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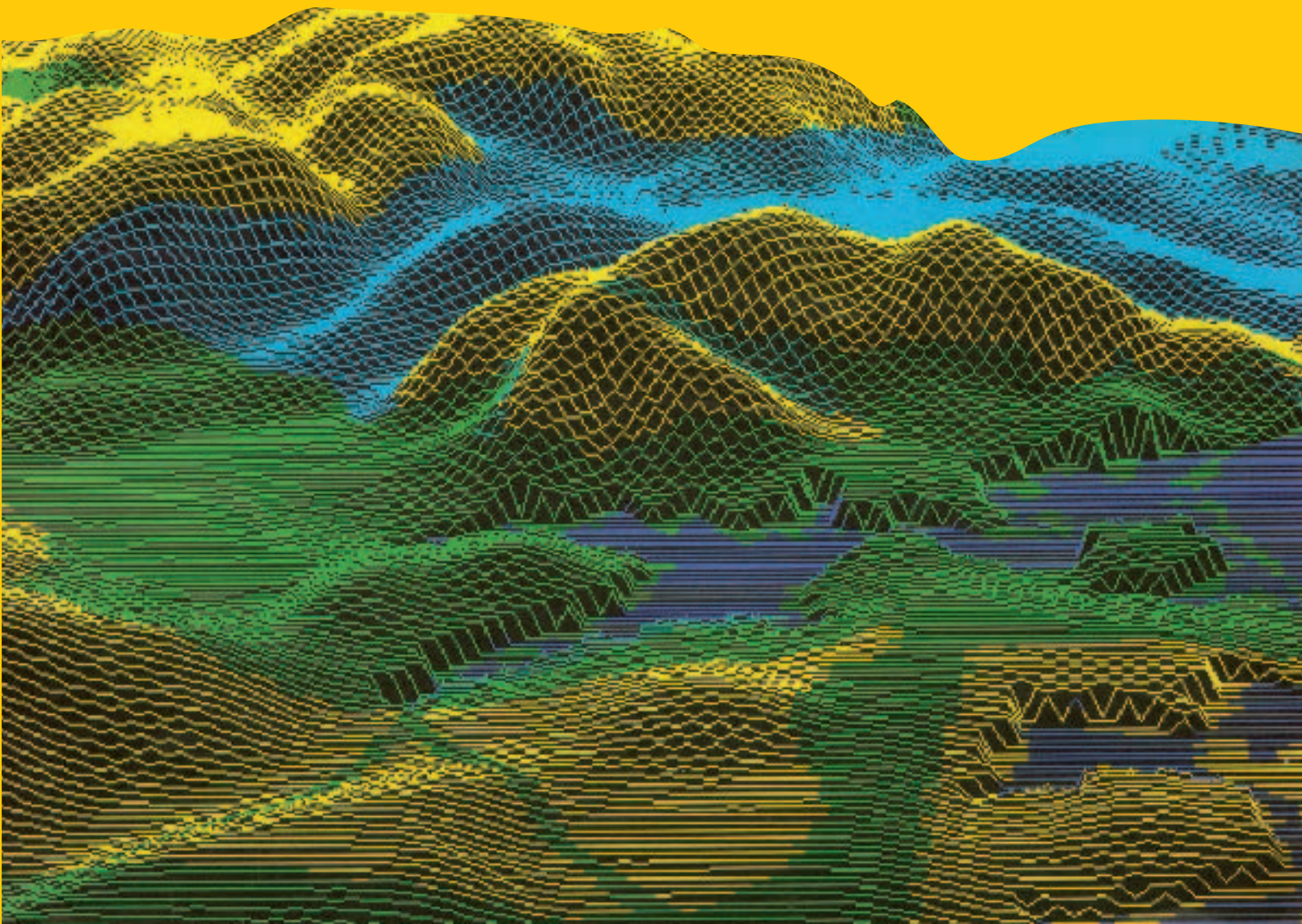

