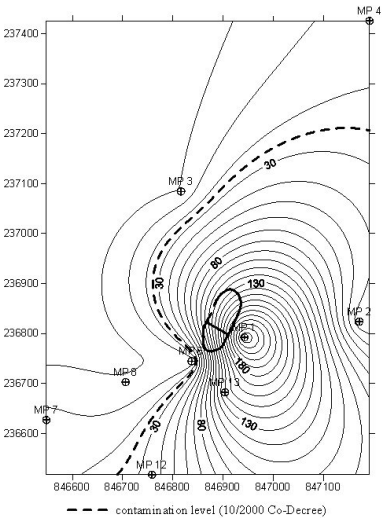

Fig. 4: Nitrate concentration (mg/l) in July (2005) in Mikepércs

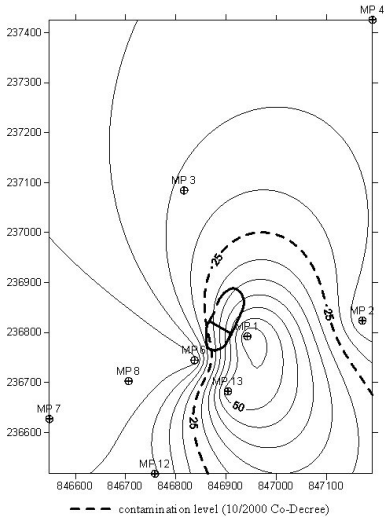

Fig. 5: Nitrate concentration (mg/l) in December (2005) in Mikepércs

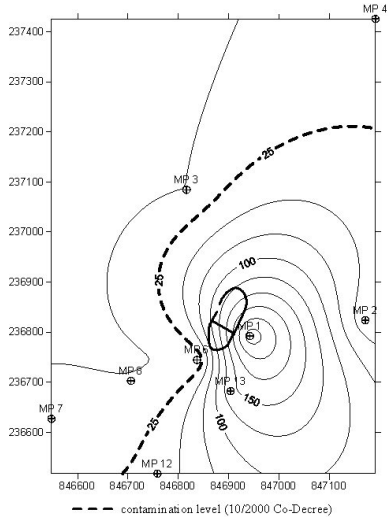

Fig. 6: Nitrate concentration (mg/l) in June (2006) in Mikepércs

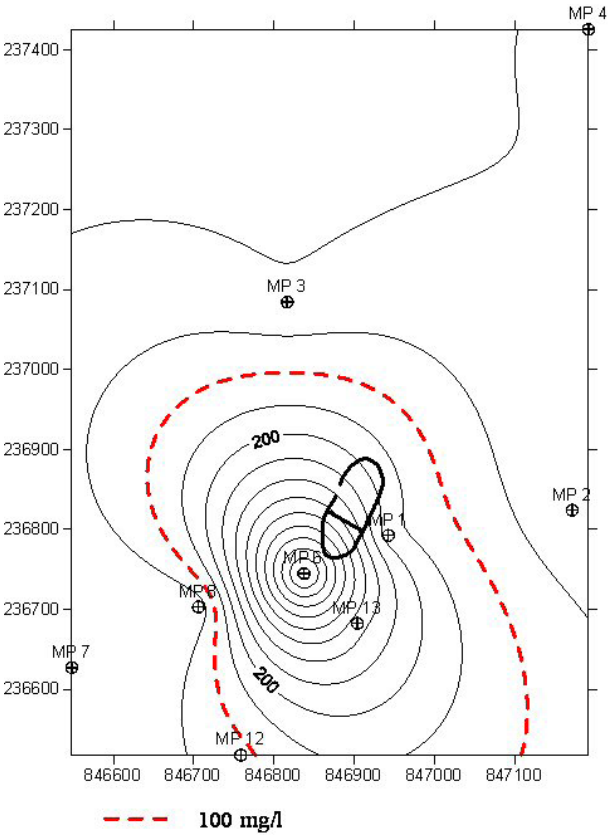

Fig. 7: Sodium concentration (mg/l) in November (2005) in Mikepércs

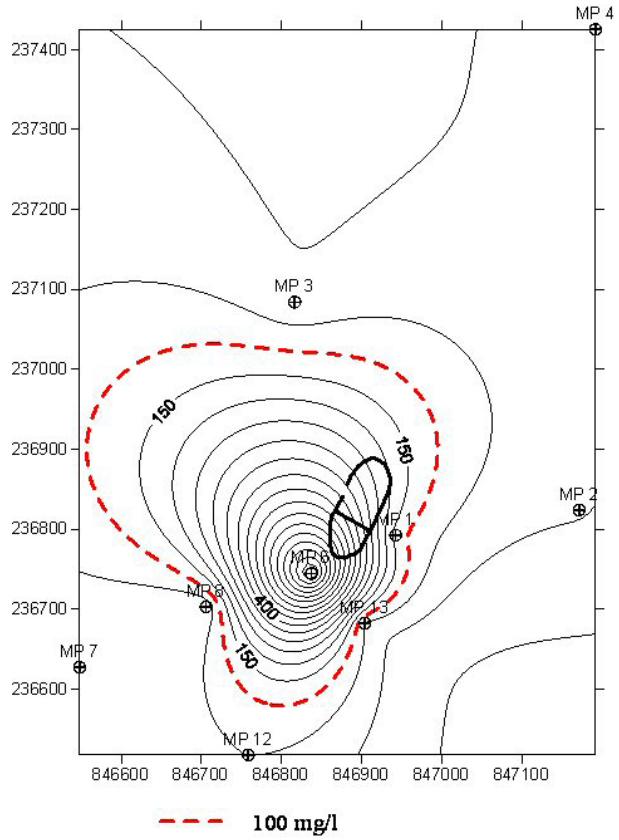

Fig. 8: Sodium concentration (mg/l) in July (2006) in Mikepércs

Arsenic and nickel in the groundwater exceeded 3-4 times the limit values. Lead occurred as a new element present in the quantity 2-6 times higher than the limit in the water samples of every drilling. Its occurrence is not explained by the composition of sewage mud where its concentration was 54 mg/kg, i.e. half of the limit value and besides, lead is not regarded as an easily mobilisable element. Apart from this, the concentration of nickel – as it can be seen later – remains below the limit in the sewage sludge and its concentration was greatest in that drilling, which does not coincide with the direction of groundwater movement and does not fit in the distribution of the other contaminants. Based on the above, its origin from the disposal is not proved in the case of neither lead nor nickel. The phosphate content was high in all boreholes and the ammonium content exceeded the "B" limit set by the decree 10/2000 in the drilling situated in the groundwater movement direction.

In the case of this sewage disposal site, the sewage sludge contained hydrocarbons at significant quantities; the TPH content was 1190 mg/kg exceeding the limit by 1090 mg/kg. The silver content was 23 mg/kg, which is more than ten times beyond the limit. Cadmium and copper exceeded two times the "B" limit and zinc (1095 mg/kg!) exceeded it 6.5 times.

