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REGIONÁLNA ŠTRUKTÚRA SLOVENSKA V POSLEDNÝCH TROCH DESAŤROČIACH

REGIONAL STRUCTURE OF SLOVAKIA IN THE LAST THREE DECADES

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A regional structure is an important feature of a territory. In the last three decades, the regional structure of Slovakia has undergone significant changes connected with the transformation of social and economic sphere of society. A considerable intensity of differential tendencies and the deepening of regional polarization has been and accompaniment of the transition period in Slovakia. The aim of this paper is to identify regions in accordance with the evaluation of the partial and complex indicator of socio-economic level and highlight the evolution and main features of the transforming regional structure in the Slovak republic.

Key words: regional structure, disparities, (pre-)transition period, Slovakia

Dôležitým znakom územia je regionálna štruktúra. V posledných desaťročiach na vývoj regionálnej štruktúry Slovenska mali vplyv zmeny ekonomického a sociálneho prostredia, ktoré so sebou priniesol prechod z centrálne riadenej ekonomiky na trhové hospodárstvo. Sprievodným javom transformačného obdobia na Slovensku je pomerne značná intenzita diferenciačných tendencií a prehlbujúca sa regionálna polarizácia. Procesy sú odrazom zásadných zmien nielen v transformácii, výkonnosti a prosperite ekonomických subjektov, ale vo zvýšenej miere aj v uplatnení kvalitatívnych faktorov ako sú ľudské zdroje, sociálny kapitál a infraštruktúrna vybavenosť regiónov. Priestorovým prejavom týchto procesov sú regionálne disparity.

Problematika regionálnych rozdielov vo vzťahu k regionálnej štruktúre územia je vysoko aktuálna téma, ktorá je najmä v posledných rokoch v pozornosti záujmu odborníkov z oblasti geografie (Korec, 2005; Korec a Ondoš, 2009; Matlovič a Matlovičová, 2005; Bezák, 2001; Lauko et al., 2009; Ira, 2007; Rajčák, 1998 a i.), sociológie (Pašiak, 2007; Gajdoš a i., 2007) a ekonómie (Tvrdoň a i., 2007).

Cieľom štúdie je na základe hodnotenia demografického profilu, profilov zamestnanosti a trhu práce, produkčnej výkonnosti a infraštruktúrnej vybavenosti ako aj komplexného ukazovateľa sociálno-ekonomickej úrovne (Rajčáková, 2006; Rajčáková a Švecová, 2009) vo vybraných časových horizontoch (pred-)transformačného obdobia stanoviť typológiu regiónov, poukázať na vývoj regionálnych disparít a regionálnej štruktúry Slovenska.

References

Pre hodnotenie regionálnej štruktúry Slovenska bola použitá tzv. komponentná analýza. Dôležitým krokom bol výber observačných jednotiek a vstupných dát – pre predtransformačné obdobie boli zohľadnené jednotky v súlade s územno-správnym usporiadaním platným do 1. 1. 1997 (Slovenská republika, 4 kraje, 38 okresov) a pre transformačné obdobie regióny systému NUTS (NUTS 1 až NUTS 4), ktorých hranice sú totožné s aktuálne platnými územnými jednotkami (SR, 8 krajov, 78 okresov). Výber hodnotiacich ukazovateľov okrem kvalitatívnej stránky (obsah dát) zohľadňoval dostupnosť časových radov oficiálnych štatistických údajov.

Pre hodnotenie regionálnych disparít sme použili tzv. parciálne ukazovatele (demografický profil, zamestnanosť obyvateľstva a trh práce, produkčná výkonnosť a infraštruktúrna vybavenosť) a ukazovateľ komplexnej sociálno-ekonomickej úrovne. Územným jednotkám rôznej hierarchickej úrovne sa pre každý z uvedenej skupiny parciálnych ukazovateľov pridelila bodová hodnota. Vyjadrovala pozíciu územnej jednotky podľa príslušného ukazovateľa v rámci Slovenska. Priemerom hodnôt a pridelením váh podľa stupňa dôležitosti, sme stanovili príslušný koeficient (hodnota osciluje v intervale 0 – 100 bodov). Pri výpočte komplexného ukazovateľa sociálno-ekonomickej úrovne bol použitý vážený aritmetický priemer, vypočítaný z hodnôt parciálnych ukazovateľov. Komplexný ukazovateľ vyjadruje pozíciu územných jednotiek v regionálnej štruktúre Slovenska a je východiskom pre typológiu regiónov (okresov) na zaostávajúce (24,0 – 40,0 bodov), stagnujúce (40,1 – 51,0), čiastočne sa rozvíjajúce (52,1 – 70,0), rozvíjajúce sa (70,1 – 90,0) a dynamicky sa rozvíjajúce (90,1 – 99,9) a východiskom pre analýzu zmien regionálnej štruktúry Slovenska.

Výsledky a diskusia

Regionálna štruktúra Slovenska v predtransformačnom období

Pre pochopenie zmien v regionálnej štruktúre Slovenska v transformačnom období považujeme za potrebné načrtnúť hlavné znaky v poslednom desaťročí predstransformačného obdobia. Hlavnými faktormi, ktoré determinovali vývoj regionálnej štruktúry boli centrálne riadená ekonomika, usmerňovaný vývoj národohospodárskych odvetví a regiónov (oblastí), plánovaná alokácia pracovných síl, smerovanie hospodárskych a dodávateľsko-odberateľských väzieb na členské krajiny RVHP. Aj napriek usmerňovanému vývoju sa regionálna štruktúra Slovenska v 80. rokoch vyznačovala značnou rôznorodosťou.

Dominantnými procesmi demografického vývoja boli prirodzená mobilita obyvateľstva a intenzívne koncentračné procesy – migrácia obyvateľstva z rurálnych regiónov do tzv. pólov rozvoja (Bratislava, Košice, Banská Bystrica) a sídelno-hospodárskych

Tabuľka 1 Demografický profil (kraje, rok 1980)

Kraj (1)	Počet obyvateľov (2)	Hustota zaľudnenia v obyv . km^2 (3)	Prirodzený prírastok / úbytok obyvateľstva v ‰ (4)	Migračný prírastok / úbytok obyvateľstva v ‰ (5)	Celkový prírastok / úbytok obyvateľstva v ‰ (6)	Index starnutia obyvateľstva v % (7)	Index ekonomickej zaťaženosti v % (8)	Ukazovateľ demografického profilu (9)	
								koeficient (10)	poradie (11)
Bratislava (12)	379 659	1 036	9,6	12,4	22,0	68,3	70,9	8,9	1
Západoslovenský (13)	1 685 459	116	6,7	-1,8	4,9	72,0	76,6	3,7	4
Stredoslovenský (14)	1 526 358	85	8,7	-1,1	7,6	63,5	75,4	6,8	2 – 3
Východoslovenský (15)	1 392 443	87	11,6	-2,2	9,4	54,1	76,7	6,8	2 – 3
Slovensko (16)	4 983 919	108	9,2	1,8	11,0	64,5	74,9	–	

Zdroj: SŠÚ 1981, 1982, vlastné výpočty Source: SŠÚ 1981, 1982, authors´ calculations

Table 1 Demographic indicators (Regions, 1980)
(1) region, (2) population (total), (3) population density in per km^2, (4) natural increase (-decrease) of population in ‰, (5) migration increase (-decrease) of population in ‰, (6) total increase (-decrease) of population in ‰, (7) index of aging in %, (8) index of economic burden in %, (9) demographic indicator, (10) coefficient, (11) rank, (12) Bratislava Region (13) Western Slovakia, (14) Central Slovakia, (15) Eastern Slovakia, (16) Slovakia

Tabuľka 2 Ukazovateľ produkčnej výkonnosti (kraje, 1980)

Kraj (1)	Objem priemyselnej produkcie na 1 obyvateľa v tis. Kčs (2)	Objem stavebnej produkcie na 1 obyvateľa v Kčs (3)	Objem maloobchodného obratu na 1 obyvateľa v tis. Kčs (4)	Priame investície na 1 obyvateľa v tis. Kčs (5)	Priemerná mesačná mzda v Kčs (6)	Ukazovateľ produkčnej výkonnosti (7)	
						koeficient (8)	poradie (9)
Bratislava (10)	64,5	614,5	24,5	17,5	2 863	85,0	1
Západoslovenský (11)	30,5	984,9	14,8	9,0	2 536	45,0	4
Stredoslovenský (12)	40,8	766,6	15,9	9,0	2 602	70,0	2
Východoslovenský (13)	32,8	910,5	15,2	8,2	2 567	50,0	3
Slovensko (14)	36,9	869,0	17,6	9,4	2 642		

Zdroj: SŠÚ 1981, 1982, vlastné výpočty Source: SŠÚ 1981, 1982, authors´ calculations

Table 2 Indicators of Production Efficiency (Regions, 1980)
(1) region, (2) industry production per capita in thousand Kčs, (3) construction production per capita in Kčs, (4) retail sales per capita in thousand Kčs, (5) direct investment per capita in thousand Kčs, (6) average monthly salary in Kčs, (7) indicator of production efficiency, (8) coefficient, (9) rank, (10) Bratisllava region (11) Western Slovakia, (12) Central Slovakia, (13) Eastern Slovakia, (14) Slovakia

Tabuľka 3 Ukazovateľ zamestnanosti a trhu práce (kraje, 1980)

Kraj (1)	Počet zamestnaných (2)	Z toho			Zamestnanosť na 100 obyvateľov (6)	Index progresivity ekonomickej štruktúry (7)	Ukazovateľ zamestnanosti a trhu práce (8)	
		poľnohospodárstvo, lesné hospodárstvo, rybolov v % (3)	priemysel v % (4)	ostatné odvetvia v % (5)			koeficient (9)	poradie (10)
Bratislava (11)	260 981	2,0	25,5	72,5	68,7	370,5	100	1
Západoslovenský (12)	566 761	26,4	35,5	38,1	33,6	250,4	25	4
Stredoslovenský (13)	621 929	15,1	41,9	43,0	40,7	265,7	75	2
Východoslovenský (14)	523 029	19,4	31,1	49,4	37,6	263,0	50	3
Slovensko (15)	1 972 700	17,7	35,1	47,2	39,6	287,4		

Zdroj: SŠÚ 1981, 1982, vlastné výpočty Source: SŠÚ 1981, 1982, authors´ calculations

Table 3 Indicators of Employment and Labour Market (Regions, 1980)
(1) region, (2) employees, (3) agriculture, hunting, forestry and fishing in %, (4) industry in %, (5) other branches in %, (6) employees per 100 inhab., (7) index of economical structure progressivity, (8) indicator of employment and labour market, (9) coefficient, (10) rank, (11) Bratislava Region (12) Western Slovakia, (13) Central Slovakia, (14) Eastern Slovakia, (15) Slovakia

osí (považská, pohronská), s koncentráciou pracovných príležitostí, infraštruktúry, bytovej výstavby, služieb, zariadení školstva a zdravotníctva celoštátneho a nadregionálneho významu.

Začiatkom 80. rokov sa demografický vývoj vyznačoval stagnáciou prirodzenej mobility obyvateľstva (rok 1980 9,2 ‰; SŠÚ 1981) s priestorovou diferenciáciou na krajskej (Východoslovenský kraj 11,6 ‰, Bratislava 9,6 ‰; SŠÚ 1981) a okresnej úrovni. Nadpriemerné hodnoty prirodzeného prírastku boli okrem Bratislavy, Košíc a regiónu stredného Považia, v okresoch severného Slovenska (Dolný Kubín, Čadca, Poprad, Prešov, Stará Ľubovňa a i.; SŠÚ 1980). V tom čase sa formovali tzv. demograficky depresívne regióny, s vysokým emigračným saldom, postupnou degradáciou vekovej štruktúry, s nízkym prirodzeným prírastkom až úbytkom obyvateľstva. Patrili k nim okresy Podunajskej nížiny (Levice, Nové Zámky) a Juhoslovenskej kotliny (Veľký Krtíš, Lučenec a i.; SŠÚ 1981). Koncom 80. rokov prirodzená mobilita obyvateľstva výrazne poklesla (SR 4,4 ‰; SŠÚ 1989). Pokles bol v tzv. problémových okresoch južného Slovenska, rozvojových póloch a okresoch ležiacich pozdĺž hospodársko-sídelných osí. Prehlbovali sa regionálne rozdiely. Zmeny sa prejavili aj vo vekovej štruktúre (index starnutia 64,5 %; SŠÚ 1989), s koncentráciou staršieho obyvateľstva v okresoch Podunajskej nížiny a Juhoslovenskej kotliny, „mladými“ boli severoslovenské (Dolný Kubín, Poprad a i.; SŠÚ 1989) okresy. Už koncom predtransformačného obdobia hodnota demografického profilu odrážala priestorovú diferenciáciu demografických procesov (tabuľka 1).

Hodnotu ďalších parciálnych a komplexného ukazovateľa sociálno-ekonomickej úrovne ovplyvňovala odvetvová štruktúra hospodárstva a zamestnanosti obyvateľstva s dominantným postavením priemyslu v Bratislave, Košiciach, stredopovažskom, turčianskom, pohronskom a hornonitrianskom regióne. Industrializácia pôvodne poľnohospodársky a lesohospodársky zameraných regiónov severného, východného a južného Slovenska mala na vývoj regionálnej štruktúry Slovenska diferencovaný vplyv. Kým v regiónoch Oravy a Východného Slovenska sa posilnilo postavenie priemyslu, v nížinných okresoch s lokalizáciou nových priemyselných subjektov sa očakávania nenaplnili. Mnohé subjekty v dôsledku straty trhov a nízkej konkurencieschopnosti postupne zanikli. Priestorovú diferenciáciu ukazovateľa produkčnej výkonnosti na úrovni krajov v roku 1980 udáva tabuľka 2.

V predtransformačnom období sa nezamestnanosť prakticky nevyskytovala. Rozhodujúcim ukazovateľom trhu práce bola odvetvová štruktúra zamestnanosti, s vedúcim postavením priemyslu (35,1%, SŠÚ 1980), ktorý dominoval najmä v tzv. priemyselných okresoch (Martin, Považská Bystrica, Trenčín, Liptovský Mikuláš a i.). Prírodný potenciál determinoval nadpriemernú zamestnanosť obyvateľstva v poľnohospodárstve v nížinných (Dunajská Streda, Komárno, Levice – viac ako 40 %) a v kotlinových (Veľký Krtíš, Košice-vidiek a i. – viac ako 50 %, SŠÚ 1980) okresoch.

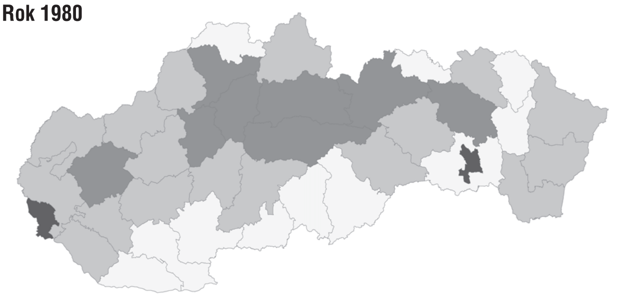
Zamestnanosť v terciárnom sektore závisela od funkcie sídiel v regionálnej štruktúre. V súlade s funkciou hlavného mesta Bratislavy, krajských miest a sídiel nadregionálneho významu sa v nich lokalizovali nevýrobné aktivity, v dôsledku čoho dosahovali nadpriemernú zamestnanosť v terciárnom sektore (Bratislava 72,5 %, Košice 65,4 %, okres Žilina 64,4 % a i.; SŠÚ 1980). Počas 80. rokov diferenciácia zamestnanosti obyvateľstva zostala zachovaná, aj keď rastúca intenzita dochádzky za prácou v rámci funkčného regiónu dennej dochádzky Bratislavy, ovplyvnila transformáciu zamestnanosti v okresoch jej zázemia (Dunajská Streda, Trnava a i.).

V roku 1989 sa stretávame s fenoménom nezamestnanosti, ktorej intenzita a s ňou spojené negatívne javy (dlhodobá nezamestnanosť, pokles životnej úrovne obyvateľstva a i.) neboli v porovnaní s neskorším obdobím výrazné. Postupne sa rozvíjajúce podnikateľské prostredie (miera podnikateľskej aktivity Bratislava 4,1 %, Žilina 3,6 %, Košice 3,1 %, Nitra 2,4 % a i.; SŠÚ 1990) vytváralo nové pracovné príležitosti. Koncom predtransformačného obdobia dominantné postavenie podľa ukazovateľa trhu práce dosiahli okresy s polyfunkčnými hospodárskymi nodálnymi centrami celoštátneho a krajského významu, ktoré tvorili „kostru“ ekonomickej štruktúry Slovenska.

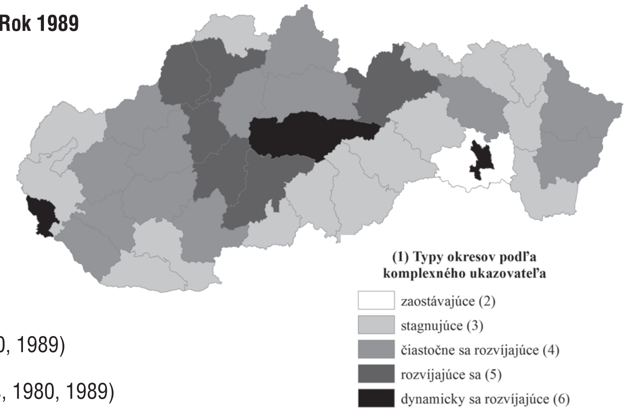
Nevyhnutným rozvojovým predpokladom je infraštruktúrna vybavenosť. Analýza technickej, sociálnej a dopravnej infraštruktúry poukázala na jej nepriaznivý a potrebám nezodpovedajúci stav, s dominantou pozíciou okresov, ktorými prechádza považský dopravný koridor. Naopak problematická sa ukázala pozícia okresov južného Slovenska s absenciou dopravného prepojenia celoštátneho a medzinárodného významu.