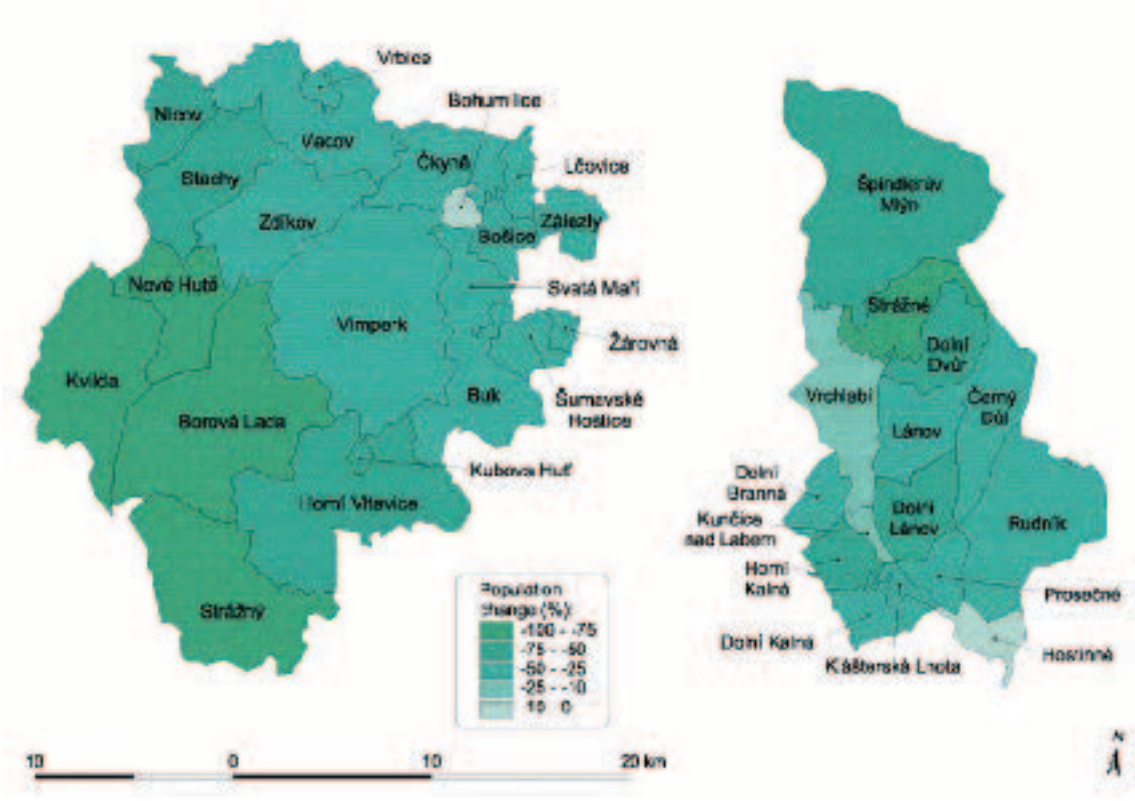

Fig. 4: Population change in 1910 – 1961
(Source: Statistický lexikon obcí v Republice Československé I. Státní úřad statistický, Praha, 1923; Retrospektivní lexikon obcí ČSSR 1850 – 1970, díl I / 1. ČSÚ, 1974)