Therefore, the occurrence of a more serious contamination in the soil samples was expected here regarding the metal bonding capacity of colloids represented by the clay content. Our assumption was justified as a contamination above the limit was found in several cases. Nickel exceeded the contamination limit set by the decree 10/2000 by 30% while arsenic exceeded it by 50%. However, nickel reached its highest value in the drilling located further away from the disposal site. Moreover, the nickel concentration is 33 mg/kg remaining below the contamination limit. Therefore this contamination cannot be explained by the disposal itself. Here presumably the bonded metal content occurs due to the great colloid content so this must be a natural enrichment of elements. This is also supported by the literature according to which the nickel content of the soils not contaminated in Hungary is around 4-450 mg/kg (Simon, 1999).

Spreading of hydrocarbons from the sewage mud is very slow due to the high clay content in the soil. Although the oil is let through readily by the impervious clay due to its lower dielectric constant, however, the saturated clay can impede oil as well. Probably this occurred in the area of the disposal site as contaminants present at very large amounts in the sewage sludge are found in minimum concentrations (20-40 mg/kg) in the soil.

Data of soil samples collected from the disposal basin (Tab. 2) differ from those found in the drillings: it is clearly seen in the table that only the concentrations of copper and zinc exceeded the limit values stipulated in the decree 10/2000. Copper was found in concentrations 2 times higher than the limit value while zinc was 32 mg/kg above the limit values. These values occur in the pre-settling basin. Sampling was repeated but no such high concentrations were found again. This may be caused by the micro-heterogeneity mentioned earlier.

Higher metal contents compared to those of the site in Mikepércs are found as a result of greater colloid content in the soil than in the sand, i.e. there are larger bonding surfaces where metals are fixed.

During the examination of plant samples, not all of metal concentrations were measured as in the case of soils because the concentrations of many of them stayed below the detectable limit. The succession of accumulation was similar in nettle leaves and roots (% share of heavy metal content in the plants/heavy metal content of the soil):

- leaf: Zn (55.59%) > Cu (35.43%) > Cr (11.44%)
- root: Zn (47.24%) > Cu (33.45%) > Cr (11.97%) .

This, however, might be misleading as it gives no information on the relationship of metals taken up by the plants and on the limit values. Of the three metals, only the concentration of chromium (which is the last one in the accumulation order) reached the toxic value, but there were no visible impacts of it.

Metal	Median	Min	Max	„B" level of 10/2000 Co-Decree
Cd	0.14	0.08	0.37	1.0
Hg	0.21	0.16	0.26	0.5
Pb	21.20	17.80	44.80	100.0
Cr	37.50	15.70	55.80	75.0
Ni	44.60	17.00	44.60	40.0
Cu	24.60	10.10	149,00	75.0
Zn	43.50	18.40	232,00	200.0

Tab. 2: Heavy metal concentrations in the soil samples

5. Conclusions

There are significant differences as well as similarities between the two depositories. One of the reasons to these differences is probably the fact that the disposal site in Újszentmargita had been already abandoned for several years when the examinations started so there was enough time available for water chemical parameters suggesting recent contamination to change, attenuate or decay (Gondi et al., 2003.). This is supported by the larger amount of undecaying chloride and sodium in coinciding groundwater movement within the drilling. These mobile elements do not become fixed on the colloids; thus their presence suggests that there are contaminants from the formerly deposited sewage that may filtrate through the clayey strata and may potentially contaminate the environment.

In Mikepércs, primarily organic contaminants get into the groundwater from the pollution sources. Ammonium and nitrite detected in large quantities suggest the disposal of fresh organic material. Nitrate as an end-product attenuates within a few hundred metres and approaches the background value. The presence of these beside the continuous disposal is not to be explained. The water contaminants of the two disposal sites were the same until they were both operating. By today, however, these were mainly washed out or decayed.

Our conclusions correspond with the results of Fazekas and Pinczés (2001). They investigated the landfills in the County of Hajdú-Bihar and found that even landfills without technical isolation had just local impacts.

The most striking difference between the two disposal sites is the metal contamination of the site in Újszentmargita. The explanation probably lies in two facts. First such metal contamination can not be present in the communal sewage thus here the disposal of some kind of industrial sewage must have taken place illegally. On the other hand, based on the vertical and horizontal distribution of metal contamination it is suggested that natural enrichment also took place and that was added by the high adsorption capacity of the soil due to the high clay content. In Mikepércs the specific soil surface dominated by coarse sand fraction the amount of metals is small regarding either the background values of the control areas or the immediate environment of the disposal site or the sewage sludge itself. Although the disposal site is illegally used and it seems like the disposal of only communal sewage is taken place, otherwise there would have been other traces in the sewage mud beside the high metal content.

Based on the results it can be claimed that both disposal sites cause local groundwater contamination in the case of most of the examined water chemical components. Local contamination is reduced to the level of the background values within a distance of a few hundred metres due to physical, chemical and biological decaying processes as well as the attenuation caused by infiltrating precipitation. Metal contamination in Újszentmargita is local as the amount of metals in the soil is minimal and the metal content of the groundwater is reduced below the limit values within a short distance due to attenuation and adsorption.

According to the preliminary expectations, the disposal site in Mikepércs causes significant contamination to its wider environment as the site had no insulation thus we expected that contaminants can easily spread in the sandy textured soil and in groundwater which occurs relatively near the surface. As the most important result of the research it was revealed that only local contamination occurred even at disposal sites with particularly disadvantageous conditions. Such detailed investigations will be required in the future however, based on the studies already performed it is worth rethinking the strict regulation that presents an almost impossible – primarily from the financial point of view – task to the local governments when they have to implement the recultivation of abandoned disposal sites as these techniques are frequently disproportionately expensive comparing to the environmental risk presented by the disposal site itself. There are about 20 disposal lakes in the County of Hajdú-Bihar. They are under closing up or have been already closed, although some of them are used either illegally or legally. Most of municipalities can not afford to carry out the basic tasks either. A recultivation process costs about 32,000 Euro representing a significant amount in their budget. Usually the safest solution is to remove the polluted material, but advantages would have to be balanced individually instead of applying the regulations literally.

References:

10/2000 (VI.2.) KöM-EüM-FVM-KHVM Co-Decree on threshold values of the quality protection of the subsurface water and the soil, www.kvvm.hu (in Hungarian).

BÍRÓ, T., THYLL, Sz., TAMÁS, J. (1998): Risk assessment of nitrate pollution in lower watershed of the Berettyó River. In: Filep, Gy. [ed.]: Soil water environment relationships. Wageningen - Debrecen. p. 239-247.

BUJNOVSKÝ, R. (2003): Evaluation of nitrogen inputs into agricultural soil as source of potential pollution of water resources. Ekológia (Bratislava), Vol. 22, No. 1, p. 51-56.