V roku 1980 bodové rozpätie ukazovateľa sociálno-ekonomickej úrovne okresov oscilovalo od 25,8 do 87,3 bodov. Podľa použitej metodiky k stredne rozvinutým patrili Bratislava a Košice, okresy Banská Bystrica, Žilina a Poprad, nepriaznivú pozíciu v regionálnej štruktúre mali tzv. okrajové okresy (obrázok 1), s pokračujúcou marginalizácou v ďalšom období. Koncom 80. rokov je zreteľná pozícia troch polarizovaných jadrových regiónov – Bratislava, Košice a Banská Bystrica (obrázok 1); na rozvojové póly a ich zázemie sa priestorovo viaže stredoslovenský región s nadpriemerným ukazovateľom sociálno-ekonomickej úrovne v okresoch považsko-turčianskeho a hornonitrianskeho regiónu. Na východnom Slovensku popri Košiciach dobrú pozíciu mali priemyselné okresy Prešov, Poprad a Humenné. Ostatné, s výnimkou okresov s marginálnym polohovým poten-

Rok 1980



Rok 1989



Obrázok 1 Sociálno-ekonomická úroveň v Slovenskej republike (okresy, 1980, 1989)
Zdroj: SŠÚ 1981, 1990 vlastné výpočty

Figure 1 Indicator of socio-economic level in the Slovak Republic (Districts, 1980, 1989)
Source: SŠÚ 1981, 1990, authors´ calculations
(1) types of districts by a complex indicator of socio-economic level, (2) lagging behind, (3) stagnant, (4) less developed, (5) mid developed, (6) developed

Tabuľka 4 Indikátor infraštruktúrnej vybavenosti (kraje, 1980)

Kraj (1)	Dĺžka vodovodnej siete v km^2 (2)	Dĺžka kanalizačnej siete v km^2 (3)	Počet nemocničných lôžok na 1 000 obyv. (4)	Rozloha obytnej plochy na 1 byt v m^2 (5)	Ukazovateľ infraštruktúrnej vybavenosti (6)	
					koeficient (7)	poradie (8)
Bratislava (9)	3,23	1,82	4,4	54,5	100,0	1
Západoslovenský (10)	0,28	0,08	6,9	46,1	56,3	3
Stredoslovenský (11)	0,27	0,06	7,2	44,0	43,8	4
Východoslovenský (12)	0,07	0,22	8,0	48,1	68,8	2
Slovensko (13)	0,96	0,55	6,63	48,18		

Zdroj: SŠÚ 1981, 1982, vlastné výpočty Source: SŠÚ 1981, 1982, authors´ calculations

Table 4 Infrastructure Indicators (Regions, 1980)
(1) region, (2) length of water distribution network in km^2, (3) length of sewage network in km^2, (4) hospital beds per 1 000 inhab., (5) living space for 1 flat in m^2, (6) indicator of infrastructure, (7) coefficient, (8) rank, (9) Bratislava Region (10) Western Slovakia, (11) Central Slovakia, (12) Eastern Slovakia, (13) Slovakia

Tabuľka 5 Počet obyvateľov, hustota zaľudnenia a miera urbanizácie v Slovenskej republike (regióny NUTS 2, 1995 – 2006)

Región NUTS 2 (1)	Počet obyvateľov (2)					Rozloha* (7)		Hustota zaľudnenia v obyv./km^2 (8)	Počet sídiel (9)		Miera urbanizácie v % (12)
	rok 1995 (3)	rok 2000 (3)	rok 2006 (3)		index rastu 1995 – 2006 v % (6)						
			abs. (4)	SR v % (5)		v km^2	SR v % (5)		spolu (10)	z toho miest (11)	
Bratislavský kraj (13)	618 290	617 049	606 753	11,2	97,0	2 054	4,2	295,0	73	7	82,9
Západné Slovensko (14)	1 875 419	1 874 829	1 862 227	34,5	99,5	14 992	30,5	126,0	881	49	51,1
Stredné Slovensko (15)	1 349 357	1 355 930	1 351 088	25,0	100,3	16 265	33,2	85,0	831	42	52,2
Východné Slovensko (16)	1 524 724	1 554 739	1 573 569	29,3	102,4	15 723	32,1	101,0	1 106	40	52,8
Slovensko (17)	5 367 790	5 402 547	5 393 637	99,9	399,2	49 034	100,0	151,8	2 891	138	59,8

Zdroj: ŠÚ SR 1999, 2002, 2010 Source: ŠÚ SR 1999, 2002, 2010
* vrátane 4 vojenských obvodov *including 4 military districts

Table 5 Population, Density of Population and rate of urbanisation in the Slovak Republic (NUTS 2, 1995 – 2006)
(1) NUTS 2 region, (2) population, (3) year, (4) total, (5) share of SR in %, (6) growth 1995–2006 in %, (7) surface area km^2, (8) population density per km^2, (9) number of municipalities, (10) total, (11) of which towns, (12) rate of urbanisation in %, (13) Bratislava Region, (14) Western Slovakia, (15) Central Slovakia, (16) Eastern Slovakia, (17) Slovakia

Tabuľka 6 Hrubý domáci produkt v parite kúpnej sily v Slovenskej republike (PKS; regióny NUTS 2)

Región NUTS 2 (1)	Hrubý domáci produkt mil. PKS, b. c. v roku (2)			Hrubý domáci produkt na obyvateľa (PKS, b. c.) v roku (3)			Hrubý domáci produkt na obyvateľa (PKS, EÚ 15/EÚ 27=100%) v roku (4)		
	1995	2000	2006	1995	2000	2006	1995	2000	2006
Bratislavský kraj (5)	9 426	14 016	21 260	15 266	22 708	35 131	87	101	147,8
Západné Slovensko (6)	14 595	18 708	27 627	21 683	30 102	15 040	45	45	62,8
Stredné Slovensko (7)	9 556	12 279	15 715	14 188	18 112	11 615	40	40	49,2
Východné Slovensko (8)	9 861	12 916	21 260	12 948	16 685	35 131	37	37	44,0
Slovensko (9)	43 438	57 919	80 930	8 098	10 724	15 012	47	49	75,9

Zdroj: http://www.nbs.sk, 2010 Source: http://www.nbs.sk, 2010

Table 6 Gross domestic product in purchasing power parity at current prices in the Slovak Republic (PPS; NUTS 2)
(1) NUTS 2 region, (2) gross domestic product million PPS, c. p., (3) gross domestic product per capita PPS, c. p., (4) gross domestic product per capita PPS as share of EÚ 15/EÚ 27 in 2006, (5) Bratislava region, (6) Western Slovakia, (7) Central Slovakia, (8) Eastern Slovakia, (9) Slovakia

ciálom a zlou dostupnosťou na východe a juhu Slovenska, patrili k ekonomicky a sociálne priemerným (obrázok 1). Proces marginalizácie sa začal v súvislosti s diferencovaným polohovým a primárnym potenciálom, rozdielnou absorpčnou kapacitou na nové podmienky (likvidácia priemyselných subjektov, strata trhov, konverzia zbrojárskej výroby, nízka konkurencieschopnosť, nezamestnanosť, nízka vzdelanostná úroveň obyvateľstva, vysoký podiel rómskeho etnika a i.) výraznejšie prejavovať v ďalšom období. Regionálna štruktúra z roku 1989 odráža postupné členenie územia Slovenska pomyslenou líniou na dva subregióny (obrázok 1).

Regionálna štruktúra Slovenska v transformačnom období

Geopolitické zmeny, transformácia ekonomického a sociálneho prostredia, integračné úsilie a členstvo v EÚ výrazne ovplyvnili formovanie regionálnej štruktúry Slovenska v posledných dvadsiatich rokoch. Intenzívnejšie sa prejavili regionálne disparity na všetkých hierarchických úrovniach. Bratislavský kraj, ktorý je zároveň regiónom NUTS 2 aj NUTS 3, na rozlohe 4,2 % SR koncentruje 11,2 % obyvateľstva, s priemernou hustotou zaľudnenia 295 obyv.km^{-2} (tabuľka 5).

Bratislavský kraj dosahuje HDP na obyvateľa v parite kúpnej sily (ďalej PKS) vyšší ako priemer EÚ 27, čo je viac ako dvojnásobok priemeru SR a podieľa sa 26,3 % na pridanej hodnote SR. Ekonomická výkonnosť ostatných regiónov je diferencovaná (tabuľka 6).

Dynamika využívania rozvojového potenciálu regiónov je ovplyvnená aj priamymi zahraničných investíciami (ďalej PZI). V transformačnom období objem PZI umiestnených v SR vzrástol, avšak viac ako 4/5 PZI je lokalizovaných v Bratislavskom kraji a regióne NUTS 2 Západné Slovensko. V problémových regiónoch je objem PZI relatívne nízky (tabuľka 7).

V súvislosti s hospodárskou krízou viaceré subjekty s majoritnou zahraničnou účasťou obmedzujú produkciu, uvoľňujú pracovné sily, čím zhoršujú ekonomickú pozíciu regiónu a zvyšujú negatívne sociálne dopady najmä v marginálnych regiónoch.

Reštrukturalizácia hospodárstva je spojená aj so zmenami v zamestnanosti obyvateľstva a trhu práce. Nové systémové a reštrukturalizačné podmienky, spolu s regionálnymi špecifikami a slabou aktívnou politikou trhu práce viedli k rastu nezamestnanosti a utváraniu nerovnovážneho stavu na regionálnych trhoch práce. Začiatkom 90. rokov bolo uvoľnených cca 150 tis. pracovníkov, približne o 1/3 poklesla zamestnanosť v priemysle. V súčasnosti je v NH aktívnych 2 131,8 tis. pracovníkov a odvetvová štruktúra zamestnanosti sa postupne približuje k priemeru EÚ 27 (tabuľka 8).

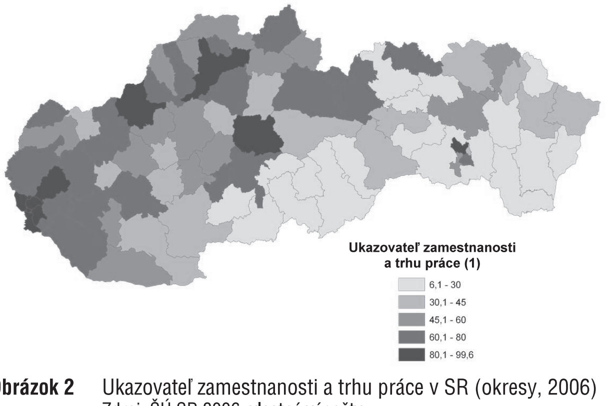
Počas transformačného obdobia nezamestnanosť zaznamenala niekoľko etáp – začiatkom 90. rokov prudko vzrástla, vo viacerých okresoch dlhodobo dosahovala mieru nezamestnanosti (MN) nad 20 % a bola sprevádzaná negatívnymi (rast dlhodobej nezamestnanosti, vysoká nezamestnanosť absolventov, mladistvých a ťažko adaptabilného rómskeho obyvateľstva) a sociopatogénnymi javmi. Aj keď prišlo v súlade s pozitívnym vývojom ekonomiky k vytváraniu nových pracovných príležitostí, problémy pretrvávajú naďalej. MN je priestorovo diferencovaná, miera podnikateľskej aktivity a absorpčných možností relatívne nízka a s výnimkou Bratislavského kraja, podnikateľské prostredie nedokáže eliminovať nevyvážený stav trhov práce. Vhodnou charakteristikou regionálnych rozdielov a regionálnej štruktúry je ukazovateľ zamestnanosti a trhu práce. V koncentrovanej podobe vyjadruje stav trhu práce, štruktúru podnikateľského prostredia a jeho schopnosť eliminovať nerovnovážny stav ponukovej a dopytovej stránky regionálnych trhov práce (tabuľka 9).

Priestorová diferenciácia ukazovateľa zamestnanosti a trhu práce sa prejavuje na všetkých hierarchických úrovniach. Dominantné postavenie majú okresy Bratislava I až III, Pezinok, Senec, ale aj dobre dostupný, infraštruktúrne a hospodárskymi väzbami prepojený okres Trnava a stredopovažský región; nadpriemernú hodnotu ukazovateľa dosahujú aj Košice, okresy Banská Bystrica a Nitra. V priestorovej diferenciácii sa prejavuje pomyselná deliacia línia jz-sv smeru a rozpätie bodového skóre je výraznejšie (obrázok 2).

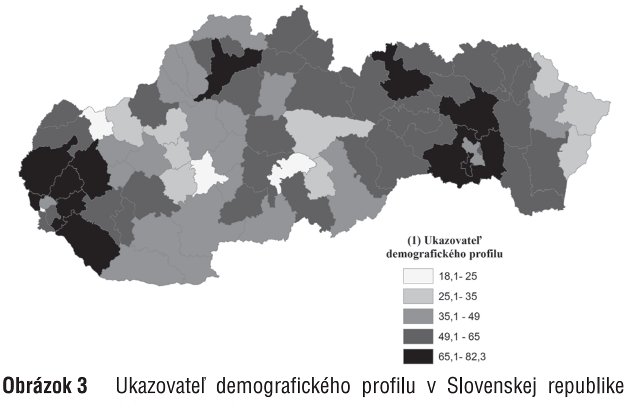
Ukazovateľ demografického profilu odráža vývoj a stav demografických procesov (pokles prirodzenej mobility, zmenu migračných tokov, starnutie obyvateľstva a i.).

Najvyššie komponentné skóre v okresoch zázemia Bratislavy (Senec, Malacky, Dunajská Streda) a Košíc je výsledkom nadpriemerného migračného salda spojeného s intenzívnou suburbanizáciou. Rozvoj ekonomického prostredia a silné stránky (polohová atraktivita, dopravná a vzdelávacia infraštruktúra a i.) pozitívne ovplyvňujú mobilitu a štruktúru obyvateľstva v okresoch Trnava a Žilina. Marginálna pozícia okresov Juhoslovenskej kotliny (Poltár, Veľký Krtíš, Rimavská Sobota), severovýchodného Slovenska (Medzilaborce, Snina, Sobrance) zostáva naďalej zachovaná (obrázok 3).

Priestorová diferenciácia ukazovateľov produkčnej výkonnosti a infraštruktúrnej vybavenosti je v úzkej korelačnej väzbe



Obrázok 2 Ukazovateľ zamestnanosti a trhu práce v SR (okresy, 2006)
Zdroj: ŠÚ SR 2006, vlastné výpočty
Figure 2 Indicator of Employment and Labour Market in the Slovak Republic (District, 2006)
Source: ŠÚ SR 2006, author´s calculations
(1) indicator of employment and labour market



Obrázok 3 Ukazovateľ demografického profilu v Slovenskej republike (okresy, 2006)
Zdroj: ŠÚ SR 2006, vlastné výpočty
Figure 3 Demographic Indicators in the Slovak Republic (District, 2006)
Source: ŠÚ SR 2006, author´s calculations
(1) demographic indicator

Tabuľka 7 Zahraničné investície v Slovenskej republike (regióny NUTS 2)

Región NUTS 2 (1)	Priame zahraničné investície (2)								
	rok 1996 (3)			rok 2000 (3)			rok 2007 (3)		
	v mil. Sk (4)	v % SR (5)	na obyv. v tis. Sk (6)	v mil. Sk (4)	v % SR (5)	na obyv. v tis. Sk (6)	v mil. Sk (4)	v % SR (5)	na obyv. v tis. Sk (6)
Bratislavský kraj (7)	22 797	58,0	36,8	98 022	56,0	158,9	601 917	61,6	493,94
Západné Slovensko (8)	8 418	21,4	4,5	20 720	11,8	34,6	185 734	19,0	37,32
Stredné Slovensko (9)	4 537	11,5	3,4	13 590	7,8	20,0	92 347	9,5	26,53
Východné Slovensko (10)	3 584	9,1	2,3	42 638	24,4	55,4	96 435	9,9	25,64
Slovensko (11)	39 336	100,0	23,5	174 970	100,0	67,2	976 435	100,0	145,86

Zdroj: http://www.nbs.sk, 2010 Source: http://www.nbs.sk, 2010

Table 7 Foreign direct investments in the Slovak Republic (NUTS 2)
(1) NUTS 2 region, (2) foreign direct investmenst, (3) year, (4) in million Sk, (5) share of SR in %, (6) per capita in thousand Sk, (7) Bratislava Region, (8) Western Slovakia, (9) Central Slovakia, (10) Eastern Slovakia, (11) Slovakia

Tabuľka 8 Zamestnanosť obyvateľstva podľa sektorov národného hospodárstva v SR (regióny NUTS 2)

Región NUTS 2 (1)	Rok 1995 (2)			Rok 2000 (2)			Rok 2006 (2)						
	poľno-lesné hospodárstvo, rybolov (3)	priemysel (4)	ostatné odvetvia (5)	poľno-lesné hospodárstvo, rybolov (3)	priemysel (4)	ostatné odvetvia (5)	spolu (6)	poľno-lesné hospodárstvo, rybolov (3)		priemysel (4)		ostatné odvetvia (5)	
	v %	v %	v %	v %	v %	v %		spolu (6)	v %	spolu (6)	v %	spolu (6)	v %
Bratislavský kraj (7)	1,8	17,1	81,1	1,5	17,1	81,4	402 879	4723	1,2	58558	14,5	339598	84,3
Západné Slovensko (8)	8,5	36,2	55,4	8,2	32,5	32,5	722 961	36426	5,0	241524	33,3	445011	61,6
Stredné Slovensko (9)	6,9	32,5	60,6	7,3	29,8	29,8	489 744	21283	4,4	132285	26,9	336176	68,7
Východné Slovensko (10)	7,7	28,4	64,0	6,5	25,6	25,6	516 233	22346	4,4	131459	25,5	362428	70,2
Slovensko (11)	6,6	30,1	63,3	6,3	27,4	66,3	2 131 817	84778	33,8	563826	219,3	1483213	546,9

Zdroj: ŠÚ SR Bratislava 2001, 2010 Source: ŠÚ SR Bratislava 2001, 2010

Table 8 Employment by Sectoral Structure of Economy in the Slovak Republic (NUTS 2)
(1) NUTS 2 region, (2) year, (3) agriculture, hunting, forestry and fishing, (4) industry, (5) other branches, (6) total, (7) Bratislava region, (8) Western Slovakia, (9) Central Slovakia, (10) Eastern Slovakia, (11) Slovakia

Tabuľka 9 Ukazovateľ zamestnanosti a trhu práce v Slovenskej republike (regióny NUTS 2, 2006)

Región NUTS 2 (1)	Zamestnaní na 100 obyv. (2)	Právnické osoby na 100 obyv. (3)	Fyzické osoby – podnikatelia na 100 obyv. (4)	Živnostníci na 100 obyv. (5)	Miera nezamestnanosti v % (6)	Miera podnikateľskej aktivity v % (7)	Index progresivity ekonomickej štruktúry (8)	Ukazovateľ zamestnanosti a trhu práce (9)
Bratislavský kraj (10)	75,5	7,0	10,5	9,8	2,4	15,9	260,2	89,6
Západné Slovensko (11)	38,0	2,0	7,2	6,8	6,6	9,9	232,1	57,7
Stredné Slovensko (12)	33,8	2,0	7,0	6,6	12,3	9,1	234,4	47,3
Východné Slovensko (13)	32,2	2,1	5,9	5,4	14,4	13,1	232,3	34,9
Slovensko (14)	44,9	3,3	7,6	7,2	8,9	12,0	239,8	57,4

Zdroj: ŠÚ SR 2006, vlastné výpočty Source: ŠÚ SR 2006, authors´ calculations

Table 9 Indicators of employment and labour market in the Slovak Republic (NUTS 2, 2006)
(1) NUTS 2 region, (2) employees per 100 inhab., (3) legal persons per 100 inhab., (4) natural persons – entrepreneurs per 100 inhab., (5) self-employed persons per 100 inhab., (6) unemployment rate in %, (7) entrepreneurial activity rate in %, (8) index of economical structure progressivity, (9) indicator of employment and labour market, (10) Bratislava region, (11) Western Slovakia, (12) Central Slovakia, (13) Eastern Slovakia, (14) Slovakia

Tabuľka 10 Ukazovateľ demografického profilu v SR (regióny NUTS 2, 2006)

Región NUTS 2 (1)	Prirodzený prírastok / úbytok obyvateľstva v ‰ (2)	Migračný prírastok / úbytok obyvateľstva v ‰ (3)	Celkový prírastok/úbytok obyvateľstva v ‰ (4)	Index starnutia obyvateľstva v % (5)	Index vzdelanostnej úrovne v % (6)	Index ekonomickej zaťaženosti v % (7)	Ukazovateľ demografického profilu (8)
Bratislavský kraj (9)	-0,5	5,5	5,0	172,8	49,1	55,5	60,0
Západné Slovensko (10)	-1,8	1,0	-0,8	143,0	34,8	55,2	47,5
Stredné Slovensko (11)	-0,6	-0,1	-0,7	120,6	34,7	57,2	48,2
Východné Slovensko (12)	2,2	-1,2	1,0	100,5	34,9	58,4	54,0
Slovensko (13)	-0,2	1,3	1,1	134,2	38,4	56,6	52,4