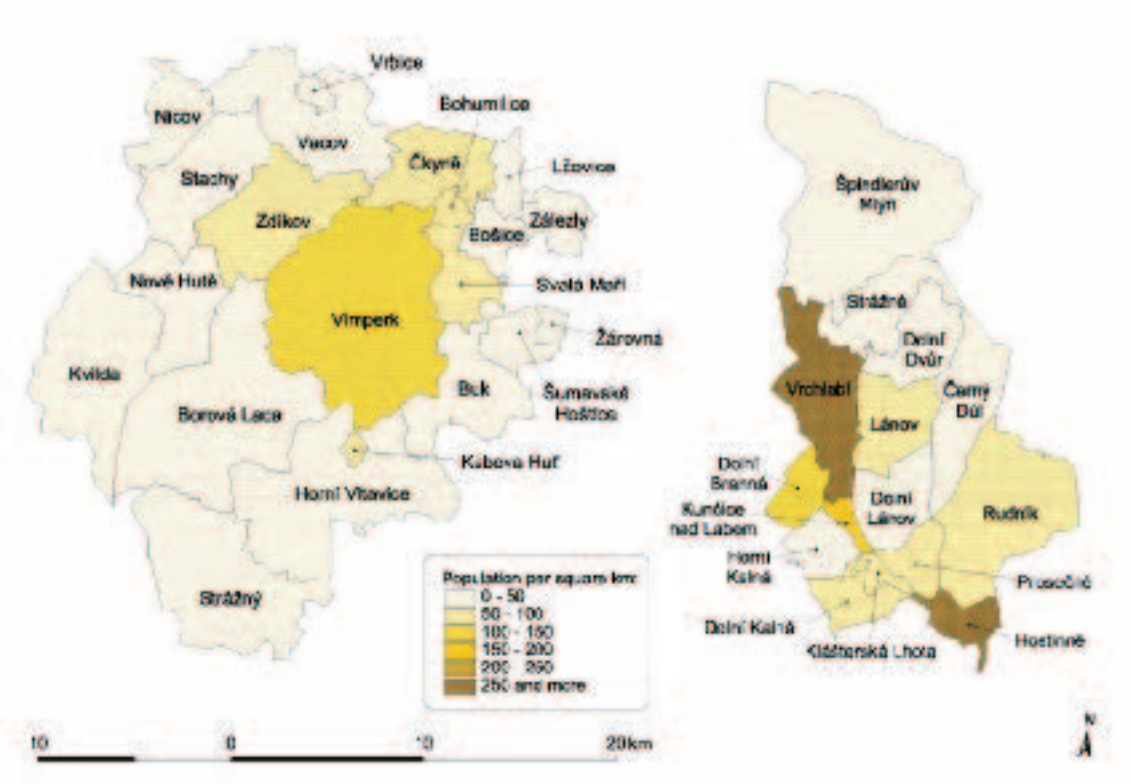

Fig. 5: Population density 2001
(Source: http: / / www.czso.cz / sldb / sldb2001.nsf / index)

Illustrations to P. Klapka´s et al. paper.

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Articles

Reports

AGRICULTURAL PROBLEM AREAS, IN POLAND[1] , 2002

Roman KULIKOWSKI

Abstract

Analysis of data from the Polish Agricultural Census of 2002 resulted in the delimitation of agricultural problem areas. This process comprised assessments of natural conditions, as well as the social, organisational, technical, production-related and structural characteristics of agriculture, which were the basis for selecting 11 negative indicators. In 803 units of analysis (gminas and towns in urban-rural types of gminas), none of the 11 indicators were recorded. In 1.202 units, where 1 – 2 negative features appeared, the level of agriculture was good, but with some visible problems. For a further 591 units, however, agriculture was defined as problematic: 3 to 5 diagnostic features were apparent. In a final group of 451 units of analysis, 6 or more negative features were recorded for the most problematic areas. All of these areas are characterised by level and are shown on map no 1. In concluding this paper, the author discusses the main changes in Polish agriculture in the period of transformation.

Shrnutí

Problémové zemědělské oblasti v Polsku

Analýza dat z agrocensu 2002, který se týkal hodnocení přírodních podmínek, sociálních, organizačních, technických, produkčních a stukturálních charakteristik zemědělství, byla základem pro výběr 11 charakteristických negativních jevů, na jejichž základě byly vymezeny problémové zemědělské oblasti v Polsku. V 803 studovaných jednotkách (obce a města urbánně-zemědělského typu) nebyl zjištěn žádný negativní jev, ve 1202 dalších byly identifikovány 1 – 2 negativní jevy (úroveň zemědělství zde byla dobrá, ale s určitými viditelnými problémy). V další 591 jednotce bylo zemědělství považováno za problematické (výskyt 3 – 5 diagnostikovaných negativních charakteristik). Poslední skupina, kterou tvořila 451 jednotka, vykazovala 6 a více negativních jevů. Všechna tato území jsou znázorněna na mapě č. 1. V závěru příspěvku jsou uvedeny hlavní změny polského zemědělství v transformačním období.

Key words: *agriculture, problem areas, period of transformation, Poland*

1. Introduction

In most countries, the level of development is varied spatially and problem areas are an inseparable part of their geographical space. Some areas are backward in terms of their development from agricultural point of view.

The concept of so called „problem", „conflict", or „depressed areas" is one of attractive components of methods dealing with the solution of complex issues in spatial planning at a micro-, medium-, and macro-scale. This issue was used in the last spatial development plan of Poland, prepared by the then Ministers Council Planning Commission (Plan, 1988).

There is a relatively lot of works dealing with the topic (Grocholska, 1980, 1990; Zagożdżon, 1988; Kulikowski, 1986, 1992, 1995, 2003; Suchta, 1988; Kurek, 1988; Ciok, 1994, 1996; Bański, 1999, 2000; Bielecka, Ciołkosz, 2003). Based on opinions concerning the problem areas as presented in the above literature there are two basic categories of the problem areas. One of them is represented by backward areas with a relation to other areas located in the similar economic and natural conditions for agriculture. They are often defined as *depressed* or *marginal* areas. The second category of problem areas is characterised by the concentration of many different functions, such as agriculture, forestry, settlement, services, industry, communication and other. Very frequently in this situation, the development of one of these above mentioned functions occurs at the cost of the other. Such areas are called *conflict areas.*

Another interesting study connected with the main topic of this paper was prepared by Bielecka and Ciołkosz (2003). The authors used the statistic data of

[1] Changed and inlarged version of paper published in Polish by GUS [in:] Charakterystyka rolniczej przestrzeni produkcyjnej Polski, Warszawa. 2003, p.179-184.