CSORBA, P. (2001): Environmental Impact Assessment. Distance Learning Material. Phare 343. program, 135 pp. (in Hungarian).

FAZEKAS, I., PINCZÉS, Z. (2001): Environmental problems and characteristics of the waste management in local and regional level in Hajdú-Bihar County. In: Zsilincsar, W., Pinczés, Z., Fazekas, I., Fischer, W. [eds.]: Charakteristische Merkmale der örtlichen und regionalen Müllentsorgung und ihre Umweltproblematik in Komitat Hajdú-Bihar, Debrecen, p. 70-160.

GADALLAH, M. A. A. (1996): Phytotoxic effects of industrial and sewage waste waters on growth, chlorophyll content, transpiration rate and relative water content of potted sunflower plants. Water, Air, & Soil Pollution, Vol. 89, No. 1-2, p. 33-47.

GEHRINGS, M., TENNHARDT, L. (2005): Altpapier als Quelle für hormonell wirksame Schadstoffe in Abwasser und Klärschlamm. Müll und Abfall, No. 37. p. 33-38.

GONDI, F., HALMÓCZKI, Sz., LIEBE, P., SZABÓ, I., SZARKA, A. (2003): Site investigation and monitoring. Site investigation of contaminated areas and remediation monitoring systems, Remediation Guidance 6. Ministry of Environment and Water Protection, (in Hungarian).

ILLÉS, I. (1993): Treatment of Communal Wastewater, BME Mérnöktovábbképző Intézet, Budapest, 114 pp. (in Hungarian).

KERÉNYI, A., SZABÓ, Gy., KISS G., MARTONNÉ ERDŐS, K., CSORBA, P., SZEGEDI, S. (1995): Investigation of potencial and actual pollution sources in the protective zones of abstraction sites of Debrecen. Scientific Report for Municipality of Debrecen, 50 pp. (in Hungarian).

LANGERGRABER, G., MUELLEGGER, E. (2005): Ecological sanitation – a way to solve global sanitation problems? Environment International, No. 31, p. 433-444.

LITERÁTHY, P. (1973): Universal methods of water analysis I. Chemical methods, Vízgazdálkodási Tudományos Kutatóintézet IV. Vízminőségi és Víztechnológiai Főosztálya, 233 pp. (in Hungarian).

MILLS, L.J., CHICHESTER, C. (2005): Review of evidence: Are endocrine disrupting chemicals in the aquatic environment impacting fish populations? Science of the Total Environment. 343. p. 1-34.

NEKAP 1997. National Action Program of Environment and Health, http://www.antsz.hu/oki/nekap (in Hungarian).

O'NEILL, P. (1993): Environmental chemistry, Chapman and Hall, 268 pp.

OLÁH, J., SZLÁVIK I., SZŐNYI, I. (1984): Development of the communal sewage sludge management technic. Vízügyi Műszaki Gazdasági Tájékoztató, 147. Budapest, 160 pp. (in Hungarian).

ÖLLŐS, G. (1992): Treatment of wastewater I., BME Mérnöktovábbképző Intézet, Budapest, 262 pp. (in Hungarian).

SIMON L. (1999): Soil pollution. In: Simon L. [ed.]: Soil pollution, soil remediation, Környezetügyi Műszaki Gazdasági Tájékoztató, KGI, Budapest, p. 1-30. (in Hungarian).

SZABÓ, Gy., SZABÓ, Sz., SZABÓ, A., SZEMÁN, B. (2006): Investigation of pollution level of the groundwater wells in Mikepércs and Bodrogkeresztúr. 3th Hungarian Conference on Geography, Proceedings, 6-7th September 2006, Budapest, p. 13. (in Hungarian).

SZABÓ, Sz., SZABÓ, Gy. (2005a): Environmental auditation of the sewage disposal site of Mikepércs, Report on the Environmental Auditation, Debrecen, 30 pp. (in Hungarian).

SZABÓ, Sz., SZABÓ, Gy. (2005b): Environmental auditation of the sewage disposal site of Újszentmargita, Report on the Environmental Auditation, Debrecen, 26 pp. (in Hungarian).

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BORDER ADMINISTRATIVE UNITS IN THE CZECH REPUBLIC

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Abstract

The paper deals with outlining the main contemporary problems of the Czech borderland against a background of changing character of the present European borders. The Czech borderland was delimited by 110 micro-regions of the authorized communes situated in the immediate vicinity of the state border. The qualification structure of population was identified as the main indicator of marginality in the borderland. The share of inhabitants elder than 15 years with post-secondary education was chosen as the particular indicator. All 110 frontier micro-regions can be found below the Czech average according to this indicator. Additionally, an analysis of the character of individual sections of the border according to their physical character, historical heritage and presuppositions of the trans-border co-operation was implemented. Catchment areas of the weakest centres and micro-regions consisting of small and very small settlements are considered for the most problematic. An improvement of the qualification structure of people, which has an important impact on preparedness for trans-border co-operation, is the most acute challenge for at least partial overcoming of marginality.

Shrnutí

Pohraniční mikroregiony v České republice

Příspěvek se zabývá nastíněním hlavních problémů českého pohraničí v současném období na pozadí změn charakteru současných evropských hranic. České pohraničí bylo vymezeno prostřednictvím 110 mikroregionů pověřených obecních úřadů, nacházejících se v bezprostřední blízkosti státní hranice. Jako hlavní indikátor marginality pohraničí byla identifikována kvalifikační struktura populace, konkrétně podíl obyvatel starších 15 let s pomaturitním vzděláním. Všech 110 pohraničních mikroregionů se nachází pod průměrnou úrovní ČR. Byla rovněž provedena analýza charakteru státní hranice podle jednotlivých úseků z hlediska fyzického charakteru, historického dědictví a předpokladů spolupráce. Za nejproblematičtější regiony jsou považovány spádové obvody slabých středisek a mikroregiony, skládající se z malých a velmi malých sídel. Nejnaléhavějším úkolem k alespoň částečnému překonání marginality je zlepšení kvalifikační struktury populace, která má významný vliv na připravenost k přeshraniční spolupráci.

Keywords: *Czech borderland, marginality, qualification structure, cross-border co-operation*

1. Introduction

In addition to the demise of the intra-German border after 1989, many other boundaries were established in Europe as result of the disintegration of the Soviet Union, Yugoslavia and Czechoslovakia. The trend turned the attention of European geographers to the problem of state boundaries. Nevertheless, the borderland of European countries ceases to be a problem of delimiting the border of national states but it becomes a problem of overcoming barriers within the process of European integration instead. It is generally the issue of cross-border cooperation in the nowadays Europe. There are efforts focused on the economic development of border regions, overcoming their marginality, elimination of distrust often given by historical or even ethnic conditions and on the establishment of cooperation that might benefit from economic differences on both sides of the border. One of the means to enforce such cooperation within the European Union is represented by euroregions covering today a greater part of internal and external borders of EU countries[1].