Zdroj: ŠÚ SR 2006, vlastné výpočty Source: ŠÚ SR 2006, authors´ calculations

Table 10 Demographic indicators in the Slovak Republic (NUTS 2, 2006)
(1) NUTS 2 region, (2) natural increase (-decrease) of population in ‰, (3) migration increase (-decrease) of population in ‰, (4) total increase (-decrease) of population in ‰, (5) index of aging in %, (6) index of education level in %, (7) economic dependency ratio in %, (8) demographic indicator, (9) region of Bratislava, (10) Western Slovakia, (11) Central Slovakia, (12) Eastern Slovakia, (13) Slovakia

Tabuľka 11 Ukazovateľ produkčnej výkonnosti v SR (regióny NUTS 2, 2006)

Región NUTS 2 (1)	Tržby z priemyselnej výroby na 1 000 obyv., mil. Sk (2)	Objem stavebnej produkcie na 1 000 obyv., mil. Sk (3)	Priemerná mesačná mzda v SK (4)	Priame zahraničné investície na 1 000 obyv., mil. Sk (5)	Ukazovateľ produkčnej výkonnosti (6)
Bratislavský kraj (7)	646,68	102,69	25 466	493,94	73,8
Západné Slovensko (8)	193,46	16,67	17 780	37,32	59,1
Stredné Slovensko (9)	124,94	17,24	16 670	26,53	45,9
Východné Slovensko (10)	109,73	25,88	16 538	25,64	37,6
Slovensko (11)	268,70	40,62	19 113	145,86	54,1

Zdroj: ŠÚ SR 2006, vlastné výpočty Source: ŠÚ SR 2006, authors´ calculations

Table 11 Indicators of production efficiency in the Slovak Republic (NUTS 2, 2006)
(1) NUTS 2 region, (2) turnover in industry per 1000 inhab., million Sk, (3) construction production per 1000 inhab., million Sk, (4) average monthly salary v Sk, (5) foreign direct investments per 1 000 inhab., million Sk, (6) indicator of production efficiency, (7) Bratislava region, (8) Western Slovakia, (9) Central Slovakia, (10) Eastern Slovakia, (11) Slovakia

Tabuľka 12 Ukazovatele infraštruktúrnej vybavenosti a komplexnej sociálno-ekonomickej úrovne v SR (regióny NUTS 2, 2006)

Región NUTS 2 (1)	Počet internetových prípojok na 100 domácností (2)	Počet áut na 100 obyv. (3)	Počet nemocničných lôžok na 1 000 obyv. (4)	Podiel obcí napojených na vodovodnú sieť* (5)	Počet obcí napojených na kanalizačnú sieť** (6)	Rozloha obytnej plochy v m^2 na obyv.*** (7)	Index redukovanej dĺžky ciest (8)	Počet prenocovaní na 1000 návštevníkov (9)	Ukazovateľ infraštruktúrnej vybavenosti (10)	Komplexný ukazovateľ sociálno-ekonomic kej úrovne (11)
Bratislavský kraj (12)	6,4	351,6	110,7	96,7	76,0	19,6	48,0	3 389,5	82,3	96,7
Západné Slovensko (13)	2,7	225,6	80,0	77,0	13,9	18,2	15,4	1 440,1	51,7	68,3
Stredné Slovensko (14)	2,3	249,8	92,1	84,3	24,9	17,1	11,4	3 104,3	50,2	60,6
Východné Slovensko (15)	2,4	186,8	81,1	64,6	32,1	16,8	15,2	1 487,5	41,8	53,3
Slovensko (16)	3,0	237,7	87,1	78,2	29,0	17,7	18,4	2 111,7	52,7	96,7

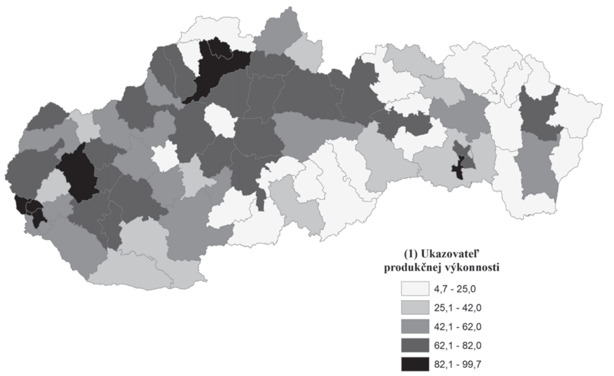
Zdroj: ŠÚ SR 2006, *–*** ŠÚ SR 2001, vlastné výpočty Source: ŠÚ SR 2006, *–*** ŠÚ SR 2001, authors´ calculations

Table 12 Infrastructure indicators and indicators of socio-economic level in the Slovak Republic (NUTS 2, 2006)
(1) NUTS 2 region, (2) internet access per 100 households, (3) cars per 100 inhab., (4) hospital beds per 1 000 inhab., (5) share of municipalities supplied from public water network*, (6) share of municipalities using public sewage network**, (7) living area in m^2 per inhab.***, (8) index of reduced road lenght, (9) overnight stays per 1 000 visitors, (10) indicator of infrastructure, (11) complex indicator of socio-economic level, (12) Bratislava region, (13) Western Slovakia, (14) Central Slovakia, (15) Eastern Slovakia, (16) Slovakia

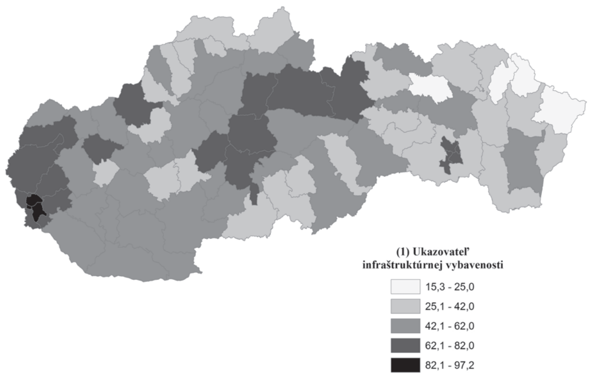
s vyššie uvedenými ukazovateľmi a odráža rozvojový potenciál, komparatívne výhody (polohový potenciál, dopravná dostupnosť, kvalifikovaná pracovná sila, infraštruktúrna vybavenosť, prírodný potenciál a i.), efektívnosť a pozíciu ekonomických subjektov v regionálnej štruktúre. Bodové rozpätie produkčnej výkonnosti na úrovni okresov narastá od 4,7 do 99,7 bodov. Okrem Bratislavy, okresy s najvyšším bodovým skóre sú koncentrované pozdĺž považskej rozvojovej osi (Trnava, Trenčín, Žilina, Považská Bystrica, Liptovský Mikuláš), v regióne stredného Pohronia (Banská Bystrica, Zvolen); na východnom Slovensku dominantné postavenie majú Košice a okres Humenné. Marginálne okresy východného a južného Slovenska dosahujú najnižšiu produkčnú výkonnosť (obrázok 4).

Ukazovateľ infraštruktúrnej vybavenosti poukazuje na rozdielnu vybavenosť infraštruktúrou a zohľadňuje návštevnosť v rámci cestovného ruchu. Hodnota ukazovateľa klesá od západu smerom na východ – najvyššie hodnoty dosahujú okresy Bratislava I a III, Zvolen, Banská Bystrica, Liptovský Mikuláš a i. – okresy s dopravnou infraštruktúrou medzinárodného a celoštátneho významu, kvalitnou technickou a sociálnou infraštruktúrou, s prírodnou a polohovou atraktivitou, vysokým kultúrno-historickým potenciálom a vhodnými realizačnými predpokladmi pre rozvoj cestovného ruchu. Nevyhovujúci stav je v južných a východných okrajových marginálnych okresoch, s nepostačujúcou a kvalitatívne nevyhovujúcou infraštruktúrou (obrázok 5).

Podľa komplexného ukazovateľa sociálno-ekonomickej úrovne sú najvyššie hodnoty v okresoch Bratislavy a jej bezprostredného zázemia, ďalej v centrálnom (Trnava, Piešťany), záhorskom (Senica, Skalica, Piešťany) a južnom podunajskom (Dunajská Streda, Galanta) subregióne Trnavského kraja. Identickú pozíciu majú Košice a priestorovo rozsiahly región, tvorený okresmi ekonomicko-sídelných systémov Považia (Trenčín, Žilina, Liptovský Mikuláš, Ružomberok, Martin) a región stredného Pohronia (Banská Bystrica, Zvolen; obrázok 6). Jadrá uvedených regiónov sú pólmi rozvoja a ťažiskami osídlenia a hospodárstva SR (Aurex, MŽP SR 2001). V regiónoch južného a severovýchodného Slovenska sa aj napriek potenciálu a snaženiu v industriálnom období (lokalizácia priemyslu, školstva, administratívna funkcia a i.) nevyformovali významnejšie články regionálnej štruktúry. V regióne Východné Slovensko, popri Košiciach „kostru" regionálnej štruktúry dotvárajú regióny nižšej hierarchickej úrovne – Hornádsky (Prešov) a Zemplínsky (Michalovce, Humenné), kým ostatná časť, najmä prihraničné okresy (Sobrance, Snina, Medzilaborce) dlhodobo patria medzi marginálne (obrázok 6). „Prepad" zaznamenala komplexná ekonomicko-sociálna úroveň Hornonitrianskeho regiónu, ktorý v minulosti mal relatívne uzavretý hospodársky (priemyselný) cyklus. Reštrukturalizácia sa nepriaznivo prejavila v ekonomickej prosperite, sociálnej sfére ako aj životnej úrovni obyvateľstva.

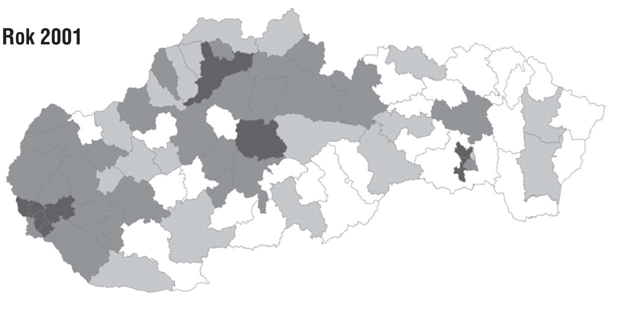


Obrázok 4 Ukazovateľ produkčnej výkonnosti v Slovenskej republike (okresy, 2006)
Zdroj: ŠÚ SR 2006, vlastné výpočty
Figure 4 Indicator of Production Efficiency in the Slovak Republic (District, 2006)
Source: ŠÚ SR 2006, authors´ calculations
(1) indicator of production efficiency

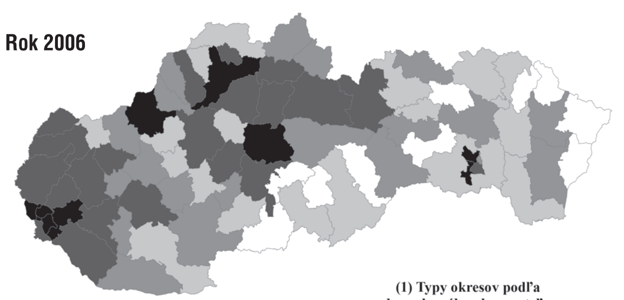


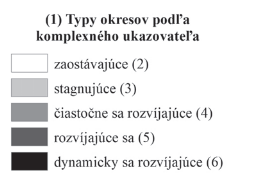
Obrázok 5 Ukazovateľ infraštruktúrnej vybavenosti Slovenskej republiky (okresy 2006)
Zdroj: ŠÚ SR 2006, vlastné výpočty
Figure 5 Indicator of Infrastructure in the Slovak Republic (District, 2006)
Source: ŠÚ SR 2006, authors´ calculations
(1) indicator of infrastructure

Rok 2001



Rok 2006





Obrázok 6 Sociálno-ekonomická úroveň v Slovenskej republike (okresy, 2001, 2006)
Zdroj: ŠÚ SR 2001, 2006, vlastné výpočty
Figure 6 Indicator of socio-economic level in the Slovak Republic (Districts, 2001, 2006)
Source: ŠÚ SR 2001, 2006, authors´calculations
(1) types of districts by indicator of socio-economic level, (2) lagging behind,(3) stagnant,(4) less developed, (5) mid developed, (6) developed

Záver

Z analýzy komplexnej sociálno-ekonomickej úrovne vo vzťahu k regionálnej štruktúre SR možno vyvodiť nasledovné závery. Významným znakom regionálnej štruktúry Slovenska sú neustále sa prehlbujúce regionálne rozdiely (disparity). Formovať sa začali už v predtransformačnom období, počas transformačného obdobia sa regióny s rozdielnym prírodným a polohovým potenciálom, štruktúrou hospodárstva, demografickým správaním a schopnosťou reagovať na podmienky trhovej ekonomiky rozvíjali diferencovane. Už v 90. rokoch sa v regionálnej štruktúre vymedzovali tzv. otvorené regióny (Bratislava, Košice), regióny parciálnej adaptácie (stredné Považie, stredné Pohronie) a zaostalé (marginálne) regióny (Rajčák, 1998). Priestorová diferenciácia komplexného ukazovateľa sociálno-ekonomickej úrovne umožňuje na území SR vyčleniť zaostávajúce, stagnujúce, čiastočne sa rozvíjajúce, rozvíjajúce sa a dynamicky sa rozvíjajúce regióny (okresy; obrázok 6). Územie Slovenska je rozčlenené pomyselnou líniou juhozápadno-severovýchodného smeru, ktorá „rozdeľuje" Slovensko na dva výrazné subregióny s diferencovaným rozvojovým potenciálom a predpokladmi pre rast konkurencieschopnosti (obrázok 6). V súčasnosti sa dynamicky rozvíjajú vybrané regióny a ich póly rozvoja. Ide o Bratislavský región (v širších súvislostiach Bratislavsko-Trnavský rozvojový región), stredné Považie s pólmi rozvoja Trenčín, Žilina, Považská Bystrica, Liptovský Mikuláš, Považská Bystrica a i., Banskobystrický a Košický región. Negatívnou črtou regionálnej štruktúry je prehlbovanie regionálnych disparít a trvalý proces vytvárania marginálnych regiónov, so znakmi zaostávania v ekonomickej a sociálnej oblasti. Viaceré z nich tvoria bázu pre tzv. regióny chudoby (okresy Poltár, Veľký Krtíš, Detva, Revúca, Sobrance, Gelnica a i.). Transformácia regionálnej štruktúry SR jednoznačne potvrdila zvýraznenie ekonomickej a sociálnej polarizácie, myšlienku priestorového členenia SR na centrálne-ťažiskové (Bratislavský a Košický región) a koridorové regióny západno-východného smeru (severný Považský a koridor systému Juhoslovenských kotlín; Lukniš, 1985) ako aj výsledky viacerých štúdií (Bezák, 2001; Korec, 2005; Korec a Ondoš, 2009; Gajdoš, 2007; a i.).

Prekonať hlavné problémy regionálnej štruktúry Slovenska, najmä zastavenie ďalšieho prehlbovania regionálnych disparít, bude možné zabezpečiť cielenou a účinnou regionálnou politikou, zameranou na podporu endogénneho rozvoja s efektívnym využívaním nástrojov kohéznej politiky EÚ 2007 – 2013.

Súhrn

Dôležitým znakom územia je jeho regionálna štruktúra. Regionálna štruktúra Slovenska prešla v posledných troch desaťročiach významnými zmenami, ktoré sú spojené s transformáciou ekonomickej a sociálnej sféry spoločnosti. Sprievodným javom transformačného obdobia na Slovensku je pomerne značná intenzita diferenciačných tendencií a prehlbujúca sa regionálna polarizácia. Cieľom príspevku je na základe hodnotenia parciálnych a komplexného ukazovateľa sociálno-ekonomickej úrovne regiónov spracovať typológiu regiónov, poukázať na vývoj a hlavné znaky transformujúcej sa regionálnej štruktúry Slovenska.

Kľúčové slová: regionálna štruktúra, regionálne disparity, (pred-)transformačné obdobie, Slovensko

Poďakovanie

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VPLYV TRANZITNÉHO PLYNOVODNÉHO SYSTÉMU NA TEPLOTU PÔDY V ZÁVISLOSTI OD TERMÍNU ZISŤOVANIA, VZDIALENOSTI OD PLYNOVODNÉHO POTRUBIA A VRSTVY PÔDY

EFFECTS OF TRANSIT PIPELINE SYSTEM ON SOIL TEMPERATURE DEPENDING ON TERM OF DATA COLLECTION, DISTANCE FROM GAS PIPES AND SOIL LAYER

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We detected the influence of transported natural gas by transit pipeline system on soil temperature depending on time of temperature measuring, soil depth and distance from the pipeline in the two research sites located behind the output pipeline object in Veľké Kapušany (KS01) and output pipeline object in Jablonové (KS02) in 2006. The maximum soil temperatures were measured above the pipelines in both research sites. In summer term, the soil temperature reached a value ranging from 34.2 °C in the depth of 0.2 m to 43.3 °C in the depth of 1.0 m in the first site. The soil temperature at the distance of 10 m from the pipeline was significantly lower in the individual soil depths and varied in the range from 27.9 °C in the depth of 0.2 m to 24.9 °C in the depth of 1.0 m. The results from the second research site were similar, only the temperature in different soil layers was somewhat lower compared with the first research site. This is due to different compression conditions affecting the temperature of the gas behind the gas output in Kapušany and in front of the gas entry in Jablonové. The research results show that the temperature of the transported natural gas in years with less rainfall during the growing season may negatively affect the production performance of cultivated crops especially in the area behind the output objects KS01-KS04 and vice versa, the gas temperature positively affects the production efficiency of the crops in years with higher rainfall during the growing season in the area through which the transit pipeline system runs.

Key words: soil temperature, gas temperature, transit gas line, production soil potential, air temperature

V súčasnej technicky vyspelej spoločnosti je poľnohospodársko-lesná krajina aj na území Slovenska ovplyvňovaná viacerými činnosťami človeka. Mnohé tieto činnosti však vyplývajú zo spoločensky nutnej ekonomickej aktivity niektorých hospodárskych odvetví slovenského hospodárstva. Sú to napr. rozvodné siete Slovenských elektrární, ťažba ropy a zemného plynu, ťažba nerudných surovín a ďalšie.

Významným spôsobom do krajinného priestoru zasahuje aj tranzitný plynovod. Umiestnením jednotlivých línií plynovodného potrubia do pôdy nastala deštrukcia pôdneho krytu. Nad plynovodmi bol pôvodný kryt nahradený umelými vrstvami s odlišnými morfologickými vlastnosťami. Okrem týchto priamych vplyvov, ktoré môžu negatívne pôsobiť na produkciu poľnohospodárskych plodín treba uviesť aj vplyvy, ktoré sa prejavujú menej deštrukčne a boli identifikované vo forme prekryvov pôvodného pôdneho profilu antropogénnym materiálom v rôznej veľkosti.

Významným spôsobom môže ovplyvniť teplotu pôdy aj samotný tranzit plynu. Tento vplyv môže byt‘ väčší alebo menší v závislosti od kompresných pomerov ovplyvňujúcich teplotu plynu medzi jednotlivými kompresorovými stanicami. Vzhľadom na to, že potrubia sú uložené v priemere jeden meter pod úrovňou terénu, teplota plynu v potrubí prehrieva aj pôdu nad potrubím, čím sa zvyšuje výpar vody z pôdy, rastliny pestované nad potrubím začnú trpieť nedostatkom vody, čo sa môže prejaviť znížením ich produkčného potenciálu.

Z uvedeného vyplýva, že tranzitný plynovod možno v rokoch s nižším úhrnom zrážok počas vegetačného obdobia považovať za určitý obmedzujúci faktor produkčného potenciálu plodín na území cez ktoré prechádza.