[1] Research, from which the presented paper comes out, was financed by the Ministry of Education, Youth and Sports of the Czech Republic by means of the National Research Programme II within the project No. 2D06001 "Problems in the development of Czech border regions" (Study case Orlice). The objective of this paper is to provide basic frameworks for the typology of Czech borderland as a basis for further analyses

2. Theory

European borderland passed through significant changes in the last decades. We can mention the fall of the Iron Curtain, the reunion of Germany, enlargement of the European Union or establishment of the Schengen area on the one hand, and the demise of the Soviet Union, Yugoslavia and Czechoslovakia on the other.

Except for the most economically developed part of Europe (within the borderland of Benelux, France, Germany and Switzerland), the other European borderlands are largely peripheral regions. Many factors influence this fact. The most significant of them are remoteness from metropolises, physical barriers in the form of worse accessible mountain systems, but also the heritage of barriers in ethnic states from the last century. In respect to that, we propose to distinguish between the peripheral character that is a function of distance (considering length, time and expenses) and might be expressed quantitatively, and the marginality that represents a qualitative underdevelopment in relation to central regions.

Border changes in Central and Eastern Europe initiated development of a sub-discipline within geography that might be called border geography (e.g. Grimm, 1995, 1998; Ravbar, 1999; Haase-Hudseljak, 2000; Bufon, 2001, 2007), in the Czech Republic apart from others Jeřábek, Dokoupil, Havlíček et al. (2004). The topicality of research into border regions from the perspective of globalization processes and changes in the meaning of borders is emphasized in Western Europe, too (Anderson, O'Dowd, 1999). Another contribution to the research into the role of borders was brought by a change of their character in relation to the accession of new countries in the European Union (Gorźelak, Jałowiecki, 2002).

The Czech Republic has experienced nearly all of the above mentioned processes during the last 20 years. Peculiar is considered the fact that in the wake of World War II most of the German population was transferred from a greater part of the Czech borderland and the population was largely changed. No tradition of cross-border relationships had a chance to originate on these border sections before 1990. On the contrary, a rather ethnically based distrust among inhabitants was supported on both sides.

The issue of borderland started to be addressed also by the Czech geography. One of the authors systematically pursuing borderland research is M. Jeřábek. In his surveys, he deals with the issue of borderland not only from the regional point of view (Jeřábek, 2000; Balej, Jeřábek [eds.], 2002), but he studies e.g. labour market and cross-border migrations, too (e.g. Jeřábek, 1998, 2004). He published a number of theoretical studies (e.g. Jeřábek [ed.], 1999; Jeřábek [ed.] 2001; Jeřábek 2003b; Jeřábek, Dokoupil, Havlíček et. al., 2004). Other Czech authors engaged in theoretical work and dealing with the demarcation of borderland are for example P. Chromý (2000), M. Hampl (2000), J. Dokoupil and T. Havlíček (2002). Issues of the development of agriculture in the Šumava Mts. were analyzed by M. Novotná (e.g. Novotná 2000, 2001). Studies on the perspectives of further development of the borderland in the Czech Republic were published among others by S. Řehák (1997), J. Dokoupil and S. Řehák (2001), J. Dokoupil and T. Havlíček (2002). A report on changes in the number of transport connections in the Czech-Slovak borderland after the disintegration of Czechoslovakia was prepared by S. Řehák (1998).

Euroregions represent an instrument of the European Union to overcome barriers and develop cross-border cooperation (Student, 1998). Euroregions should help to establish contacts among entities along the borderline within communal and regional fields, in the areas of culture, sport, education, management, solution of environmental problems etc. When the contacts are established, the tasks of euroregions are extending towards the cooperation of border regions on both sides of the border with the perspective for the joint solution of cross-border development (Jeřábek, 1999).

In the countries of the former socialist block, the establishment of euroregions dates back to the early 1990s. In the Czech Republic, the first euroregions originated near the Czech-German border. It was primarily the municipalities in the German borderland that initiated the formation of euroregions, namely because of the chance to win a financial support from the European structural funds for cross-border cooperation.

In the Czech geographic literature, there are numerous publications prevailingly focussing on euroregions belonging to the areas at the Czech-Saxon and Czech-Bavarian borders (e.g. Dokoupil, 2000; Jeřábek, 2000, 2002a, 2002b, 2003a, 2004; Novotná, 1995; Husák, 2005; Cetkovský, Klusáček, Martinát, Zapletalová, 2007). The issue of euroregions in the Czech Republic is addressed by S. Cetkovský et al. (2005). Topics of cross-border cooperation in the Weinviertel-Pomoraví-Záhorie Euroregion are discussed in surveys published by V. Dočkal et al. (2005) and V. Slavík (2001). Euroregions situated at the Czech-Polish border were analyzed by Wahla, Šindler and Lednický (2001). Cross-border cooperation in the Těšínské Slezsko Euroregion (The Těšín Silesia Euroregion) is tackled in the publication by J. Runge, ed. (2003). A relatively comprehensive survey of the Slovak-Czech cross-border cooperation was elaborated in Slovakia (Halás, 2005) etc.

3. Methodology of the research

In the Czech environment, we commonly meet with a double demarcation of the borderland that has additionally a number of other variants. According to historical approach, borderland are considered municipalities from which the German population was transfered shortly after the end of World War II. Such a determination has a certain justification with respect to the persisting specific social environment especially in rural parts of borderland defined by this way. However, it does not meet the geographical concept of borderland. On the one hand, the borderland defined in this way would have to include even places located in the deep inland of Bohemia and Moravia, and on the other hand, the definition does not reflect the new borderland with Slovakia.

According to some earlier surveys, all districts of the Czech Republic bordering with neighbouring states were considered borderland. Such an approach was motivated particularly by the availability of database for individual districts between the population censuses. However, considering the shape of the country's territory, a substantial part of districts was included into the borderland. Besides that, data for districts deeply reaching into the inland do not reflect marginality of the territory occurring directly at the state border.

On the other hand, from the residential-geographical viewpoint it is not appropriate to consider as borderland only the area of border communes. The residential-geographical processes in fact take place within nodal regions formed by the catchment districts of their centres. Therefore, in our research the borderland was demarcated by catchment microregions of communes with authorized municipal authorities. The number of identified microregions was 110.

These authorities are located in central communes (in the borderland mostly located in small towns), and their task is to assure for neighbouring communes such professional activities in the field of state administration for which the small communes have neither relevant professionals nor facilities. This concerns the smallest microregions in the sphere of state administration and potential areas for a future needful new integration of communess.

Two groups of indicators were applied in the borderland typology. The first group includes indicators characterizing microregions situadted on the state border. Data used were particularly those describing possible marginality of microregions. Discussed were indicators of demographic development (which is however not unfavourable in the Czech borderland and which is more favourable in the rural borderland than in the urbanized borderland), unemployment (which is however reflection of structural changes in the economy rather than of marginality as such) and qualification structure.

A possible indicator to express actual qualitative marginality (not only in the borderland) seems to be in Czech conditions namely the indicator of population`s qualification structure. This indicator reflects to a certain extent also economic strength and purchasing power of population (in this respect there are no data available in Czech statistics), way of work, lifestyle and namely the general cultural level of population. The cultural level in the borderland is important partly with respect to skills (language literacy especially on borders with the German speaking countries, knowledge of history and development of relationships in the region etc.), partly with regard to general tolerance and respect towards foreign partners. Qualification is also important while representing a potential for the obtainment of means of finance for development projects from structural funds and other special-purpose resources. We suppose that an important cultural milestone in the Czech conditions is represented by post-secondary education (higher technical and university education).

The second group of indicators is represented by the very character of the border, given by historical development and relationships between concrete states. Important attributes for possible cooperation are existing barriers, possibly traditions (historical, political, linguistic, cultural and economic) on the one hand, and the character of settlement and landscape, and physical permeability of the border on the other.

4. Borderland typology according to qualifications of the population in borderland microregions

The acquired level of population's skills plays a key role in the social and economic development of the society. Its degree reflects to some extent the quality of human capital available in a certain area. At present, the education level seems to be a precondition for a successful entry to labour market, which also shows in the constantly increasing share of secondary school-leavers. This is why we may currently consider this education level as a standard and we can focus more on the share of population with tertiary education, i.e. with the completed higher than secondary education.

The qualification structure of population in border microregions is influenced by a range of factors, most important of them including the size of centres, the microregion location and its connection to main transport routes or existence of a large-size centre in the hinterland of the Czech Republic. Orientation of the economy and situation on the labour market significantly affect sustenance of skilled workers.

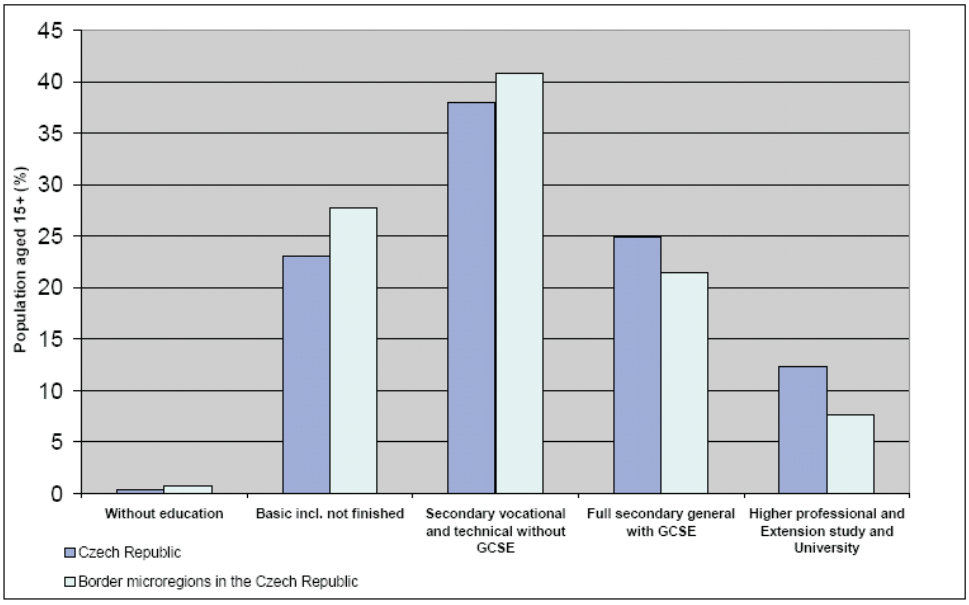

Fig. 1: Comparison of the Czech average in education with the situation in border regions
Source: Population census 2001, Czech Statistical Office Prague[1]. Drawn by P. Dvořák

A common feature of the Czech borderland is the low share of persons with the post-secondary and higher education. None of the studied microregions exhibited the proportion of these highly skilled persons reaching the Czech average of 12.4%. The lowest share is observed in microregions with a small centre tightly adjacent to the state border (e.g. Osoblaha 3.4%, Šluknov 4.6%, Horní Lideč 4.6%); on the contrary, the highest proportion is observed in microregions with a strong centre and with the developed quaternary economic sector (e.g. Frýdek–Místek 11.9%, Opava 11.8%).

Qualification structure depends on the size of settlements. According to data from the 2001 population census, the share of persons over 15 years with the higher education increases from 5.4% in communes with less than 200 inhabitants to communes with 10,000 to 20,000 inhabitants (11.9%). All the size groups below 20,000 have the qualification structure under average; the remaining size groups with more than 20,000 persons have an above-average qualification structure. It follows that the low qualification in the borderland closely connects with the rural character of a large part of the territory.

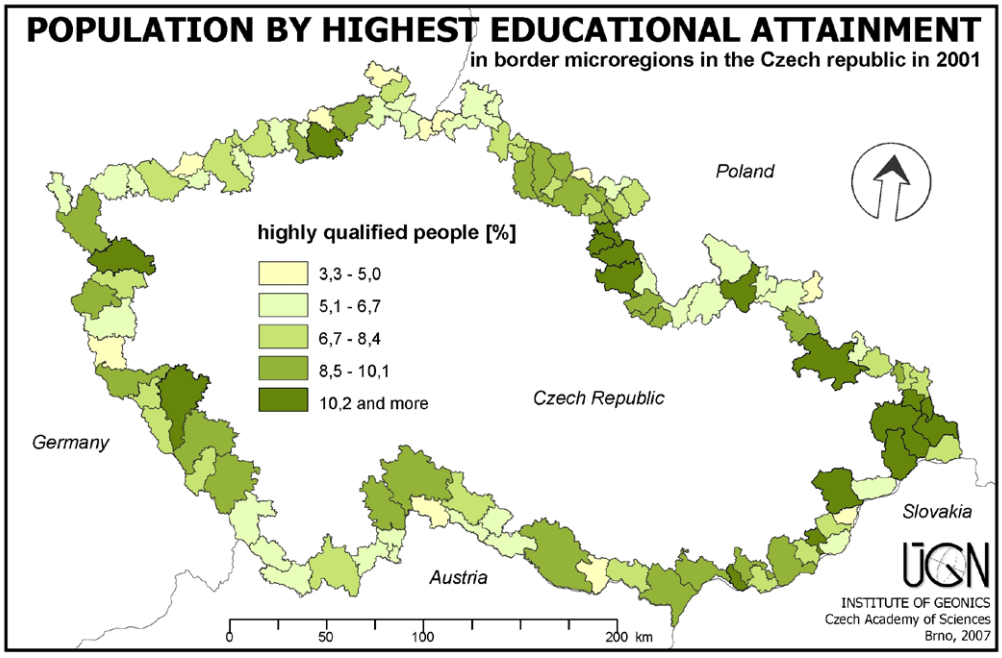

Fig. 2: Level of education in borderland microregions
Source: Population census 2001. Czech Statistical Office Prague. Drawn by E. Nováková

[1] GCSE – General Certificate of Secondary Education

Qualification structure appears to be less favourable in microregions with a high populated centre or in regions functioning as a residential hinterland of big cities. Such a situation we can see in the Ostrava agglomeration. However, strongly urbanized and industrialized regions do not have implicitly a good qualification structure particularly due to the composition of industry, which does not provide for the assertion of skilled labour force. Example can be mining districts in the Ostrava region (Orlová, Karviná) or in Northern Bohemia.