Teplota pôdy ovplyvňuje výpar vody, pohyb vzduchu a ďalšie fyzikálne, chemické, fyzikálno-chemické reakcie v pôde. Teplota pôdy ovplyvňuje hydraulickú vodivosť a v dôsledku jej účinku aj viskozitu pôdy. Teplota ovplyvňuje aj ďalšie pôdne vlastnosti, predovšetkým vlhkosť pôdy, mikrobiálnu aktivitu, rozklad rastlinných zvyškov a prístupnosť živín. Všetky rastliny prakticky spomaľujú svoj rast pri teplote nižšej ako je 9 °C a vyššej ako je 50 °C. Nárok na teplotu pôdy počas vývinu rastlín je preukazne druhovo špecifický (Peng a Dang, 2003). Hood (2001) pri štúdiu vplyvu teploty pôdy na rozklad organickej hmoty a rast rastlín stanovil, že obsah anorganického dusíka v pôde sa všeobecne znižuje so zvyšovaním teploty pôdy. Obsah sušiny rastlín sa preukazne znižoval so zvyšovaním teploty pôdy a zvyšoval so zvyšovaním vlhkosti pôdy. Tiež pomer nadzemnej časti rastliny ku koreňu klesal so zvyšovaním teploty pôdy. Dilustro et al. (2004) monitorovali teplotu pôdy, vlhkosť pôdy, hmotu organickej vrstvy pôdy a ich pôsobenie na odtok pôdneho CO_2. Stottlemych et al. (2001) uvádzajú, že otepľovanie pôdy môže posilniť uvoľňovanie CO_2 a CH_4, mineralizáciu a tvorbu pôdneho dusíka. Problematikou vplyvu tranzitného plynovodu na teplotné a vlahové pomery v pôde sa vo svojich prácach zaoberali aj Blaško (2005) a Halmová (2008).

Materiál a metódy

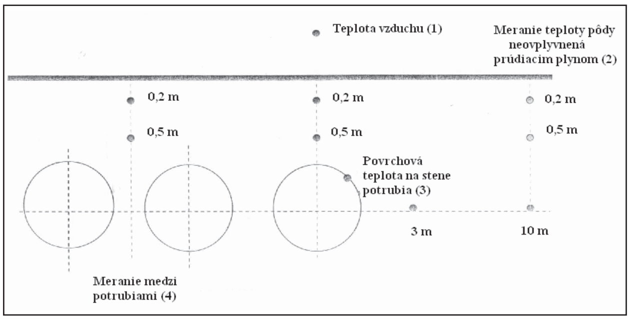
Zamerali sme sa na sledovanie vplyvu transportovaného zemného plynu tranzitným plynovodným potrubím na teplotu pôdy v závislosti od termínu zisťovania, vzdialenosti od kompresorových staníc, vzdialenosti od plynovodného potrubia a hĺbky pôdy.

Meranie teploty pôdy sa uskutočnilo v roku 2006 na dvoch stanovištiach:

č. 1 výstupný objekt plynovodu KS01 (kompresorová stanica KS01, V. Kapušany),

č. 2 vstupný objekt plynovodu KS02 (kompresorová stanica KS02, Jablonov).

Vzdialenosť medzi dvoma výskumnými stanovišťami je 110 km.



Obrázok 1 Miesta merania teploty pôdy
Figure 1 Measuring points of soil temperature
(1) air temperature, (2) measurement of soil temperature not affected by the flowing gas, (3) surface temperature of the pipe wall, (4) measurement between the pipelines

Merania teploty pôdy vo vertikálnom smere sa uskutočnili medzi líniami plynovodu v hĺbke pôdy 0,2 m; 0,5 m a 1 m, nad líniou plynovodu v hĺbke pôdy 0,2 m; 0,5 m a nad stenou potrubia. Merania teploty pôdy v horizontálnom smere sa uskutočnili nad potrubím, 3 m od potrubia a 10 m od potrubia (obrázok 1).

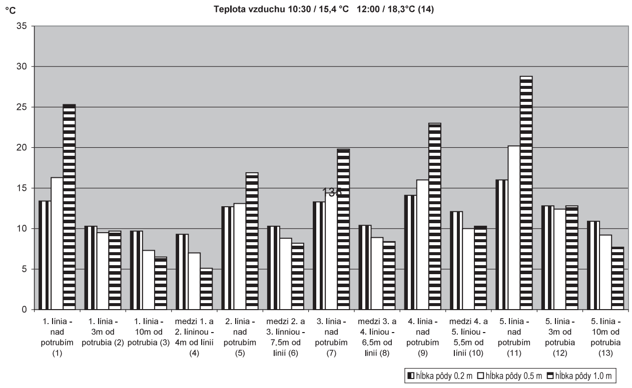
Merania teploty pôdy na prvom stanovišti vo Veľkých Kapušanoch sa uskutočnili 28. 3. 2006, 6. 7. 2006 a 15. 10. 2006. Na druhom stanovišti v Jablonove 27. 4. 2006 a 7. 7. 2006. Na meranie teploty pôdy sa použil digitálny pôdny teplomer. Miesta merania teploty pôdy sú znázornené na obrázku 1.

Výsledky a diskusia

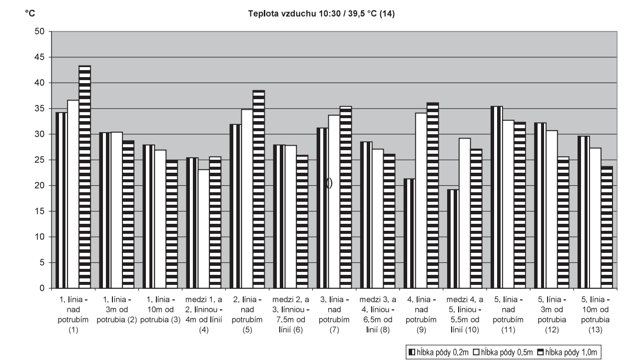
Priemerné teploty pôdy v °C zistené na pokusnom stanovišti č. 1 (výstupný objekt plynovodu KS 01) a sledované v troch termínoch sú uvedené v tabuľke 1 a na obrázkoch 2, 3, 4. Priemerné teploty pôdy zistené na pokusnom stanovišti č. 2 (vstupný objekt plynovodu KS02) a sledované v dvoch termínoch sú v tabuľke 2 a na obrázkoch 5, 6.

Z teplotných údajov zistených na pokusnom stanovišti č. 1 (tabuľka 1) vyplýva, že vo všetkých troch časových obdobiach (zisťovaných 28. 3. 2006, 6. 7. 2006 a 15. 10. 2006) a pri všetkých piatich líniách tranzitného plynovodu boli najvyššie teploty pôdy nad potrubím vo všetkých troch sledovaných vrstvách pôdy (0,2, 0,5, 1,0 m). Teplota pôdy 3 m, resp. 10 m od potrubia postupne klesá vo všetkých troch sledovaných obdobiach a vrstvách pôdy. Napr. pri prvej línii tranzitného plynovodu teplota pôdy v 1,0 m vrstve pôdy nad potrubím zistená 28. 3. 2006 mala hodnotu 25,3 °C, 3 m od potrubia 9,7 °C a 10 m od potrubia len 6,5 °C. Podobná tendencia, i keď nie tak výrazná, je aj v ďalších dvoch sledovaných obdobiach a pri všetkých piatich líniách tranzitného plynovodu. Najnižšie hodnoty teploty pôdy boli zistené pri všetkých piatich líniách plynovodu v najvzdialenejšom mieste od potrubia, a to 10 m od potrubia. Ak porovnáme teploty pôdy zistené v jednotlivých termínoch (28. 3. 2006, 6. 7. 2006, 15. 10. 2006) môžeme konštatovať, že najvyššie priemerné teploty pôdy pri všetkých piatich líniách plynovodu a vo všetkých troch hĺbkach pôdy, či už nad potrubím, alebo mimo potrubia boli v letnom období, kedy najmä plodiny okopaninového charakteru sú v plnej vegetácii a majú najväčšie nároky na vodu.

Na pokusnom stanovišti č. 2 (vstupný objekt plynovodu KS02), ktoré je vzdialené od pokusného stanovišťa 110 km sa teplota pôdy pri jednotlivých líniách plynovodu v rôznych vrstvách pôdy a termínoch zisťovania pohybovala približne v rovnakých reláciách ako na stanovišti č. 1. Výška teplôt však v letnom termíne zisťovania (7. 7. 2006) bola v porovnaní s tým istým obdobím na stanovišti č. 1 o niečo nižšia. Je to dôsledok rozdielnych kompresorových pomerov, ovplyvňujúcich teplotu plynu za výstupným objektom plynovodu – KS01 a pred vstupným objektom plynovodu KS02. Na vyššie teploty pôdy v mesiaci júl mala určitý vplyv aj teplota vzduchu v čase zisťovania teploty pôdy. Napr. na pokusnom stanovišti č. 1 v marcovom termíne zisťovania teploty pôdy, ovzdušie malo teplotu 18,3 °C, kým v júlovom termíne zisťovania teplota vzduchu až 39,5 °C. Podobné to bolo aj na druhom pokusnom stanovišti, kde v aprílovom termíne merania teploty pôdy malo ovzdušie teplotu 21,7 °C, v júlovom termíne 34,1 °C.



Obrázok 2 Teplota pôdy v °C zisťovaná nad plynovodným potrubím, v rôznej vzdialenosti od potrubia a v rôznej hĺbke pôdy v marci 2006 na pokusnom stanovišti č. 1
Figure 2 The average soil temperature in °C measured above the pipeline, in different distances from the pipeline and at various soil depths in March 2006 in the experimental site no. 1
(1) 1st line – above the pipeline, (2) 1st line – 3 m from the pipeline, (3) 1st line – 10 m from the pipeline, (4) between 1st and 2nd line – 11 m from the lines, (5) 2nd line – above the pipeline, (6) between 2nd and 3rd line – 7.5 m from the lines, (7) 3rd line – above the pipeline, (8) between 3rd and 4th line – 6.5 m from the lines, (9) 4th line – above the pipeline, (10) between 4th and 5th line – 5.5 m from the lines, (11) 5th line – above the pipeline, (12) 5th line – 3 m from the pipeline, (13) 5th line – 10 m from the pipeline, (14) air temperature, (15) soil depth
Legenda: soil depth 0.2 m, soil depth 0.5 m, soil depth 1.0 m



Obrázok 3 Teplota pôdy v °C zisťovaná nad plynovodným potrubím v rôznej vzdialenosti od potrubia a v rôznej hĺbke pôdy v júli 2006 na pokusnom stanovišti č. 1
Figure 3 The average soil temperature in °C measured above the pipeline in different distances from the pipeline and at various soil depths in July 2006 in the experimental site no. 1
(1) 1st line – above the pipeline, (2) 1st line – 3 m from the pipeline, (3) 1st line – 10 m from the pipeline, (4) between 1st and 2nd line – 11 m from the lines, (5) 2nd line – above the pipeline, (6) between 2nd and 3rd line – 7.5 m from the lines, (7) 3rd line – above the pipeline, (8) between 3rd and 4th line – 6.5 m from the lines, (9) 4th line – above the pipeline, (10) between 4th and 5th line – 5.5 m from the lines, (11) 5th line – above the pipeline, (12) 5th line – 3 m from the pipeline, (13) 5th line – 10 m from the pipeline, (14) air temperature, (15) soil depth
Legenda: soil depth 0.2 m, soil depth 0.5 m, soil depth 1.0 m

Tabuľka 1 Priemerná teplota pôdy v °C zisťovaná nad plynovodným potrubím v rôznej vzdialenosti od potrubia a v rôznej hĺbke pôdy na výskumnom stanovišti č. 1

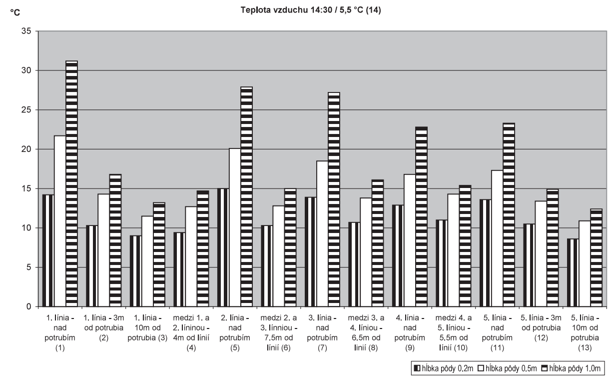
Termín merania teploty pôdy (1)	Hĺbka pôdy v m (2)	Číslo línie a vzdialenosť od plynovodného potrubia (19)												
		1. línia – nad potrubím (3)	1. línia – 3 m od potrubia (4)	1. línia – 10 m od potrubia (5)	medzi 1. a 2. líniou – 4 m od línií (6)	2. línia – nad potrubím (7)	medzi 2. a 3. líniou – 7,5 m od línií (8)	3. línia – nad potrubím (9)	medzi 3. a 4. líniou – 6,5 m od línií (10)	4. línia – nad potrubím (11)	medzi 4. a 5. líniou – 5,5 m od línií (12)	5. línia – nad potrubím (13)	5. línia – 3 m od potrubia (14)	5. línia – 10 m od potrubia (15)
28. 3. 2006 teplota vzduchu 18,3 °C (16)	0,2	13,4	10,3	9,7	9,3	12,7	10,3	13,3	10,4	14,1	12,1	16,0	12,8	10,9
	0,5	16,3	9,5	7,3	7,0	13,1	8,8	14,4	8,9	16,0	10,0	20,2	12,4	9,2
	1,0	25,3	9,7	6,5	5,1	16,9	8,2	19,8	8,4	23,0	10,3	28,8	12,8	7,7
6. 7. 2006 teplota vzduchu 39,5 °C (17)	0,2	34,2	30,3	27,9	25,4	31,9	27,9	31,2	28,5	21,3	19,2	35,4	32,2	29,6
	0,5	36,6	30,4	26,9	23,1	34,8	27,8	33,7	27,1	34,1	29,2	32,7	30,7	27,3
	1,0	43,3	28,7	24,9	25,6	38,5	25,9	35,4	26,1	36,1	27,1	32,3	25,6	23,7
15. 10. 2006 teplota vzduchu 5,5 °C (18)	0,2	14,2	10,3	9,0	9,4	15,0	10,3	13,9	10,7	12,9	11,0	13,6	10,5	8,6
	0,5	21,7	14,3	11,5	12,7	20,1	12,8	18,5	13,8	16,8	14,3	17,3	13,4	10,9
	1,0	31,2	16,8	13,2	14,7	27,9	15,0	27,2	16,1	22,8	15,4	23,3	14,9	12,4

Table 1 The average soil temperature in °C measured above the gas pipeline in different distances from the pipeline and at various soil depths in the research site No. 1
(1) date of measurement, (2) soil depth in m, (3) 1st line – above the pipeline, (4) 1st line – 3 m from the pipeline, (5) 1st line – 10 m from the pipeline, (6) between 1st and 2nd line – 4 m from the lines, (7) 2nd line – above the pipeline, (8) between 2nd and 3rd line – 7.5 m from the lines, (9) 3rd line – above the pipeline, (10) between 3rd and 4th line – 6.5 m from the lines, (11) 4th line – above the pipeline, (12) between 4th and 5th line – 5.5 m from the lines, (13) 5th line – above the pipeline, (14) 5th line – 3 m from the pipeline, (15) 5th line – 10 m from the pipeline, (16) 28th March 2006, air temperature 18.3 °C, (17) 6th July 2005, air temperature 39.5 °C, (18) 5th October 2006, air temperature 5.5 °C, (19) number of line and distance from the pipeline

Tabuľka 2 Priemerná teplota pôdy v °C zisťovaná nad plynovodným potrubím v rôznej vzdialenosti od potrubia a v rôznej hĺbke pôdy na výskumnom stanovišti č. 2

Termín merania teploty pôdy (1)	Hĺbka pôdy v m (2)	Číslo línie a vzdialenosť od plynovodného potrubia (17)											
		4. línia nad potrubím (3)	4. línia 3 m od potrubia (4)	4. línia 10 m od potrubia (5)	Medzi 4 – 2 líniou, 4 m od línie (6)	2. línia – nad potrubím (7)	medzi 2 – 1 líniou, 9 m od línie (8)	1. línia nad potrubím (9)	1. línia 3 m od potrubia (10)	1. línia 10 m od potrubia (11)	3. línia nad potrubím (12)	3. línia, 3 m od potrubia (13)	3. línia, 10 m od potrubia (14)
27. 4. 2006 teplota vzduchu 21,7 °C (15)	0,2	17,2	16,5	15,9	16,3	17,8	16,4	16,8	16,0	15,9	18,5	16,0	14,1
	0,5	17,2	15,8	14,0	15,2	16,9	14,9	16,8	15,5	13,8	18,7	19,2	12,3
	1,0	18,1	15,3	13,0	16,4	17,6	13,3	15,5	14,4	11,8	19,1	12,3	10,2
7. 7. 2006 teplota vzduchu 34,1 °C (16)	0,2	29,6	26,5	25,3	29,5	27,8	25,8	27,2	24,6	23,0	25,2	22,8	22,2
	0,5	27,1	24,3	22,8	26,1	24,9	22,5	24,6	22,8	21,3	24,8	21,6	20,7
	1,0	27,9	22,7	20,5	23,9	23,5	21,1	22,6	20,6	18,2	25,3	20,1	18,9

Table 2 The average soil temperature in °C measured above the gas pipeline in different distances from the pipeline and at various soil depths in the research site No. 2
(1) date of measurement, (2) soil depth in m, (3) 4th line – above the pipeline, (4) 4th line – 3 m from the pipeline, (5) 4th line – 10 m from the pipeline, (6) between 4th and 2nd line – 4 m from the line, (7) 2nd line above the pipeline, (8) between 2nd and 1st line – 9 m from the lines, (9) 1st line – above the pipeline, (10) 1st line – 3 m from the pipeline, (11) 1st line – 10 m from the pipeline, (12) 3rd line, (13) 3rd line – 3 m from pipeline, (14) 3rd line – 10 m from the pipeline, (15) 27th April 2006, air temperature 21.7 °C, (16) 7th July 2005, air temperature 34.1 °C, (17) number of line and distance from the pipeline

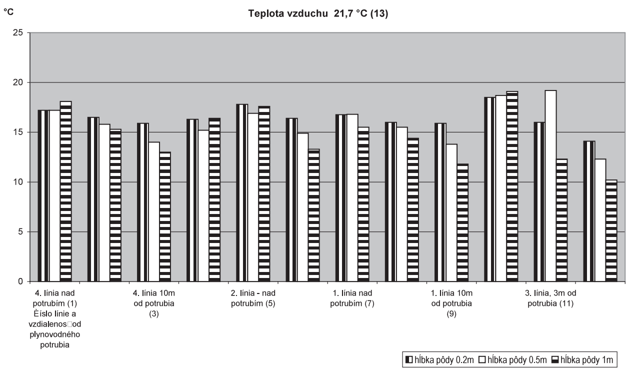


Obrázok 4 Teplota pôdy v °C zisťovaná nad plynovodným potrubím, v rôznej vzdialenosti od potrubia a v rôznej hĺbke pôdy v októbri 2006 na pokusnom stanovišti č. 1

Figure 4 The average soil temperature in °C measured above the pipeline, in different distances from the pipeline and at various soil depths in October 2006 in the experimental site no. 1

(1) 1st line – above the pipeline, (2) 1st line – 3 m from the pipeline, (3) 1st line – 10 m from the pipeline, (4) between 1st and 2nd line – 11 m from the lines, (5) 2nd line – above the pipeline, (6) between 2nd and 3rd line – 7.5 m from the lines, (7) 3rd line – above the pipeline, (8) between 3rd and 4th line – 6.5 m from the lines, (9) 4th line – above the pipeline, (10) between 4th and 5th line – 5.5 m from the lines, (11) 5th line – above the pipeline, (12) 5th line – 3 m from the pipeline, (13) 5th line – 10 m from the pipeline, (14) air temperature, (15) soil depth