Qualification structure reflects the share of working population employed in individual sectors of economy too. The lowest share of persons in the primary sector (0.6–2.2%) can be found in the urbanized regions of Northern Bohemia and Ostrava. On the contrary, the highest share of people in this sector (7.0–2.1%) is in rural regions on the Czech – Bavarian and Czech – Austrian border. The maximum value is reached in Vranov nad Dyjí.

Industrial employment is relatively high in the borderland, exceeding the country's average in the majority of microregions. It concerns especially industrial regions of Ostrava surroundings and Northern Bohemia. The Moravian – Slovak borderland and nearly all the borderland with Poland are industrial too, although there are only a few medium-sized towns there. The lowest industrial employment we can see in South Moravia and in the spa and tourist regions of West Bohemia, in the Jeseníky Mts. and Krkonoše Mts. with the developed tertiary sector.

Regions of peripheral location within the Czech Republic exhibit the lowest potential in terms of qualified population. These regions are weakly populated, with a small centre and with the rural type of settlement, usually with the mountain relief and bad transport connection. Such regions occur within the whole border zone. The regions of Šluknov, Frýdlant, Broumov and Osoblaha are the greatest losers. As problematic areas appear also the mountain areas of the Czech-Saxon borderland, the microregions of Bor and Poběžovice at the Czech-Bavarian borderline, and nearly the entire borderland with Austria and the regions in the middle of the Czecho-Slovak borderland.

5. Borderland typology according to the state border character

There are five types of borderland that can be discussed with respect to borderland character. The Bavarian and Austrian borderlines were a part of the Iron Curtain until 1989, the Saxon and Polish borderlands, which until that time represented the internal boundary of real socialism and the new Slovak borderland. Each of the boundaries has kept its particularities until the present time.

The Bavarian border is the only segment of the Czech boundary representing the line of development. Until 1989, it was the most strictly guarded border. Due to the transfer of German population, the Bavarian borderland lost a considerable part of inhabitants who have never been replaced in terms of either quantity or qualification. Investment into human resources and economy was insufficient. This fact, on the other hand, caused a rather significant conservation of nature values, which is also true for some other parts of the borderland. The situation changed substantially after opening the borders. A considerable part of the Czech cross-border cooperation aims towards or through Bavaria. Here the peripheral character of the borderland is given namely by worse accessible relief of the Šumava Mts. The only urbanized part of the Bavarian-Czech borderland is the Cheb region.

The Austrian border has a similar character as to consequences after the transfer of German population and the conservation of nature values. Moreover, the Austrian border does not represent a natural barrier at its major stretches. Fertile farmland is available within a part of the borderland. Yet, this boundary has not become a border of development. Austrian borderland regions Weinviertel and Waldviertel belong to marginal ones even on the Austrian side of the border. Moreover, this side of the border seems to be burdened more with political problems caused mainly by the intra-Austrian political struggle. Thus, a major part of the Austrian border remains further a significantly marginal and rural area.

Worse accessible mountain chains broken primarily by the Labe (Elbe) River form the Saxon border. In the socialist period, the ex-GDR was apparently the closest political "partner" to the previous Czech part of Czechoslovakia. In spite of that, no intense neighbourly relationships were developed directly on the border. This might have been affected by a certain post-war anti-German phobia felt by the Czech population. At present, Saxony focuses more on the so-called old Lands while expecting economic and social aid from them. Eventual interest in cooperation with the Czech border regions appears to be just the other priority. Shopping tourism occurs there as well (Köppen, 2000). A great part of the Czech-Saxon borderland can be considered as urbanized. The belt starting in Chomutov and ending in Děčín is not of a too rural character. This eventuates also the population losses in the concerned borderland.

On the longer western part of the current Polish border (which used to constitute a border with Germany before the WWII) the majority of population was transfered on the both sides. Therefore, no tradition of cross-border cooperation could have been developed. The cooperation varied politically according to actual development in

Czechoslovakia and Poland. Natural barriers such as the Sudeten System form a greater part of the border. Language barrier is smaller here than at the border with the German speaking countries. The Czech-Polish border represents to a great extent a retailing boundary. The borderland population takes advantage of different prices on the two sides of the border. The eastern part of the Czech-Polish borderland from Orlová to Třinec is strongly urbanized and does not show a marginal character.

The border with Slovakia came to existence as a new barrier in 1993. It is formed mostly by nature elements. Although the southernmost part of the Czech-Slovak borderland is of rural character, it is not marginal. It includes a relatively rich Moravian countryside with important centres of settlement, namely Hodonín and Břeclav. There is in fact no language barrier there. In the period of Czechoslovakia, namely at the time when the country was endangered by Hitlerian Germany, significant investments into the armaments industry and transport infrastructure took place particularly on this border. In the socialist period, the boundary was the main crossing point for huge amounts of goods exported to the then most important previous economic partner - the Soviet Union. The border regime is above-standard for the citizens of the Czech Republic and Slovakia. Some economic problems emerged after the currency separation.

After the accession of the Czech Republic, Slovakia and Poland in the European Union, all state borders of the Czech Republic became inner boundaries of the European Union. Specific problems arise only in the case of illegal migration from eastern and south-eastern countries. The accession of the new member states into the Schengen area and the introduction of euro will represent another important step. The border in terms of a political barrier will nearly disappear. However, some differences will remain, namely the problems of historical burden perceived on a psychological level and economic characteristics given by unequal economic development of individual neighbouring states. In this respect, the aforementioned types of state boundaries will affect even the marginality level of border microregions.

6. Discussion

The question is what types of border regions represent a problem and why. It is obvious that problematic issues only minimally reflect the character of relations with the neighbouring country. A certain historical burden on the borders with the German speaking countries or anti-Temelín manifestations of our Austrian neighbours rather reflect the internal political scene of neighbouring countries; their influence on a concrete cooperation at a microregional level does not seem to be fundamental.

Main problem of the borderland seems to be marginality, which is expressed generally as a lack of investments and a worse access to cultural values. This results in other problems such as high unemployment rate and emigration tendencies of young and educated population. If we consider the population's qualification level as one of the most important indicators of marginality, it seems that the least problematic border microregions are those whose centers are towns with a significant higher tertiary function (e.g. district or spa towns).