Legenda: soil depth 0.2 m, soil depth 0.5 m, soil depth 1.0 m



Obrázok 5 Priemerná teplota pôdy v °C zisťovaná nad plynovodným potrubím v rôznej vzdialenosti od potrubia a v rôznej hĺbke pôdy v apríli 2006 na výskumnom stanovišti č. 2

Figure 5 The average soil temperature in °C measured above the pipeline, in different distances from the pipeline and at various soil depths in April 2006 in the research site No. 2

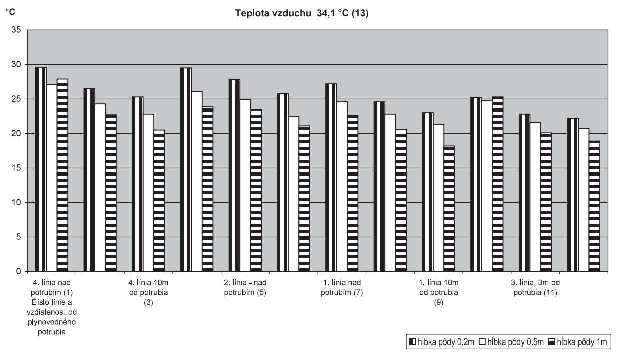
(1) 4th line – above the pipeline, (2) 4th line – 3 m from the pipeline, (3) 4th line – 10 m from the pipeline, (4) between 4th and 2nd line – 4 m from the line, (5) 2nd line – above the pipeline, (6) between 2nd and 1st line – 9 m from the lines, (7) 1st line – above the pipeline, (8) 1st line – 3 m from the pipeline, (9) 1st line – 10 m from the pipeline, (10) 3rd line – above the pipeline, (11) 3rd line – 3 m from the pipeline, (12) 3rd line – 10 m from the pipeline, (13) air temperature, (15) soil depth

Legenda: soil depth 0.2 m, soil depth 0.5 m, soil depth 1.0 m

Záver

Z merania teploty pôdy na dvoch úsekoch línií tranzitného plynovodu možno urobiť nasledovné závery:

- Na obidvoch pokusných stanovištiach, vo všetkých termínoch merania teploty pôdy a vo všetkých troch sledovaných vrstvách pôdy, najvyššie teploty pôdy boli namerané nad plynovodným potrubím. Na prvom stanovišti za výstupným objektom plynovodu KS01 v prvom jarnom termíne v hĺbkach 0,2 – 1,0 m sa teplota pôdy pohybovala v rozpätí od 13,4 °C v hĺbke 0,2 m do 25,3 °C v hĺbke 1,0 m. V letnom ter-



Obrázok 6 Priemerná teplota pôdy v °C zisťovaná nad plynovodným potrubím v rôznej vzdialenosti od potrubia a v rôznej hĺbke pôdy v júli 2006 na výskumnom stanovišti č. 2

Figure 6 The average soil temperature in °C measured above the pipeline, in different distances from the pipeline and at various soil depths in July 2006 in the research site no. 2

(1) 4th line – above the pipeline, (2) 4th line – 3 m from the pipeline, (3) 4th line – 10 m from the pipeline, (4) between 4th and 2nd line – 4 m from the line, (5) 2nd line – above the pipeline, (6) between 2nd and 1st line – 9 m from the lines, (7) 1st line – above the pipeline, (8) 1st line – 3 m from the pipeline, (9) 1st line – 10 m from the pipeline, (10) 3rd line – above the pipeline, (11) 3rd line – 3 m from the pipeline, (12) 3rd line – 10 m from the pipeline, (13) air temperature, (14) soil depth

Legenda: soil depth 0.2 m, soil depth 0.5 m, soil depth 1.0 m

míne merania teplota pôd v uvedených hĺbkach pôdy bola podstatne vyššia a pohybovala sa v rozpätí od 34,2 °C v hĺbke 0,2 m do 43,3 °C v hĺbke 1,0 m. V jesennom termíne merania teploty pôdy boli hodnoty teploty pôdy namerané v rozpätí od 14,2 °C v hĺbke 0,2 m do 31,2 °C v hĺbke 1,0 m.

- Teplota pôdy v sledovaných vrstvách pôdy vzdialených od potrubia 3 m, resp. 10 m na obidvoch pokusných stanovištiach a vo všetkých troch sledovaných obdobiach postupne klesala. Na prvom stanovišti, v jarnom termíne merania teploty pôd, 10 m od potrubia pri prvej línii plynovodu v hĺbkach 0,2 – 1,0 m sa pohybovala teplota pôd v rozpätí od 9,7 °C v hĺbke 0,2 m do 6,5 °C v hĺbke 1,0 m. V letnom termíne merania teplota pôd v uvedených hĺbkach pôdy sa teplota pôd pohybovala v rozpätí od 27,9 °C v hĺbke 0,2 m do 24,9 °C v hĺbke 1,0 m. V jesennom termíne merania teploty pôdy boli namerané teploty podstatne nižšie ako nad potrubím a pohybovali sa v rozpätí od 9,0 °C v hĺbke 0,2 m do 13,2 °C v hĺbke 1,0 m.
- Najvyššie priemerné teploty pôdy pri všetkých piatich líniách tranzitného plynovodu boli zistené v júlovom termíne zisťovania a na prvom stanovišti sa pohybovali v hĺbke 0,2 m v rozpätí od 19,2 °C do 35,4 °C, v hĺbke 0,5 m v rozpätí od 23,1 °C do 36,6 °C a v hĺbke 1,0 m v rozpätí od 23,7 °C do 43,3 °C.
- Okrem teploty prepravovaného plynu tranzitnou sústavou, na teplotu pôdy môže výrazne vplývať aj teplota vzduchu, najmä v letných mesiacoch vegetačného obdobia poľných plodín.

Súhrn

V roku 2006 na dvoch výskumných stanovištiach nachádzajúcich sa za výstupným objektom plynovodu vo Veľkých Kapušanoch (KS01) a výstupným objektom plynovodu v Jablonove (KS02) sme zisťovali vplyv prepravovaného zemného plynu tranzitným plynovodným systémom na teplotu pôdy v závislosti od termínu merania teploty, hĺbky pôdy a vzdialenosti od plynovodného potrubia. Na obidvoch výskumných stanovištiach boli najvyššie teploty pôdy namerané nad plynovodným potrubím. V letnom termíne merania na prvom stanovišti teplota pôdy dosiahla hodnotu pohybujúcu sa v rozpätí od 34,2 °C v hĺbke 0,2 m do 43,3 °C v hĺbke 1,0m. Vo vzdialenosti 10 m od potrubia teplota pôdy bola v jednotlivých hĺbkach pôdy preukazne nižšia a pohybovala sa v rozpätí od 27,9 °C v hĺbke 0,2 m do 24,9 °C v hĺbke 1,0 m. Na druhom výskumnom stanovišti to bolo podobne, len výška teplôt v jednotlivých vrstvách pôdy bola v porovnaní s prvým stanovišťom o niečo nižšia. Vyplýva to z rozdielnych kompresných pomerov ovplyvňujúcich teplotu plynu za výstupným objektom v Kapušanoch a pred vstupným objektom v Jablonove. Z uskutočneného výskumu vyplýva, že teplota prepravovaného zemného plynu v rokoch s nižším úhrnom zrážok počas vegetačného obdobia môže negatívne ovplyvniť produkčnú výkonnosť pestovaných plodín, najmä na území za výstupnými objektmi KS01-KS04 a naopak, v rokoch s vyšším úhrnom zrážok počas vegetačného obdobia teplota plynu pozitívne ovplyvňuje produkčnú výkonnosť plodín pestovaných na území, cez ktoré prechádza tranzitný plynovodný systém.

Kľúčové slová: teplota pôdy, teplota plynu, tranzitný plynovod, produkčný potenciál pôdy, teplota ovzdušia

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REGIONAL DISCREPANCIES IN HUNGARY

REGIONÁLNE ROZDIELY V MAĎARSKU

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In the first half of the 90's, the regional differences in economic development by regions, counties and settlement types grew significantly. There is a significant difference between the two parts of Hungary. Analyzing region-level differences within Hungary, we can say that the difference between the most and the less developed region is 2.3-fold (calculation based on per capita GDP). This indicator is roughly adequate to the actual figures of the EU member states. We assume that notable regional differences in the economy and their constant presence are strictly reflected in the labour market as well.

Key words: Central Hungarian region, economic development, labour market, unemployment

The Hungarian social and economic development shows temporal and spatial inequality. Due to this fact, certain regions significantly differ from each other. This is well reflected in the basic economic index numbers, such as: GDP, industrial production, real wages, employment rate, consumer price index, investments, and unemployment rate. Nowadays, regional research focusing at this trend is actual, particularly in connection with the European Union. As a result of the changes occurred after the political system change in Hungary, former differences existing among the regions got even sharper and higher.

In post-transition Hungary, the regional differences in unemployment by regions, counties and settlement types have grown significantly. Although the differences across counties and regions have become somewhat smaller in the past few years, there is still no significant tendency for leveling-off, despite governmental efforts. In the first half of the 90's, new differentiation processes started in the spatial structure of Hungary due to market forces and the territorial inequalities significantly deepened (incomes, employment etc.). It was visible in the stabilization after 1996. The dynamic regions (Budapest, Central Hungary, Western Transdanubia, and Region of Lake Balaton) remained the same, but the number and the territory of regions in crisis decreased.

There is a significant difference between the two parts of Hungary. As we pass from the West to the East, the number of unemployment is rising significantly.

Results and discussion

Acceptation of regional differences in the European Union

In the second clause of the Treaty of Rome it is written that „the aim of Treaty is to facilitate the harmonious development of Member States and increase the quality of life", the Treaty does not aim at developing a specified regional policy. The six founding members are situated in the most developed part of Europe, which is why the regional policy did not have great importance. Except for a few regions (e.g. Italy), significant regional differences were not indicated. At the time of establishing the European Community, experts forecasted that slight territorial differences would disappear by the progress of integration.

In the mid 60's and early 70's, the progress of European integration has fallen back. According to regional science, the territorial disparities naturally accompany the economic and social development. One of the most important objectives of EU is to approximate different levels of regional development by implementing an active structural policy.

Contrary to macro-economic progress, internal regional development gap in Hungary has not decreased. It follows that actual regional differences and dualistic structural problems should be handled by the Hungarian economic policy itself. The EU resources and principles should appear as supplementary resorts only, improving the competitive power of the country indeed, in case the appropriate underlying national concept is formed. The experience in the EU is that structural resources accelerate progressive procedures on a macro-economic level, but cannot speed up notably internal cohesive attractions.

Regional inequalities in Hungary

In 2004, Hungary joined the EU, which was accompanied by a lot of changes. Development of a regional system adequate to EU's five-level territorial classification was an important task during the period of preparation. According to NUTS 2 system and European practice, seven planning – statistical regions have been formed (Figure 1).

Közép-Magyarország – Central Hungary (Budapest, Pest County): 38.5 % of companies work in this territory, similarly to nationwide data, their number showed a 4.4 % increase comparing to the figure of early 2002. Industrial output increases dynamically. Large part of total industrial production (28 %) comes from here. The level of unemployment is the lowest in the country (4.4 %) here, however, there are several districts in the capital (e.g. Józsefváros), with indicators worse than above.

Figure 1 Regions of Hungary
Source: KSH
Obrázok 1 Regióny Maďarska
Zdroj: KSH

Közép-Dunántúl – Central Transdanubia (Fejér, Komárom-Esztergom, Veszprém County) Economic figures of this region exceed the national average, 10 % of companies are situated here. This is the most industrialized part of Hungary – 22 % of total industrial product is generated here. Unemployment is below the national average: 8.2 %.

Nyugat-Dunántúl – Western Transdanubia (Győr-Moson--Sopron, Vas, Zala County): 9.8 % of companies are located here, their number rose by 4.4 % in 2006 similarly to the national average. Pursuant to industrial data, this is the most dynamic region of Hungary. Both the turnout and the sales volume exceeded 130 %. Export expanded by over 45 %. The rate of unemployment is the second lowest among the regions: it is 5.5 %.

Dél-Dunántúl – Southern Transdanubia (Baranya, Somogy, and Tolna County): More than 9 % of companies can be found here. This area can also be characterized by dynamic development. Industrial production and distribution expanded by 15 – 20 %. Despite of the facts mentioned above, it is an interesting fact that the level of unemployment is far above the national average (11.6 %)

Észak-Magyarország – Northern Hungary (Borsod-Abaúj--Zemplén, Heves, and Nógrád County): Almost 9 % of operating companies are registered in these counties. Their number increased by 4.8 %, which is higher than the national average. Industrial output and sales volume are far below the national average. The number of unemployment is the highest in Hungary (16.7 %), particularly in Borsod-Abaúj-Zemplén County (19.1 %).

Észak-Alföld – Northern Great Plain (Hajdú-Bihar, Jász-Nagykun-Szolnok and Szabolcs-Szatmár-Bereg County): 11.4 % of operating companies are located here. Their number raised by 4 %, which is under the average growth rate. Producing 9.1 % of total industrial product, this region ranks the 4th place. Although the region shows some dynamism, the figures have not achieved the values of the Central and Transdanubian regions yet. It is obvious that during the last 1 – 2 years industrial investments appeared in Eastern Hungary as well. Unemployment rate is the second highest following the Northern Hungary region. Regarding the counties, the highest number of unemployed people in the region can be found in Szabolcs-Szatmár-Bereg county: 18.5 %.

Dél-Alföld – Southern Great Plain (Bács-Kiskun, Békés, and Csongrád County): Almost 12 % of companies are located here. Although the industrial production is below the national average, the unemployment rate is better: 9.8 %.

Inequalities by settlements

The examination carried out by Kopint-Datorg (professional leader: Gábor Oblath, 2003) defined 5 well differentiated labour market categories by cluster-analysis method, so that the labour market conditions of settlements could be described even more sophisticatedly.

The analysis affected the following features: employment rate, unemployment rate, rate of daily commuters, employment rate in agricultural, industrial and service sectors, rate of unqualified people (up to elementary school and skilled worker qualification) within the aggregate number of employed, and the development level of the small region to which the settlement examined belongs to.

It is interesting that the type of settlement (county level city, town and village) did not influence the results. The analysis defines 5 clusters:

- 5^{th} cluster – service oriented settlements with advantageous conditions. Features: high employment – low unemployment rate, the number of people employed in agriculture and industry is low, the number of people employed in service sector is high, low rate of unqualified within the aggregate number of employed. These settlements belong to dynamically developing small regions.
- 4^{th} cluster – industrial settlements with advantageous conditions with the need to commute. Features: high employment and low unemployment rate, high employment rate in the industrial sector, relatively lower employment in the agricultural and service sector. Relatively high ratio of unqualified within the aggregate number of employed. These settlements belong to developing small regions.
- 3^{rd} cluster – agricultural settlements with average conditions. Features: average employment rate, relatively low unemployment rate, agriculture oriented, where the number of employed in the industrial and service sector is low. High rate of unqualified within the aggregate number of employed. Settlements of follow-up situated small regions belong to this cluster.
- 2^{nd} cluster – industrial settlements with disadvantageous conditions. Features: low employment rate and rather high unemployment. Mainly industrial area, the number of employed in agriculture is low, same as the number of employed in the service sector. High ratio of unqualified people within the aggregate number of employed. Settlements of stagnant small regions belong here.
- 1^{st} cluster – settlements in very disadvantageous circumstances without any activity.

The figure 2 shows the regional diversification of development level by certain clusters and small regions (from cluster no. 5, white color – to cluster no. 1, black color).

Small regions' indicators consist of groups of settlements that form an economically and territorially coherent unit. Examining development diversification upon small regions' categories, it is obvious that the Central Hungarian region and Central- and Western Transdanubia are in an advantageous economic situation, while Northern Hungary and majority of Northern-Great Plain regions are economically stagnant or falling back. The majority of the remainder regions are developing or following-up ones.

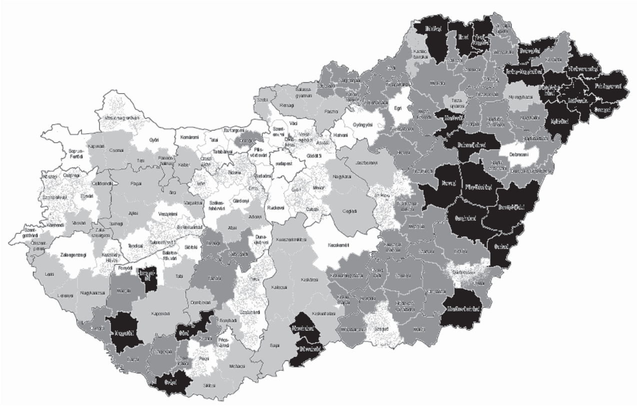

Figure 2 Diversification in development level of small regions
Source: Kopint-Datorg, 2003
Obrázok 2 Diverzifikácia úrovne rozvoja malých regiónov
Zdroj: Kopint-Datorg, 2003

Labour market circumstances

As a consequence of the changes carried out in the 90's, employment, unemployment and inactivity followed a similar tendency in each region. Following a significant fallback, labour market indicators improved in the second part of the 90's: unemployment showed an outstanding decrease, the number of employed raised, and – although very slowly – labour market activity improved (namely, the rate of inactive people reduced).

Henceforward, regional differences stayed obstinately significant, the best employment status continued to stay in Central Hungary, and Central and Western-Transdanubia. This area showed the greatest decrease of unemployment, and still indicates the lowest number of inactive people in productive age who keep off the labour market. Regions with the most unfavorable conditions are the same as before. The number of employed people is registered to be the lowest in Northern Hungary and Northern Great Plain since the early 90's, and the unemployment continued to be the highest here. I would highlight that the rate of the inactive is outstandingly high in these two disadvantaged regions, and is permanent despite of the progress of the general economic circumstances.

Unemployment varies by regions and counties in Hungary. On $1/5^{th}$ of settlements the ratio of unemployed (i. e. rate of unemployment) achieves the quarter ($1/4^{th}$) of the employed. Very low rate of unemployment (below 5 %) happens to occur only on $1/5^{th}$ of Hungarian settlements (Figure 3 and 4).

Unemployment varies by settlement in Hungary, too. In $1/5^{th}$ of settlements the ratio of unemployed (i.e. rate of unemployment) achieves the quarter ($1/4^{th}$) of the employed. Very low rate of unemployment (below 5 %) happens to occur only in $1/5^{th}$ of Hungarian settlements (Figure 5).

Comparing to other regions, Central Hungary plays a central role geographically, culturally, and economically as well. The region incorporates Budapest and the neighboring Pest County, and this situation alone determines its central role. However, this is the smallest among the seven statistical-planning regions by size, at the same time this is the most populated one, with its 3 million inhabitants, $2/3^{rd}$ of them living in Budapest. Out of 187 settlements, 28 are on city-level.

Examining the sectoral structure change of employed in the '90s, we can find that the rate of employed in the service sector increased primarily in the most developed regions (Central Hungary, Central and Western Transdanubia).

The concentration of human resources in Central Hungary is outstandingly high. Budapest is the most populated city among its competitive partners; the ratio of professionals is higher than in Wien, Prague or Bratislava. Over 500 000 professionals and over 1.2 million people with secondary

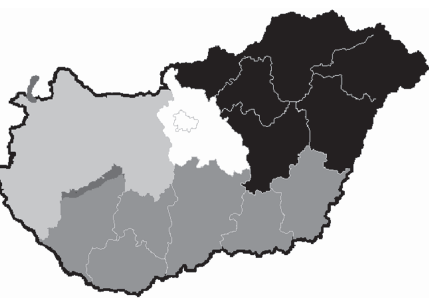

Figure 3 Rate of unemployment by region
Source: own calculations based on the data of Census
Obrázok 3 Miera nezamestnanosti v regióne
Zdroj: vlastné spracovanie na základe dát zo sčítania ľudu

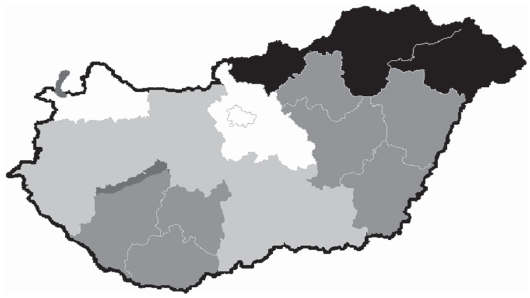

Figure 4 Rate of unemployment by county
Source: own calculations based on the data of Census
Obrázok 4 Miera nezamestnanosti v jednotlivých okresoch
Zdroj: vlastné spracovanie na základe dát zo sčítania ľudu

education live in Budapest and Pest County. The obstacle of exploiting the human resources is low activity.

Central Hungary is in the most favorable situation from labour market's point of view. This situation is due to the rise of labour market demand. In the 90's, new workplaces were established mainly in the urbanized part of the country, in the central and western regions, which offered qualified population and developed infrastructure. It is important to highlight that there are remarkable differences within the region (mainly within Pest County) from employment's and unemployment's points of view.

In the Central Hungary the employment level of the population of age of 15 – 64 years has been rising continuously since 1998: it marked 63.3 % in 2006, what exceeds the national average of 56 % (the rate of employment in Budapest was 65.4 %, and that of Pest County is also outstanding with its 60.2 %).

In Pest County, entrepreneurships that employ more than 5 people, governmental establishments and non-profit organizations employed 250 000 persons in the first quarter of 2007. Examining the economic sector, the biggest increase in headcount (12 %) occurred in tourism (quarters and hospitality service), it also exceeded the average numbers in the building industry, commerce, repair services, real estate sector, economic services, education, health care and social sectors, too.

In Budapest, entrepreneurships that employ more than 5 people, governmental establishments and non-profit organizations employed 954 000 persons in the first quarter of 2007. Taking the economic sector, the biggest increase in headcount (13 %) occurred in logistics, post and mail sector, telecommunication, real estate and economic services (7 %) sectors. Unemployment rate slowed down until 2002 (to 4% in contrary to the national average of 5.8 %). Since then it has been slightly increasing, it marked 5.8 % in 2006, which is significantly less than the national average level of 7.25 %.

Surveys of October 2008 describe 45 683 persons as registered job seekers in the Central Hungarian region, out of which 23 857 are registered in Budapest, while 21 826 are registered in Pest County.

In the next years, despite of the up-grade figures, the process of breaking away of groups that are unable to undertake a permanent job might continue, along with a process of evolution of settlements and districts with low activity. Being permanently unemployed influences the ability to undertake a job in a negative way. Inactivity (especially among men) quickly destroys self-esteem and appreciation from the family and the environment. In order to be able to get connected to the world of work, complex social-employment programs are necessary.

According to the statistics examining regional wage differences, wages in Budapest exceed the national average by more than 22 %; while in the South Great Plain region wages narrowly exceed the 80 % of the national average. The difference between the best and the worst situated regions is approximately 1.5-fold for years now.

In Central Hungary, consumers incomes are on a high level. As much as 70 % of consumers incomes of the region arises in Budapest, more than 1/5th of it enrich the population of the agglomeration, while only 10 % gets outside of the agglomeration. Traditional differences inside the region are partly explicable by income owners' different educational level; partly arise as a consequence of employment structure. Relevant factor is also the traditionally existing 30 % difference between the wages of Budapest and the countryside.

Standard of living of the region's population can be measured by wages. During the last years, average wages in the region change according to the national level. The difference between the standard of living of inhabitants of Budapest and that of Pest County is remarkable, and this difference is not diminished by statistics. Average salary of employees working in Budapest is above the national average by 25 %. At the same time, the average salary of a Pest County employee is 4 % less than the national average. It means that the difference in monthly average gross salary between Budapest and Pest County was more than 55.000 HUF in 2004. The difference originates from the different structure of economy and employment; the rate of employed in economic services and civil administration sectors altogether with those with professional degree is higher in Budapest than in Pest county, where industrial sector is dominant and the ratio of secondary educated altogether with professionals is lower than in the capital. At the same time, numerous proportion of Pest County's population works in Budapest and gets registered salary from Budapest based firms.

Considering available open positions and demanded professions, Central Hungary, namely Budapest and Pest County, have been in the most favorable labour market situation in Hungary for years. Among others, due to good infrastructural facilities, the scale of local employers is very large: from multinational business corporations to small enterprises and logistical or financial headquarters altogether with manufacturers are present on this labour market, representing all types and sizes of business establishments.

While in Budapest multinational corporations, banks and insurance companies are seeking continuously for labour force for their open positions, in Pest County logistical centers (in Herceghalom, Gyál, Vecsés) shopping centers, food, industrial and electronic enterprises, manufacturers (Samsung, Zollner,

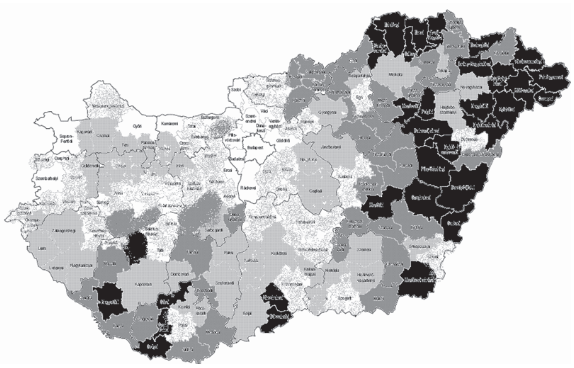

Figure 5 Rate of unemployment by settlement
Source: own calculations based on the data of Census
Obrázok 5 Miera nezamestnanosti podľa sídel
Zdroj: vlastné spracovanie na základe dát zo sčítania ľudu

Table 1 Labour market figures of the Central-Hungarian Region (%) in 2000 – 2008

	2000	2001	2002	2003	2004	2005	2006	2007	2008
	Employment rate (1)								
Central-Hungary (3)	59.3	60.1	60.6	60.9	61.7	62.9	63.3	63.8	63.2
Hungary total (4)	55.4	56.0	56.2	56.2	57.0	56.8	56.9	55.4	53.8
Unemployment rate (2)									
Central-Hungary (3)	5.2	5.2	4.3	3.9	4.0	4.5	5.2	5.3	5.6
Hungary total (4)	7.0	6.4	5.7	5.8	5.9	6.1	7.2	7.8	8.6

Source: KSH recruitment Zdroj: KSH

Tabuľka 1 Trh práce v regióne Centrálne Maďarsko (v %) v rokoch 2000 – 2008
(1) miera zamestnanosti, (2) miera nezamestnanosti, (3) Centrálne Maďarsko, (4) Maďarsko celkom, (5) Centrálne Maďarsko, (6) Maďarsko celkom

Table 2 Monthly gross average salary in the capital and in the counties (If national average is 100%)

County (1)	1994	1996	1998	2000	2002	2004	2006	2008
Budapest (2)	126.8	127.8	131.0	134.4	135.4	134.0	133.2	130.3
Pest (3)	91.0	96.6	97.6	96.6	100.3	99.7	96.0	96.4

Sources: Employment Office Zdroj: Úrad práce

Tabuľka 2 Mesačná hrubá priemerná mzda v hlavnom meste a v krajoch (ak je celoštátny priemer 100%)
(1) kraj, (2) Budapešť, (3) Pešť

Sony) are the most important employers. These business corporations are willing to employ beginners, too, and offer positions up to leader level.

Employers in Pest County miss particularly engineers and logistics professionals. Manual workers also have better chance to find a job here than in Budapest. In the capital, employers are looking for financial representatives and accountants, foreign language speaking trade professionals, to sum up, mainly intellectual professionals.

In order to prevail in Budapest, employee should be energetic, open-minded, communicative and motivated. It occurs frequently that despite lacking the professional experience, the candidate wins the position if he/she is open-minded, communicative and agile enough. Employers in Pest County expect loyalty, flexibility and trustworthiness from their employees. The ones, who are not able to meet these requirements, might face permanent unemployment. The Labour Organization registered 7214 open positions in the Central-Hungary region in October 2007.

Conclusion

In Hungary, following to the political system change, existing regional differences in employment and unemployment among counties, regions and certain typical settlements became significant.

Although they show a slight decrease nowadays, despite of governmental efforts, observable regional equalization failed to occur in the country. At present, a strong polarization is taking place, which splits Hungary to two parts: on one hand, to relatively developed Central and Western Transdanubia, and on the other, to a group of regions with Southern Transdanubia, Great Plain and Northern Hungary.

The conclusion by examining Hungarian data is that the determinative weight of the Central-Hungarian region, including the capital, has continued to grow.

The economic development level of a region is determined by the quality of labour force. Qualified, disciplined, innovative labour force motivates the employers to settle in the region, thus enhancing regional development. The sum spent on education and research in backward regions is slight. It might cause a self-exciting break-away phenomenon in the backward regions. My study aims to introduce that high unemployment rate is in coincidence with regional development categories, and that the existing differences are constant since the last decade.

Súhrn

V prvej polovici 90. rokov regionálne rozdiely v ekonomickom rozvoji regiónov, krajov a osídlení výrazne rástli. Existuje významný rozdiel dvoma časťami Maďarska. Analyzovaním rozdielov na regionálnej úrovni v Maďarsku môžeme povedať, že rozdiel medzi najviac a najmenej rozvinutým regiónom je 2,3 (výpočet na základe HDP na obyvateľa). Tento ukazovateľ približne zodpovedá aktuálnym údajom členských štátov EÚ. Domnievame sa, že výrazné regionálne rozdiely v ekonomike a ich stála prítomnosť sa výrazne prejavujú na pracovnom trhu.

Kľúčové slová: región Centrálne Maďarsko, ekonomický rozvoj, trh práce, nezamestnanosť

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BIOLOGICAL FACTORS INFLUENCING THE GROWTH AND BIOMASS PRODUCTION OF WILLOWS PLANTED IN SOUTHERN SLOVAKIA

BIOLOGICKÉ FAKTORY OVPLYVŇUJÚCE RAST A PRODUKCIU BIOMASY VŔB PESTOVANÝCH NA JUŽNOM SLOVENSKU

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The paper herein identifies biological factors affecting the growth and biomass production of fast-growing energy woody crops of *Salix* genus. Experimental data on the growth rate, leaf area index (LAI), biomass production and dynamics of the assimilation pigments is in leaves were obtained in 2009 and 2010 in the stand of five fast-growing willow varieties of Swedish origin. The three-year old willow stands (first rotation cycle) were established on agricultural land belonging to SUA in Nitra in the cadastre of Kolíňany village. Other studied biological factors included the health of the willows and identification of impacts of diseases and pests on the observed willow varieties. The paper also discusses the impact of the weed competition. The fact that growth and biomass production are genotype-conditioned was confirmed. The determining factors are the leaf area index, the length of its functional activity and the content of assimilation pigments, which is in linear correlation with the size of LAI. The size of LAI and its dry weight decreased due to leaf area losses caused by pests and diseases as well as the premature defoliation. The European Union established a common framework for the promotion of renewable energy. The EU member states, among them also Slovakia, prepared their long term strategies concerning agricultural and non-agricultural use of crops for industrial purposes.

Key words: short rotation woody crops, *Salix*, growth, biomass, biological factors, legislation

In 2008, Slovak government approved the Biomass Action Plan, which identifies barriers to implementation of biomass for energy purposes. These are technical and technological equipment, economics, lack of capital in agricultural and forestry organizations. There are also other, for e.g. biological barriers, which can significantly affect the growth and biomass production of fast-growing woody crops usable for energy purposes. As these barriers are dependent on ecological and environmental factors, it is necessary to carry out a detailed ecophysiological research of the species (and clones) and get to know their potential production efficiency in specific conditions. Physiological determinants of the growth of fast-growing species of the genus *Populus* have already been worked out in 1979 (Dickman, 1979). In subsequent years, the impact of environmental factors on growth and performance of the assimilation apparatus of various species and genotypes of fast-growing tree species (Robinson et al. 2004), relations between the size of leaf area and biomass production (Bullard et al. 2002), relations between the extension growth and diameter growth of shoots and their effects on biomass production (Verjwist 1991), coppicing ability (Sennerby-Forsse 1992) and many other factors were studied in detail. Biomass production has been investigated also in relation to the impact of biotic factors such as competition (Weger and Havlíčková, 2002) and pests and diseases (Collins and Leather, 2001).

A comparable research was not carried out in the environmental conditions of Slovakia. The first experimental plantations of Swedish willow genotypes in soil-ecological conditions of south-west Slovakia were established in Selice (2006) and Kolíňany (2007) (Demo et al., 2011). In these experimental sites, the research on ecophysiological characteristics, particularly growth and production performance of Swedish fast-growing willow genotypes has been carried out.

The objective of the present study was to quantify the biological factors that influence the growth of short rotation willows crops and varietal differences of their physiological properties on a converted agricultural site in southern Slovakia. The aim of the legislation in the field of renewable energy resources is to maintain Europe's position as one of the most energy efficient regions in the world.

Material and methods

The experiments were established on agricultural land previously cropped for cereals and root-crops and located in the research base in Kolíňany, cadastral area of Kolíňany village, Nitra district. The soil at the research site in Kolíňany is in terms of BSEU classified by the code 0111002. Climatic region is warm, very dry and plain, with an average temperature of 15 to 17 °C during the growing season. Main soil unit is gleyic fluvisol, moderate soil located mostly in the alluvial plains of rivers with high level of groundwater. Terrain steepness and exposure: a plain without signs of surface erosion (0° to 1°). The soil is deep (60 cm or more) and without skeleton. In terms of particle size, the soil belongs to moderate soils.

Meteorological conditions were analyzed based on data obtained from Slovak Hydrometeorological Institute. As for the meteorological data, we evaluated rainfall and average temperature. Based on a comparison with long-term average, we can conclude that in 2009, the rainfall was subnormal. Total

Table 1 Characteristics of the studied willow genotypes

Salix varieties (1)	Genetic background (2)
TORA	(*Salix schwerini* x *Salix viminalis*) cross between a Siberian basket willow and the Swedish willow variety ORM (3)
GUDRUN	(*Salix dasyclados*) hybrid between the Russian variety Helga and the clone Lĺnga Veka Röd (4)
INGER	(*Salix triandra* x *Salix viminalis*) cross between a Russian clone and the Swedish variety Jorr (5)
SVEN	*Salix viminalis* x (*Salix viminalis* x *Salix schwerini*) cross between the Swedish varieties Jorunn and Bjorn (6)
TORDIS	(*Salix schwerini* x *Salix viminalis*) x *Salix viminalis* cross between the Swedish varieties Tora and Ulv (7)

Tabuľka 1 Genetická charakteristika študovaných vŕb
(1) variety *Salix*, (2) pôvod, (3) kríženec sibírskej košíkarskej vŕby a švédskej odrody Orm, (4) kríženec ruskej odrody Helga a švédskeho klonu Lĺnga Veka Röd, (5) kríženec ruského klonu a švédskej odrody Jorr, (6) kríženec švédskych odrôd Jorum a Bjorn, (7) kríženec švédskej odrody Tora a Ulv

rainfall during the summer months was 167.7 mm. Precipitation in total was particularly poor in April, July and August. The year 2010 was above normal rainfall (especially April and May). In the next summer months of 2010 the total rainfall showed above average value if compared with average long-term value. Total rainfall in the warm half year was of 2010, 476.5 mm. The average air temperatures in warm half of year 2009 reached 8.81 °C, in 2010, 13.8 °C. When compared to long-term average temperature, both years were above normal temperature.

Five willow varieties have been used in the experiments. The experiments were established in 2007. Willows varieties originate from the Swedish research program. Certified supplier of the planting material was Lantmännen Agroenergi AB (Sweden) (table 1). The plantation was established by planting of cuttings in double-rows with the distance of 1 m between the rows in the double-row. The distance between the two double-rows was 2 m and between the cuttings in the rows was 0.7 m. Thus, the density of the crop stand was 10 666 plants ha^{-1}.

Biomass sampling was carried out during the growing period of 2009 (May-October) and 2010 (April-October) for 1.0 m spaced treatments. The actual collection was performed on 3 individuals from each genotype from the tops of the shoots and from the area of 1 m^{-3}. Each shoot section was divided into stems, twigs and foliage and then taken for fresh (FW) and dry weight (DW) determination. The dry matter was determined thermogravimetrically after drying of Fw in thermostat at 90 °C. The dry weight was calculated from the formula: % *Dw* = (*Dw* / *Fw*) × 100 (*Dw* is dry weight, *Fw* is fresh weight).

The size of leaf area was determined from the samples, 100 grams of fresh leaves, and then converted to m^2 with a predominance of sunny leaves in the sample by scanning the leaves followed with the use of AutoCAD and CorelDraw programs. We determined the value of LAI (leaf area index) and RGRw (relative growth rate) of the selected species according to Květ et al. (1971).

The greenness or relative content of chlorophyll in leaves was measured by chlorophyll meter (SPAD – Soil Plant Analysis Development). Chlorophyll content was measured seven times during the growing season of 2010 using a device OPTI-SCIENCES CCM-200.

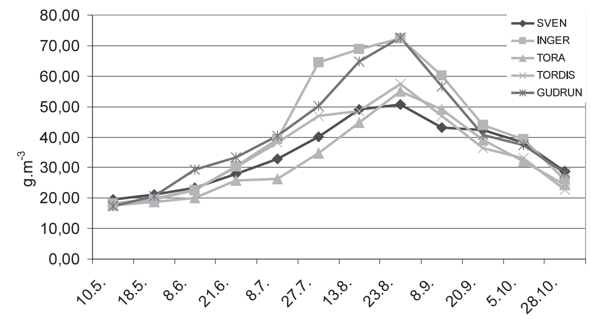
The basic statistical evaluation was done in statistic software Statgraphic plus. The significance of the correlation coefficient was evaluated by regression analysis on the significance level $\alpha = 0.05$. In the assessment of indicators, we verify the normal probability by the Shapiro-Wilkov test. We found a normal probability of files, so the statistical significance between the compared indicators was determined based on the paired two-sample *t*-test (significance level $\alpha = 0.05$).

Results and discussion

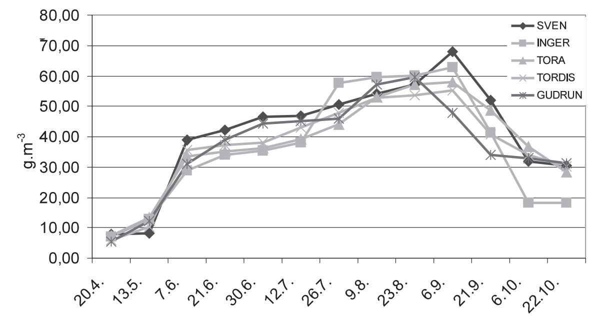
The stands of the selected Swedish willow varieties grown in the experimental years 2007 – 2010 have created a canopy closure in 2009. From this period (2009, 2010), ecophysiological characteristics of individuals were tested, as well as other biological factors that determine the growth and biomass production.

Results of the leaf area formation dynamics, leaf and shoot biomass, relative value of the assimilation pigments complex, weed control, influence of pests and diseases are summarized in the following section.