Nevertheless, some problems may occur even in these regions. It should be realized that in the socialist period a substantial part of urbanized border regions made their living on coal mining and heavy industries. The today's consequence of this fact can be seen both in environmental problems and in the negative image of microregions usually on both sides of the border, and in problems on the labour market following out of structural economic changes.

Most rural border regions can be considered marginal. However even within them, the level of marginality varies. One of distinguishing factors may be structure of settlement. Most problematic microregions are especially those with a greater number of very small settlements (below 200 inhabitants) representing the only segment of the Czech settlement system that is currently endangered by depopulation. There are 229 communes with less than 200 inhabitants in the borderland. Of those, 109 and 109 recorded positive and negative demographic development in the period of 2002 – 2006, respectively. The rest kept the same population number in the mentioned period (Vaishar, 2008).

The greatest concentration of very small communes can be found in the south western borderland with Austria and Bavaria (Novohradské hory Mts., Šumava Mts., Český les Mts.). Depopulation of this territory has a long history, which started even before World War II (Dvořák, 2007; Kubeš, 2007). There is a minimum of very small communes in the eastern borderland whereas very small communes in the Saxonian borderland mostly increase.

A special category of problematic borderlands includes microregions with weak centres. The strength of a centre itself (measured by the number of inhabitants) stands for an indicator since it reflects strength of the whole microregion. However, it is an indicator of its former strength since the development of settlement structure is a relatively long-term process. On the other hand, weak microregional centres are not usually able to integrate their microregions at full and thus provide impulses for a further development of rural settlements within their surroundings.

As to the types of borderland according to the respective neighbouring countries, the primary role is in the German speaking countries played by their economic maturity (namely in the case of Bavaria) and also by the higher experience of local and regional governments in the issues of European integration and cross-border cooperation (perhaps except Saxony). On the contrary, in the case of borders with Slavonic countries, with Slovakia and Poland in particular, the main role is represented by language and cultural affinity and by the fact that the Czech Republic represents a relatively economically advanced partner to these states. Briefly said, in the case of German speaking countries, the transboundary relationships are built up with a higher professional attitude, in the case of Slavonic neighbours a higher interest might be expected on the part of partners.

7. Conclusion

Typology of border regions was based both on inland criteria (represented by the population's qualification structure), and on external criteria (represented by the character of the state border). This combination of two criteria should help to answer a question of whether the marginality can be at least partly compensated for by international cooperation.

One of alarming conclusions is that marginality (in the sense of quantity) is at the same time also a barrier to international cooperation while requiring people well-prepared, i.e. qualified and thus prepared to accept partners with tolerance, and to work out cross-border projects possibly bringing funds from the European resources.

On the other hand, the international cooperation represents a certain (and often the only) chance to achieve at least some level of development. In this respect, it might be even motivating. It is quite necessary to realize that such cooperation requires a relatively equable participation of both partner parties directly on the border.

It is in the interests of the country not to excessively increase differences between central and marginal regions. Therefore, the government should help to initiate sustainable development strategies in marginal regions. One-sided orientation to tourism according to the model [marginal region = relatively well preserved environment = opportunity for the development of tourism] seems to be successful only partly. Although the rural border regions apparently will not aim at a development in terms of promoting progressive technologies and behaviour models, it is highly desirable that conditions are created in them also for the development of agriculture (at least with respect to landscape maintenance), industry (at least to take advantage of skilled labour force), social services (that are generally underestimated) and housing (which heads towards periphery within the model counterurbanization).

8. References:

ANDERSON, J., O'DOWD, L. (1999): Borders, Border Regions and Territoriality: Contradictionary Meanings, Changing Significance. Regional Studies, Vol. 33, No. 7, p. 593-604.

BALEJ, M., JEŘÁBEK, M. [eds.] 2002: Pohraničí, přeshraniční spolupráce a euroregiony. Sborník z XX. Jubilejního sjezdu ČGS. UJEP, Ústí nad Labem.

BUFON, M. (2001): Geografia obmejnosti, čezmejne regije in oblike čezmejne povezanosti. Geografski vestnik, Vol. 73, No. 2, p. 9-24.

BUFON, M. (2007): Border Regions in a Re-integrated Europe. Moravian Geographical Reports, Vol. 15, No. 1, p. 2-13.

CETKOVSKÝ, S., KLUSÁČEK, P., MARTINÁT, S., ZAPLETALOVÁ, J. (2005): Euroregiony na území České republiky a jejich parciální geografická analýza. In: Peková, J., Zapletalová, J. [eds.]: Euroregiony, státní správa a samospráva. Ústav geoniky AV ČR, Ostrava, p. 79-118.

CETKOVSKÝ, S., KLUSÁČEK, P., MARTINÁT, S., ZAPLETALOVÁ, J. (2007): Some aspects of cross-border cooperation in euroregions of the Czech Republic on example of the Šumava region. Moravian Geographical Reports, Vol. 15, No. 1, p. 43-55.

DOČKAL V. [ed.] (1995): Přeshraniční spolupráce na východních hranicích České republiky. Růžový obláček a hrana reality. Mezinárodní politologický ústav, MU Brno, 140 pp.

DOKOUPIL, J. (2000): Teoretické přístupy k problematice pohraničí s aplikací v česko - bavorském prostoru. Geografie Vol. 105, No. 1, p. 10-18.

DOKOUPIL, J. (2005): Přeshraniční trh práce - impulz nebo bariéra pro rozvoj příhraničního regionu (na příkladu česko-bavorského pohraničí). Acta Facultatis Rerum Naturalium Universitatis Comenianae, Geographica Supplementum No. 3. Univerzita Komenského v Bratislave. p. 114-120.

DOKOUPIL, J., HAVLÍČEK, T. (2002): Border and border region: theoretical aspects, identification and determination. Acta Universitatis Carolinae, Geographica Vol. 37, No. 1, p. 27-44.

DOKOUPIL, J., ŘEHÁK, S. (2001): Perspektiva dalšího vývoje pohraničí ČR. In.: Jeřábek, M. [ed.]: Reflexe regionálního rozvoje pohraničí České republiky. Sociologický ústav AV ČR Ústí nad Labem, p. 85-88.

DVOŘÁK, P. (2007): Settlement development of the Czech Republic border regions from 1930 to 1950. In: Blaheta, R., Kolcun, A. [eds.]: PhD Workshop 2007 Proceedings. Institute of Geonics AS CR Ostrava, p. 25-28.

GORŹELAK, G., JAŁOWIECKI, B. (2002): European Boundaries: Unity or Division of the Continent? Regional Studies Vol. 36, No. 4, p. 409-419.

GRIMM, F. (1995): Regionen an deutschen Grenzen. Institut für Länderkunde Leipzig, 147 pp.

GRIMM, F. (1998): Grenzen und Grenzregionen in Südosteuropa. Südosteuropa Gesellschaft, München, 154 pp.

HAASE, A., HUDSELJAK, I. (2000): Perspektiven und Probleme der neuen Nachbarschaft. Europa Regional Vol. 8, No. 2, p. 2-18.

HALÁS, M. (2005): Cezhraničné väzby, cezhraničná spolupráca na príklade slovensko-českého pohraničia s dôrazom na jeho slovenskú časť. Bratislava, Univerzita Komenského, 152 pp.

HAMPL, M. (2000): Pohraniční regiony České republiky: Současné tendence rozvojové diferenciace. Geografie, Vol. 105, No. 3, p. 241-254.

HUSÁK, J. (2005): Možnosti přeshraniční spolupráce na příkladu euroregionu Šumava-Bayerischer Wald-Mühlviertel. In: Peková, J., Zapletalová, J. [eds.]: Euroregiony, státní správa a samospráva. Sborník referátů. VŠE Praha/ÚGN Brno, p. 14-18.

CHROMÝ, P. (2000): Hostorickogeografické aspekty vymezování pohraničí jako součást geografické analýzy. Geografie, Vol. 105, No. 1, p. 63-76.

JEŘÁBEK, M. (1998): Vytváření přeshraničního trhu práce - pendlerství v česko-německém pohraničí. Demografie Vol. 40, No. 1, p. 39-42.

JEŘÁBEK, M. [ed.] (1999): Geografická analýza pohraniční České republiky. Sociologický ústav AV ČR Praha/Ústí nad Labem. 180 pp.

JEŘÁBEK, M. (1999): The Czech border regions standing against the backround of the republic and opportunities for co-operation. In: The Situation and Perspectives of Trans-border Development and Co-operation of Border-regions in Germany, Poland, Slovakia and the Czech Republic. House for Polish-German Co-operation, Friedrich Ebert Stiftung, Gliwice, p. 28-45.

JEŘÁBEK, M. (2000): Pohraničí v regionálním rozvoji a jeho výzkumu. Geografie, Vol. 105, No. 1, p. 1-9.

JEŘÁBEK, M., [ed.] (2001): Reflexe regionálního rozvoje pohraničí ČR. Sociologický ústav AV ČR, Praha, 107 pp.

JEŘÁBEK, M. (2002a): Česko – německá (saská) přeshraniční spolupráce se zaměřením na Euroregion ELBE/LABE. Geografie - Sborník ČGS, Vol. 107, No. 3, p. 260- 276.

JEŘÁBEK, M. (2002b): Regionální rozvoj Ústecka a Euroregion ELBE/LABE. In: ANDĚL, J. et al.: Geografie Ústecka. Skripta. PF UJEP, Ústí n. L., p. 121-127.

JEŘÁBEK, M. (2003a): Euroregion Elbe/Labe – v číslech, grafech a mapách / Euroregion Elbe – in Statistic Figures, Graphs and Maps, CSU Liberec. CD-ROM.

JEŘÁBEK, M. (2003b): Pohraničí v regionálním rozvoji a jeho výzkum. Geografie, Vol. 105, No. 1, p. 1-9.

JEŘÁBEK, M. (2004): Vnější vztahy Východního Krušnohoří – vliv hranice, sousedství s Německem, přeshraniční spolupráce. In: Balej, M., Anděl, J., Jeřábek, M. a kol.: Východní Krušnohoří – geografické hodnocení periferní oblasti. Acta Univerzitatis Purkynianae 96, Studia Geographia V., UJEP, Ústní n.L., p. 198-205.

JEŘÁBEK, M., DOKOUPIL, J., HAVLÍČEK, T. a kol. (2004): České pohraničí – bariéra nebo prostor zprostředkování? Academia Praha, 296 pp.

KÖPPEN, B. (2000): Auswirkungen des Einkaufstourismus im nordböhmischen Grenzraum. Europa Regional 8, No.2, p.19-31.

KUBEŠ, J. (2007): Rozdílný vývoj obyvatelstva v sídlech české a rakouské části přeshraničního regionu „Novohradské hory - Freiwald“ mezi léty 1869–2001. Klaudyán 4, No.1, p.32-55.

NOVOTNÁ, M. (2000): Hodnocení zemědělského využívání krajiny v pohraničním regionu Pošumaví. Geografie. 105, No. 1, p. 34-40.

NOVOTNÁ, M. (2001): Vimpersko. Geografická analýza příhraničního mikroregionu. Západočeská univerzita v Plzni, 121 pp.

RAVBAR, M. (1999): General Characteristics of Border Areas in Slovenija. In: New Prosperity for Rural Regions, Inštitut za geografijo, Ljubljana, p. 11-20.

RUNGE, J., [ed.] (2003): Terytorialny systém spoleczno-ekonomiczny pogranicza województwa śląskiego i Połnocnych Moraw oraz strategie jego rozwoji. Práce Naukowe Uniwersytetu śląskiego w Katowicach No. 2136. Univestytet Ślaski, Katovice, 310 pp.

ŘEHÁK, S. (1997): Aktuální změny prostorových interakcí na Moravskoslovenském pomezí. [závěrečná zpráva grantu GA ČR číslo 205/95/1184]. Masarykova univerzita Brno, 29 pp.

ŘEHÁK, S. (1998): Kontakty se Slovenskem na moravsko-slovenském pomezí: role vzdálenosti hranic. In Geografie X. Masarykova univerzita Brno, p. 122-127.

ŘEHÁK, S. (1998): The Moravian-Slovak borderlands: some new features following the division of Czechoslovakia. Moravian Geographical Reports, Vol. 6, No. 1, p. 14-17.

SLAVÍK, V. (2001): Euroregions in Slovakia with specific features to Euroregion Pomoravie-Weinviertel-Jižní Morava. In: Region and regionalism, No. 5, Lodž-Opole.

STUDENT, T. (1998): Regionale Zusammenarbeit zwischen Ems und Dollart: Die Euroregion EDR. Europa Regional Vol. 6, No. 4, p. 12-22.

VAISHAR, A. (2008): Aktuální demografický vývoj v českém pohraničí. In: Kallabová, E., Smolová, I., Ira, V. [eds.]: Změny regionálních struktur České republiky a Slovenské republiky. Ústav geoniky AV ČR Ostrava, p. 90-94.

WAHLA, A., ŠINDLER, P., LEDNICKÝ, V. (2001): Euroregiony a sdružení obcí a měst v česko-polském příhraničí. Ostravská univerzita Ostrava, 60 pp.

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Fig.5: The former Slovak National Council seat
Photo R. Grác

Fig. 6: National Council of the Slovak Republic today
Photo R. Grác

Illustrations related to the paper by V. Slavík and R. Grác

Fig. 3: The Bratislava Castle
Photo R. Grác

Fig. 4: Grassalkovich Palace
Photo R. Grác

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