Data on the dynamics of the leaf biomass formation are presented in Figure 1 (a, b). The culmination of the dry matter content is different in the individual years. In 2009, the maximum amount of the dry mater of leaf was detected in the third decade of August (23/08/2009) in all varieties. In 2010, the amount of dry matter culminated in early September (09/06/2010) in the most varieties except of the variety GUDRUN, which reached the maximum amount of the biomass in the third decade of August (08/23/2010). The comparison of the two groups of Swedish willow varieties is as follows: TORA and TORDIS marked a dry weight of leaves 33.71 $g.m^{-3}$ on average in 2009 and 37.55 $g.m^{-3}$ in 2010. GUDRUN and



a) growing season of 2009 (1)



b) growing season of 2010 (1)

Figure 1 Dynamics of the annual leaf dry matter formation in $g.m^{-3}$ of the SRC *Salix* varieties in the growing seasons of 2009 and 2010

Obrázok 1 Dynamika rastu suchej hmoty listov v $g.m^{-3}$ rýchlorastúcich drevín rodu *Salix* vo vegetačnom období rokov 2009 a 2010
(1) vegetačné obdobie

Table 2 Statistical differences of dry matter formation of the *Salix* varieties in the growing seasons 2009 and 2010

	Salix varieties (1)				
	SVEN	TORA	TORDIS	INGER	GUDRUN
$p < 0.05$	0.0002	0.0067	0.0164	0.1298	0.3548

Tabuľka 2 Štatistická rozdielnosť tvorby suchej hmoty listov variet rodu *Salix* vo vegetačnom období 2009 a 2010
(1) variety *Salix*

Table 3 The characteristics of growth and biomass production of *Salix* varieties in the growing seasons 2009 and 2010

Indicator (1)	Year (2)	*Salix* varieties (3)				
		TORA	TORDIS	INGER	GUDRUN	SVEN
LAI ∅	2009	4.931	5.183	5.943	5.891	5.063
	2010	5.515	5.606	6.096	6.509	6.134
RGRwl ∅ in mg $g^{-1}day^{-1}$	2009	12.18	11.83	12.87	14.29	9.21
	2010	11.53	11.78	12.82	15.41	12.01
Dry weight of shrub in t (4)	2010	0.0048	0.0031	0.0047	0.0036	0.0037
Biomass production in $t.ha^{-1}$(5)	2010	50.88	33.06	49.92	37.86	38.93

Tabuľka 3 Charakteristiky rastu a produkcie biomasy variet rodu *Salix* vo vegetačnom období 2009 a 2010
(1) ukazovateľ, (2) rok, (3) variety *Salix*, (4) suchá hmotnosť kra v tonách, (5) produkcia biomasy v $t.ha^{-1}$

INGER had a higher dry weight of leaves (41.56 $g.m^{-3}$) in 2009 than in 2010 (36.95 $g.m^{-3}$).

Using the paired two-sample *t*-test (significance level $\alpha = 0.05$), we investigated a statistical difference of dry matter formation of the varieties within two growing seasons. We found a highly significant difference in the variety TORA and a significant difference in the varieties SVEN and TORDIS (Table 2).

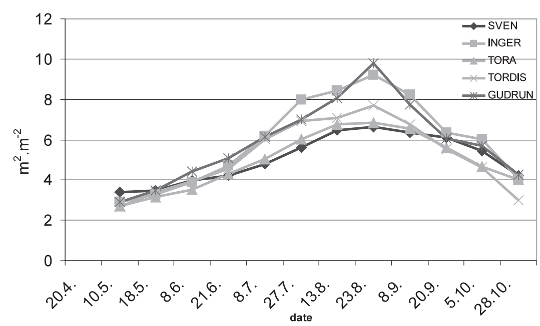
The results of the leaf biomass values of the SRC *Salix* varieties during the two growing seasons of 2009 and 2010 show, in particular, climate conditionality of the biomass production. The decisive factor is a sufficient amount of water. Higher hydration of the leaf tissues (63.45 % of the water contents) and higher values of the leaf dry mass in 2010 may be related to the moisture conditions of the growing seasons 2009 and 2010, when 2010 is considered, in terms of moisture conditions, as more favourable.

The biomass production as a quantitative indicator of productivity is determined by the area of photosynthetizing organs and their photosynthetic productivity. We observed in more detail the dynamics of the leaf area index formation (LAI) and relative growth rate of leaf dry matter (RGRwl). Medina, Klinge (1983) recommended the LAI analysis as an accurate indicator of the evaluation of the crop stand development. According to Maas et al. (1995) the seasonal development of LAI is often related to the development and production of biomass. Results are shown in table 3 and figure 2.

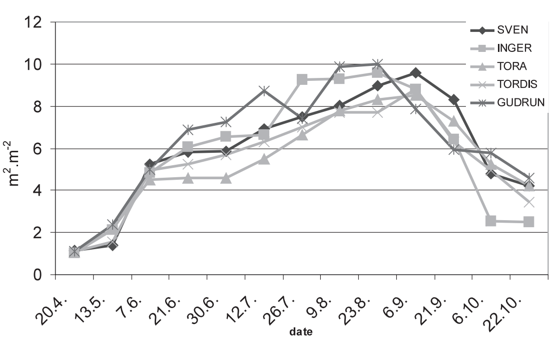
There are slight differences in the values of the growth analysis during the two studied years. Generally, higher values were marked in 2010. The values listed in Table 3 show that the RGR of the leaves is relatively low. Grime and Hunt (1975) determined values for various types of plants higher than 300 $mg.g^{-1}.day^{-1}$. The explanation is that trees and shrubs are long-lived and are able to reach large sizes throughout the life. Therefore, they accumulate the organic matter more slowly compared to herbs. The highest average growth rate of leaf dry matter among the varieties reached GUDRUN and the lowest SVEN. The faster growth is a prerequisite that the plant would faster enlarge its underground and above-ground organs and easier compete for space and resources (light, water and mineral nutrients) compared to plants whose growth rate is low. However, it may not always mean that plants with rapid growth are more efficient in production compared to the species whose RGR values are lower. Also Waring et al. (1985) indicate that slow-growing species do not necessarily need to use the produced assimilates for the construction of their structures, but they can store them in reserve for the later growth.

Leaf area index

LAI of the individual varieties reached higher values in 2010. The difference in LAI is on average 2.5% (INGER) to 10.5% (TORA). The dynamics of LAI formation of the *Salix* varieties in the research site in Kolíňany in 2009 and 2010 show Figure 2 (a, b).



a) the growing season 2009 (1)



b) the growing season 2010 (1)

Figure 2 LAI dynamics of the *Salix* varieties in the growing seasons 2009 and 2010
Obrázok 2 Dynamika LAI variet rodu *Salix* vo vegetačnom období 2009 a 2010
(1) vegetačné obdobie

LAI values ranged from 2.67 to 9.78 in 2009 (Figure 2). The increase in the leaf area occurred intensively in the period from 21/06/2009 to 23/08/2009. Subsequently, the reduction in leaf apparatus reflected the reduction of the dry leaf matter. The trend of LAI, in the conditions of the research plantation in Kolíňany, can be described by one-peak curve in the both experimental years (2009 and 2010, the first rotation). The LAI values of the genotypes ranged from 2.69 (TORDIS) to 3.39 (SVEN) at the beginning of May (10/05 – 21/06). The second decade of June (21/06 – 27/07) was characterized by the beginning of a significant expansion of the LAI values ranging from 4.30 (TORA) to 5.06 (GUDRUN). LAI culminated in the third decade of August (27/07 – 23/08), when a greater differentiation among genotypes occurred. The highest values of LAI were reached by GUDRUN (9.78) and INGER (9.20). The lowest LAI value achieved SVEN (6.62). The studies on the dynamics of LAI showed that willows often create small syleptical shoots, which increase the LAI values and fall of along with the leaves at the end of a growing period (Robinson et al. 2004). This phenomenon has been studied more properly in poplars (Barigah et al. 1994). Significant decline in LAI values caused by a beginning of the leaf cessation was marked especially in the 09/08 – 20/09 2009. The trend of the LAI formation was similar in 2010, the differences were only in the different values of LAI. Results of the present study are comparable in numerous other studies (Ridge et al., 1986; Bullard et al., 2002; Pellis et al., 2004). Dry mass of leaves can be reduced by premature defoliation and losses of the leaf area due to diseases and pests.

Leaf fall occurred during September and October, when there was progressive senescence of the oldest leaves.

In present study, we paid a close attention to the aging (maturation) of leaves at the end of the growing period 2009. We confirmed that relative value of the complex of assimilation pigments rapidly decline along with the decrease in LAI values. The values are conditioned by a genotype. The comparison of LAI and the content of the assimilation pigments showed a linear relationship, which is illustrated in Figure 3.

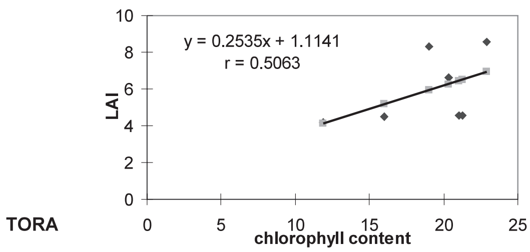
We confirmed a significant linear relationship between the leaf area index and the relative chlorophyll content in all varieties, except TORDIS (*r* = 0.1087) (Figure 3). The significance of the correlation coefficient was determined by the regression analysis on the significance level α = 0.05. The statistical relationship between LAI and the chlorophyll content can be confirmed only in the varieties GUDRUN (p = 0.0085), INGER (*p* = 0.0018) and SVEN (*p* = 0.0460). The statistical relationship between varieties TORA and TORDIS is insignificant.

Influence of pests and diseases

During the period 2007 – 2009, leaf rust caused by *Melampsora* sp. and a stem canker – *Cryptodiaporthe salicella* were the most important pathogens. The most common symptom of the *C. salicella* infection is a bark necrosis, leading to dieback of young stems. In Kolíňany, the stem cancer was first time observed in spring 2009, next year after the cutback of the two years old plantation. INGER was the most severely damaged variety, some of the plants died out. The killed stems and whole plants were 3 – 4 m in height. No symptoms were found on GUDRUN and TORA.

Melampsora rust was the next very serious disease. Between late spring and autumn, the rusts were seen as yellow-orange pustules containing urediniospores. Severe rust infection defoliates susceptible plantings prematurely, reduces yields by as much as 40% (Parker et al. 1995), and predisposes plants to infections by secondary pathogens which may lead to death of the plants.

From among the stem-feeding aphid species forming colonies on the trunk or branches, the most damaging species was – *Tuberolachnus salignus*. Colonies of *T. salignus* were first observed by the beginning of August 2008 and again in 2010. *Tuberolachnus* is regarded as an economically important pest of short rotation coppice willow, on which it can cover more



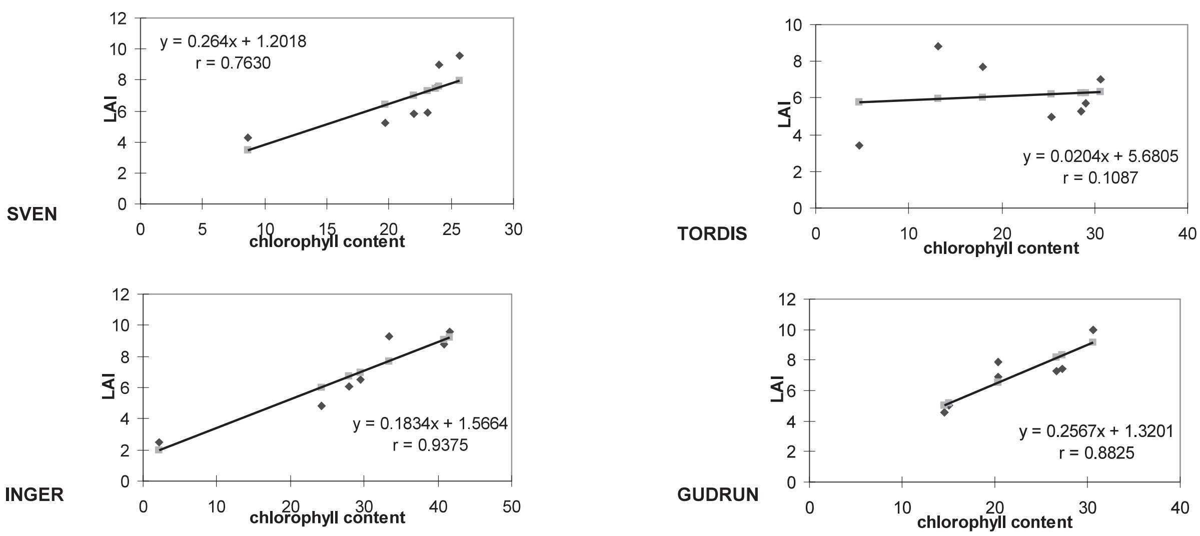


Figure 3 Linear correlation between the leaf area index (LAI) and the chlorophyll content in leaves of the *Salix* varieties in the research site in Kolíňany in 2010
Obrázok 3 Lineárna závislosť medzi indexom listovej pokryvnosti a obsahom chlorofylu v listoch variet rodu *Salix* na výskumnej lokalite Kolíňany v roku 2010

than 50 % of 1 – 3 year old stem surface of infested trees (Collins and Leather, 2001). INGER was the most severely damaged variety by the second week of August 2008. By the beginning of October the whole willow stand was equally infested by the aphids. GUDRUN was the last variety attacked by aphids. In August 2010, *T. salignus* colonies were observed only on the stems of TORA and GUDRUN localized at the edge of the plantation. They did not spread inward and to the other willow varieties due to severe epizootics of Neozygites turbinata (Zygomycetes: Entomophtorales). The strong epizootic due to *N. turbinata* in *T. salignus* populations could be observed also during October (Barta a Cagáň, 2006).

Weed control

Willows and poplars do not tolerate well a competition with weeds and even a low level of weed infestation causes their uneven growth and strongly influences the yields (Tubby and Armstrong, 2002). According to Weger and Havlíčková (2002), the weed control should be carried out adequately to the state of the weed infestation in the plantation one to three times per year. The authors argue that the weed control is particularly important in terms of reducing the competitiveness of weeds.

Parfitt et al. (1992) found in stands of willows and poplars 50 % to 95 % reduction in their growth under the influence of vigorous weeds in the first year after planting. The competition with annual weeds is highest in the period from April to June. According to Celjak (2010) the weed infestation, in combination with other adverse effects, may result in the high losses in the first year, because in 2 – 4 weeks after planting, the weeds create a canopy closure over the sprouting shoots, which tend to decay. Shoots from the well-sprouting cuttings overgrow the weeds as late as in the summer months, when they reach 50 – 80 cm.

However a number of weeds remain in the field throughout the whole period but without any impact on biomass production. At certain periods of year, the weeds may even help to maintain soil moisture and prevent soil erosion. Plant soil cover helps increase biodiversity, and therefore an excessive weed control is neither economically nor environmentally suitable.

Legislation

Production of energy from renewable sources often depends on local or regional small and medium-sized enterprises. The opportunities for growth and employment of investment in regional and local production of energy from renewable sources in the Member states and their regions are important. The Commission and the Member states should therefore support national and regional development measures in those areas, encourage the exchange of the best practices in production of energy from renewable sources between local and regional development initiatives and promote the use of structural funding in this area. Based on the Action Plan for Energy Efficiency, published by COM (2006) 545, Slovakia prepared “The Long term strategy and non agricultural use of agricultural crops for industrial purposes”. This strategy includes several documents, including “Biomass Action Plan for years 2008 – 2013”. The Biomass Action Plan is based on the Biomass Action Plan of the EU and its aim is to assess the real situation in Slovakia in the field of biomass. The Action Plan for the use of biomass states that the use of biomass as compared to conventional energy sources has many advantages for the regions in Slovakia. Lower energy prices will positively influence the competitiveness of the region and ensure regional development. The cost of biomass in comparison with other types of renewable energy is relatively low. This claim stems not only from comparison of costs for energy, but for businesses in agriculture, reducing the cost of warehousing, transportation, processing, respectively waste disposal of plant and animal production.

Conclusion

The study demonstrated that growth and biomass production of the short rotation willow coppice are conditioned by a genotype. It depends on the biological properties of the varieties, particularly the growth rate of the organic matter. Determining factors are the leaf area index (LAI), the length of its functional activity and content of assimilation pigments. The destruction of the complex of assimilation pigments in the autumn (September-October) is varietal’s characteristic. The culmination of the dry matter content of leaves is different in the individual years. The amount of biomass is determined by the size of leaf area, length of its functional activity and content of assimilation pigments. Their content is in a linear correlation with the value of LAI. The value of LAI and its dry weight decreased due to leaf area losses caused by pests and diseases as well as the premature defoliation.

Legislation of the renewable energy sources in the Slovak Republic has also a number of shortcomings that are criticized by energy producers, and also by professionals. According to the directions of the European Union, Slovakia should produce 14 percent of all energy from renewable sources by 2020. Many energy producers argue that despite of the adopted legislation this commitment will not be completed.

Súhrn

V príspevku sú identifikované biologické faktory ovplyvňujúce rast a produkciu biomasy rýchlorastúcich energetických drevín rodu *Salix*. Experimentálne údaje o rýchlosti rastu, veľkosti indexu listovej pokryvnosti (LAI), tvorbe biomasy a dynamike obsahu asimilačných farbív v listoch, boli získané v rokoch 2009 a 2010 v poraste piatich variet rýchlorastúcich vŕb švédskej proveniencie. Trojročné porasty vŕb boli založené na poľnohospodárskej pôde ŠPP SPU v Nitre v katastri obce Kolíňany, boli v prvej rotácii. Z ďalších biologických faktorov bol sledovaný zdravotný stav drevín a identifikovaný vplyv chorôb a škodcov. Diskutovaný bol vplyv konkurencie v poraste vŕb s jednoročnými burinami. Potvrdili sme, že rast a produkcia biomasy sú genotypovo podmienené. Pre veľkosť biomasy je určujúca veľkosť listovej plochy, dĺžka jej funkčnej činnosti a obsah asimilačných farbív. Tento je v lineárnej korelácii s veľkosťou LAI. Veľkosť listovej plochy a jej suchá hmotnosť boli znížené stratami listovej plochy spôsobenej chorobami a škodcami a predčasnou defoliáciou. Európska únia vytvorila spoločný rámec na podporu energie z obnoviteľných zdrojov. Členské štáty EÚ, medzi nimi aj Slovensko, pripravili svoje vlastné dlhodobé stratégie využitia poľnohospodárskych a nepoľnohospodárskych plodín na priemyselné využitie.

Kľúčové slová: rýchlorastúce dreviny, *Salix*, rast, biomasa, biologické faktory, legislatíva

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ECONOMIC AND SOCIAL DISCREPANCIES BETWEEN THE MOST DISADVANTAGED RURAL AREAS OF HUNGARY ESPECIALLY AFTER THE EU ACCESSION

EKONOMICKÉ A SOCIÁLNE DISPARITY MEDZI NAJVIAC ZNEVÝHODNENÝMI VIDIECKYMI OBLASŤAMI MAĎARSKA S DÔRAZOM NA OBDOBIE PO VSTUPE DO EURÓPSKEJ ÚNIE

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The paper is based on research concerning the economic and social discrepancies among the regions of Hungary for years, especially focusing on the period since the EU accession. We have been analyzing the economic and social changes that happened due to the use of both national and EU funds. Based on our findings we can state that the differences between the most and the least developed regions have increased in the past period, which is a totally adverse tendency compared to the EU objectives, e.g. to reduce the spatial inequalities. The most developed central region has improved a lot more than the others and at the same time the peripheral regions were not able even to catch up with the average performance. The aim of the paper is to analyze the regions which are in an extremely difficult situation compared to their counterparts, since the least developed areas of the country belong to these regions. There are four regions out of seven in this category. Based on the complex indicators in the classification of the governmental decision, there are 33 microregions of Hungary which need special development concepts to keep the population in the rural areas, to produce economic growth, to increase the employment etc. The regions which contain these underdeveloped areas cannot be considered homogenous; therefore it is very difficult to define general development objectives for such territories. Thus, individual and endogenous development concepts have to be elaborated to enable them to survive and increase their competitiveness. In the paper we intend to examine the economic and social tendencies of the regions mentioned above with statistical methods, using the data available after 2004 and try to define potential paths to break out and develop.

Key words: regional development, regions lagging behind, peripheries, economic differences

The year of 2010 had great importance in the Cohesion policy of the EU. In spring, there were two influential reports published, namely the Barca report and the EUROPE 2020, which will greatly affect the future trends of the cohesion policy objectives and the economic and social trends of the member states, especially those of the new members, including Hungary.

In order to achieve the strategic objectives of the EUROPE 2020, it is inevitable that there should be cohesion among the regions. We cannot have a competitive Union on the global market unless we manage to reduce the current significant discrepancies among the regions.

Cohesion policy is such a policy that contributes to the improvement of the competitiveness of the territories taking into consideration the development needs and potentials of the given territory as well as the strategic objectives of the Union (Káposzta-Nagy, 2009). Therefore it can be a greatly efficient instrument in the realization of the objectives of the EUROPE 2020. The total budget for cohesion policy for the current programming period is more than eur 347 billion, which is equal to the 35 % of the Community's budget. The Hungarian EU presidency in the first half of 2011 also sought to maintain this frame to promote further development of the EU and its cohesion policy. Since the national policies on regional development have contributed to the strengthening of the European cohesion only in a very low extent, the moderation of territorial inequalities has become a priority strategy in the European Union by now. One of the basic activities of the regional policy is to moderate the gap in the economic and social development levels of the territories and to strengthen the cohesion with channeling funds to the regions. However, this system has required a uniform territorial nomenclature throughout the whole European Union. Thus, the NUTS classification was created to allow the definition of the target areas of the community policies. These provide the basis for the system of planning and statistical regions of Europe as well as for our research. Therefore, the Hungarian House of Parliament passed the Act. No. 21/1996 on territorial development in line with the system of institutions and instruments of the Union's regional policy, intending to achieve balanced national development, to encourage the economic, social and cultural development of the regions, to carry out a coherent spatial development policy and to harmonize the national and regional spatial development activities. The Act rules the spatial development, its aims, its national and regional institutional system as well as the instruments including the financial sources, the planning and the spatial information system.

Due to the EU accession, the role of our regions has become more important, not to mention that the EU's Structural Funds are available especially for the NUTS 2 regions. Therefore, the NUTS 2 level is the level of regions which are the targets of the Community's regional policy. The classification of the NUTS 2 regions is approved by the EU based on the proposals of the member states. The NUTS 2 category is such an object which represents an indivisible unit, since regarding the eligibility for the EU funds, these borders cannot be modified (at least in short terms) (Szabó, 2005). The Hungarian NUTS 2 regions are displayed on the Figure below.

Having overviewed the Hungarian tendencies after the EU accession, we can see that there are both winning and losing regions. Before the accession, Hungary had had one strong center, namely the capital, Budapest, where all the activities of national importance had been located and we could have seen the rural areas around it with much lower standard of living. These

Figure 1 NUTS 2 regions of Hungary
Source: own processing based on CSO data, 2011.
Obrázok 1 Regióny NUTS 2 v Maďarsku
Zdroj: vlastné spracovanie na základe dát CSO, 2011
(1) Západné Zadunajsko, (2) Stredné Zadunajsko, (3) Južné Zadunajsko, (4) Centrálne Maďarsko, (5) Veľká južná nížina, (6) Severné Maďarsko, (7) Veľká severná nížina

inequalities unfortunately remained after the accession, or even increased. The two major goals of the European cohesion policy should be better addressed in Hungary, resulting in the development of all the regions and contributing more to the catching up of the rural areas. The research was focused on those regions where the least developed micro-regions can be found.

Material and methods

The development of the EU integration made it increasingly necessary to launch such policies and tools that intend to achieve territorial equalities while moderating the territorial differences within the Community. The first Objective was defined by the Council Act 2081/1993 EC on the 'facilitation of the catching up of economically underdeveloped regions'. At that time the priority was not aiding the regions lagging behind, but helping them to catch up. In general, it can be stated that the efforts of the EU's cohesion policy, from the very beginning, has been focusing on the reduction of inequalities, adjusting to the fast changes and the problem of aging population (Csite-Jakobi, 2009).

There is an Act in effect in Hungary, classifying the beneficial territories of the country which entered into effect in 2007. The governmental regulation No. 311/2007 (XI.17.) laid down a rank for the 174 microregions, based on the article 'e' of the 6 § of the Act No. 21, year 1996, considering complex economic and infrastructural indicators for those territories. The regulation defined the least developed 33 micro-regions as well, comprising nearly 20 % of the population, and it laid down the necessity of complex development programs for the improvement of the conditions in those areas. It is important to notice that the preparation of the development programs for the least developed microregions started in the first half of 2008. By February 2009, all the 33 microregions submitted their project proposals, out of which the National Development Agency has approved more than 1000. They were allowed to follow their own planning methodology and considering their own conditions. The only requirement was to meet the basic quality criteria and to compete with the proposals of more developed territories.

This separated channel of supports can be primarily efficiently applied in certain forms of funds in the regional operation programs, the Operation Programs of Social Reform and Social Infrastructure, especially in development related to the local governments. In the present period, nearly HUF 100 billion is available from those operation programs only for the 33 microregions mentioned above. There is additional HUF 27 billion in the regional operation programs and HUF 13 billion in the other operation programs available, meaning the start of nearly 500 projects. The approval of additional 500 projects is underway. Due to the economic development projects, industrial plants can be created in the least developed territories. As a result of location developments, the income-generating capacity of the regions may also improve. Some of the fundamental shortages of those areas are the low-educated human resources and the difficulty of job creation. In several settlements, the population is very low, which has negative correlation with the capital attractiveness (Nagy-Káposzta, 2010).

According to the national legislation in effect, it is not an easy task to classify the 174 microregions into different categories, since it is an ever-changing system. The population and the territory of a microregion may change from one year to another (Botka, 2009). Until 31 December 2006, 168 microregions had existed, and the number increased to 174 later, as mentioned above. The classification of the microregions lagging behind is a topic closely related to our research, so it is useful to overview the criteria of the classification. The Parliamentary Act No. 2007/67 is a fundamental document related to the spatial development funds, the principles of decentralization and the conditions of classification. Based on the above-mentioned act, during the distribution of the spatial development funds, a complex indicator has to be considered, reflecting the economic and infrastructural underdevelopment of the settlements and regions. This complex indicator includes the following elements, on which the microregions are put into categories:

- economic indicators,
- infrastructural indicators,
- social indicators,
- employment indicators.

The Governmental regulation No. 2007/311 classifies the microregions based on their level of development, applying the conditions defined in the Parliamentary Act No. 67/2007.

According to the regulation, the following categories are distinguished:

1. Temporarily beneficial microregions.
2. Disadvantaged microregions.
3. Most disadvantaged micrregions.
4. The least-developed micro regions that require complex development programs to be carried out.

In our research, we focused on the last category, the 33 microregions in Hungary, which are multi-handicapped and where complex development programs have to be applied because of their poor social and economic performance. The location of these microregions is displayed on Figure 2 with dark green color.

Our methodology and findings are based on statistical data for the period after 2004, available for the targeted microregions, as well as review on other researches carried out related to the territories in question.

We have collected the necessary statistical data from the Central Statistical Office to be able to carry out comparisons between the microregions and the regions where they are located in order to see how much they contribute to the economic capacity and development potential of the region. In each case the data of the microregions were compared to the data of the region. We intended to see the change and the tendency from 2004 to 2009; therefore, we tried to focus on the data of these years. In the case of the migration per 1 000 inhabitants we

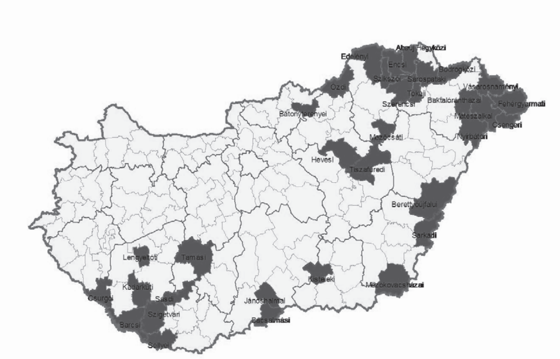

Figure 2 The least developed microregions of Hungary that require complex development programs to be carried out
Source: own processing, based on data from CSO, 2011

Obrázok 2 Najmenej rozvinuté mikroregióny v Maďarsku, ktoré vyžadujú vytvorenie komplexných rozvojových programov
Zdroj: vlastné spracovanie, na základe dát z CSO, 2011

calculated the number of migrants in the percentage of the total population of the examined years (2004 and 2009).

Therefore, the time frame of our research was 2004-2009; the territorial units examined were the least developed microregions which should be developed with complex development programs as well as the four NUTS regions out of the 7 Hungarian regions where such microregions are located.

The indicators we have selected were such indicators that are suitable for displaying and reflecting the economically and socially underdeveloped situations and are perfect to show the territorial discrepancies within the territorial units (as aimed in the title of this paper).

Results and discussion

According to the NUTS classification, there are 7 regions in Hungary and there are 33 underdeveloped microregions which require complex development programs. These territories represent 19% of the total number of microregions (174). While examining the regions, we need to see the share of the least developed microregions out of the total number of microregions within each region.

The table above shows that 31.7 % of the microregions located in these four regions is underdeveloped. It clearly determines their economic and social situation, since more than one third of the microregions belong to this unfavourable category. If we look at the country as a whole, it has a direct impact on its economy as well, since 4 regions out of 7 include such territories lagging behind. The worst situation can be observed in Northern Hungary, where more than 42 % of the microregions are underdeveloped and need complex development support. In regional comparison, this region produced the least GDP in the period after 2004 and is the last in the rank of the regions at the moment as well. Moreover, the highest number of people lost their jobs in this region between 2004 and 2008, exceeding 22,000.

It is important to examine how much of the population should live under such circumstances, how many people are affected by such unfavorable conditions. Based on our researches of the past years, we must state that their situation seems not to be short-lasting; both the economic and social conditions are much poorer than e.g. in some of the Western parts of the country. These microregions are mainly located near the borders, far from the major infrastructure and the level of qualification of the human resources is also rather poor.

Based on the figures, we can see that the picture is similar to that mentioned above. The most difficult challenges have to be faced by Northern Hungary, where almost one third of the population lives in the least developed territories. The most favorable situation refers to Southern Transdanubia, where 8.7 % of the population lives in these poor areas. It means that despite of the fact that some of their micro regions belong to the same category (being the least developed micro regions requiring complex development), their economic and social backgrounds are different, and they need to face different difficulties and challenges. Therefore, they cannot be

Table 1 The regional location of the 33 micro-regions requiring complex development, 2009

Regions (1)	Total number of microregions within the region (2)	Number of microregions which require complex development within the region (3)	Share of microregions which require complex development out of the total number in % (4)
Northern Hungary (5)	28	12	42.9
Northern Great Plain (6)	27	8	29.6
Southern Great Plain (7)	25	5	20.0
Southern Transdanubia (8)	24	8	33.3
Total (9)	104	33	31.7

Source: own processing, based on data from CSO, 2011 Zdroj: vlastné spracovanie, na základe dát z CSO, 2011

Tabuľka 1 Regionálne rozmiestnenie 33 mikroregiónov, ktoré vyžadujú komplexný rozvoj
(1) regióny, (2) celkový počet mikroregiónov v regióne, (3) počet mikroregiónov, ktoré vyžadujú komplexný rozvoj v regióne, (4) podiel mikroregiónov, ktoré si vyžadujú komplexný rozvoj z ich celkového počtu, (5) Severné Maďarsko, (6) Veľká severná nížina, (7) Veľká južná nížina, (8) Južné Zadunajsko, (9) spolu

Table 2 The population in the 33 underdeveloped microregions, 2009

Regions (1)	Regional population (2)	The population living in the 33 microregions (3)	The share of population living in the 33 microregions lagging behind in % (4)
Northern Hungary (5)	1,209,142	328,666	27.2
Northern Great Plain (6)	1,492,502	321,323	21.5
Southern Great Plain (7)	1,318,214	114,284	8.7
Southern Transdanubia (8)	947,986	165,971	17.5
Total (9)	4,967,844	930,244	18.7

Source: own processing, based on data from CSO, 2011 Zdroj: vlastné spracovanie, na základe dát z CSO, 2011

Tabuľka 2 Počet obyvateľov v 33 zaostalých mikroregiónoch, 2009
(1) regióny, (2) regionálna populácia, (3) počet obyvateľov žijúcich v 33 mikroregiónoch, (4) podiel populácie žijúcej v 33 zaostávajúcich regiónoch, (5) Severné Maďarsko, (6) Veľká severná nížina, (7) Veľká južná nížina, (8) Južné Zadunajsko, (9) spolu

Table 3 The change in the share of registered enterprises located in the least developed microregions, 2004 – 2009

Regions (1)	Share of enterprises located in the least developed microregions out of the total registered businesses in % (2)	
	2004	2009
Northern Hungary (3)	18.18	23.19
Northern Great Plain (4)	14.88	24.95
Southern Great Plain (5)	5.54	10.30
Southern Transdanubia (6)	9.65	15.74

Source: own processing, based on data from CSO, 2011
Zdroj: vlastné spracovanie, na základe dát z CSO, 2011

Tabuľka 3 Zmena podielu registrovaných podnikov nachádzajúcich sa v najmenej rozvinutých mikroregiónoch
(1) regióny, (2) podiel podnikov, ktoré sa nachádzajú v najmenej rozvinutých mikroregiónoch z celkového počtu registrovaných podnikov, (3) Severné Maďarsko, (4) Veľká severná nížina, (5) Veľká južná nížina, (6) Južné Zadunajsko

developed with the same development measures. Overall, examining all the 4 regions, it can be stated that 18.7 % of the population of these regions live under difficult circumstances.

After having examined the demographic situation in the 4 regions, we considered it very important to see their economic activity as well. While drafting development concepts for such regions, we need to see how many enterprises operate in the least developed microregions in order to see the economic and social potentials of those territories.

The table shows that the share of registered enterprises increased in all the territories examined between 2004 and 2009. It might refer to the fact that local people tend to set up their own businesses to avoid unemployment. Unfortunately, the share of operating enterprises out of the registered ones is still very low in these areas. The highest increase was in Northern Great Plain, which can be explained by two reasons. On one hand, the role of agriculture is more determining there than in the other regions, so the increase was caused primarily by the creation of small agricultural businesses. Many people start agricultural activity to make their own living in the underdeveloped areas, since agricultural traditions have strong roots on the Great Plain. On the other hand, due to the EU structural and rural development funds, many people had only one possibility to survive, namely to start their own enterprises. Table 3 also refers to the fact that the 4 regions comprising the least developed microregions of the country can be divided into two groups. The 3 regions to the east from the Danube are similarly underdeveloped, while Southern Transdanubia is in the 'most favorable' position among the

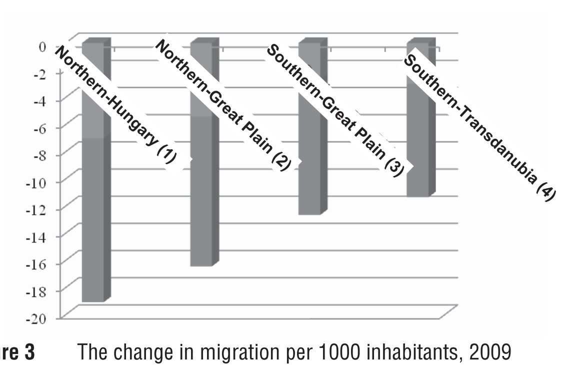

Figure 3 The change in migration per 1000 inhabitants, 2009
Source: own processing, based on data from CSO, 2011
Obrázok 3 Zmena v migrácii na 1000 obyvateľov, 2009
Zdroj: vlastné spracovanie, na základe dát z CSO, 2011
(1) Severné Maďarsko, (2) Veľká severná nížina, (3) Veľká južná nížina, (4) Južné Zadunajsko

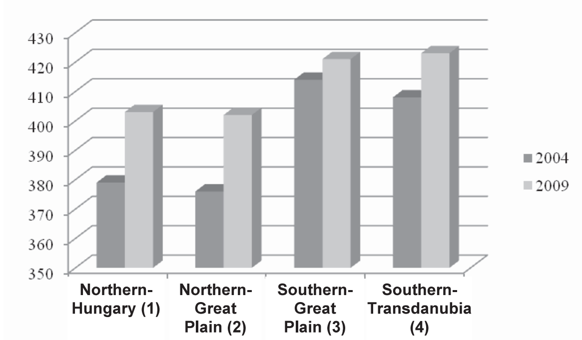

Figure 4 The change in the number of taxpayers per 1000 inhabitants, 2004 – 2009
Source: own processing, based on data from CSO, 2011
Obrázok 4 Zmena v počte daňových poplatníkov na 1000 obyvateľov, 2004 – 2009
Zdroj: vlastné spracovanie, na základe dát z CSO, 2011
(1) Severné Maďarsko, (2) Veľká severná nížina, (3) Veľká južná nížina, (4) Južné Zadunajsko

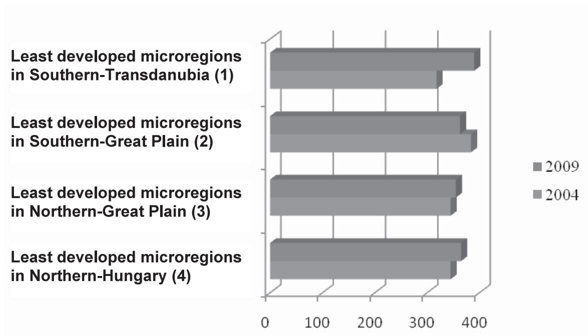

Figure 5 The change in the number of taxpayers per 1000 inhabitants in the least developed microregions, 2004 – 2009
Source: own processing, based on data from CSO, 2011
Obrázok 4 Zmena v počte daňových poplatníkov na 1 000 obyvateľov v najmenej rozvinutých mikroregiónoch, 2004 – 2009
Zdroj: vlastné spracovanie, na základe dát z CSO, 2011
(1) najmenej rozvinuté mikroregióny v Južnom Zadunajsku, (2) najmenej rozvinuté mikroregióny vo Veľkej južnej nížine, (3) najmenej rozvinuté mikroregióny vo Veľkej severnej nížine, (4) najmenej rozvinuté mikroregióny v Severnom Maďarsku

4 examined regions. Therefore, specified development programs are necessary to help their catch-up.

In order to see the present and future human resources potential of the microregions, we considered it important to analyze the migration tendencies. We have applied the method of deviation to see the difference between the migration figures of the microregions and those of the regions per 1 000 inhabitants. However, we need to highlight that there were negative tendencies in all the regions over the examined period. Unfortunately, this tendency started long ago. People have been moving from the least developed areas to other places in the country to find jobs and better lives for themselves for a long time. Based on the figures of 2004, it can be stated that the highest deviation was in Southern Transdanubia (regional average: -1.9, the average of the least developed microregions -5.19). In Southern Great Plain, the migration from the microregions was also higher than the regional average. That of the microregions in the two other regions was also higher, but not significantly. The figure below shows that the situation changed greatly by 2009, concerning the share of people leaving the regions in question. According to the statistics, increasing number of people migrate from these areas to other parts of the country. The deviation between the regional average and the