Agricultural Census from 2002 and parameters of the agricultural area such as altitude above sea level and slopes, whereas the socio-economic parameters such as productivity of agriculture areas and their population, climatic conditions and relief determined so called less-favourable farming areas (LFA).

One of the most comprehensive and relatively actual studies devoted to the problem areas in Polish agriculture is a monograph by Bański (1999) in which 4 types of problem areas are distinguished as follows:

1. Backward areas, characterised by the lowest level of development of agriculture in the country and the area where farms derive their income solely from agriculture.
2. Areas of productive reserves characterised by an inadequate use of the natural and socio-economic potential as compared with the theoretical potential (by Kulikowski, 1986, – defined as "*opportunity areas*").
3. Areas of low standard natural environment for agricultural production, characterised by natural conditions that hinder agriculture (see also: Bielecka, Ciołkosz, 2003).
4. Conflict areas, characterised by an excessive development and concentration of non- agricultural functions competing with the agricultural roles.

2. Procedure of determining the agricultural problem areas

The main aim of this paper is to define and characterise problem areas of agriculture, which are forthcoming most to the first group of the above-mentioned divisions. On the other hand, in the author's opinion such an agricultural problem area is characterized by the lower level of development then other ones located in the similar socio-economic and natural environment, but its proper development is hindered by the accumulation of certain negative phenomena.

The statistic basis used consisted of data from the Agricultural Census 2002 concerning the assessment of natural conditions for agriculture – such as agricultural production space valorisation index divided into four classes (poor, average, good and very good). Another basis of analysis was a very ample set of data concerning the level and the spatial differentiation of social, organizational, technical, production and structural characteristics of agriculture (see: Kulikowski, 2003, p. 9-88).

The analysis of about forty above-mentioned features resulted in the selection of 11 indicator features, which constituted a base to determine the problem areas of agriculture in Poland 2002. The following features were chosen to determine these areas:

1. Low quality of agricultural production space. The percentual share of farmland with the indicator below 0.4 (areas of natural conditions unfavourable for agriculture) was above 50 % of total agricultural area in the investigated units (gminas and towns in urban-rural type of gminas).
2. Very big share of smallest individual holdings (with an average size of 1 – 5 hectares) in total area of agricultural land of the investigated units.
3. High share of individual private farms having their agricultural lands in 10 and more plots (high fragmentation of lands).
4. High share of managers of individual private farms without agricultural education in the total number of individual farm managers.
5. High share of users of individual private farms aged above 65 years in the total number of individual farm users.
6. High share of fallow and other periodically uncultivated land in total area of arable lands in the investigated unit.
7. Low level of agricultural mechanization (above 25 hectares of agricultural land per 1 tractor).
8. Very low number (below 20) of conventional (large) animal units per 100 hectares of agricultural land.
9. High share of rural households (farming on an area above 1 hectare) with an income from pension and retirement pay exceeding 50 % of the total income.
10. High share of fully subsistent farms (without any commercial agricultural production) in the total number of private individual farms.
11. High share of private farms with a very low value of the sales of agricultural products (below 10 thousand zloty during the year) in the total number of private individual farms.

The next stage of the procedure to determine the problem agricultural area was a procedure of the standardization of each of the above described 11 indicators as follows: 1 class – very low share, 2 class – low share, 3 class – average share, 4 class – high share, 5 class – very high share. In case of the above mentioned features 1 to 7 and 9 to 11, the fifth class was taken as that creating the problem areas. Only in the case of the 8th diagnostic feature (number of conventional animal units), the first class was used (the lowest number of livestock conventional units) to determine such areas.

3. Location and description of the problem agricultural areas

It was stated as a result of above proceedings that 803 investigated units (gminas and towns situated in the gminas of rural-urban type) in Poland did not exhibit any of the eleven indicator features. The level of agriculture development in these units was classified as quite satisfactory.

In 1,202 rural gminas and towns located in the rural-urban type of gminas, where 1 – 2 negative indicator features appeared, the level of agriculture development was found as relatively good, but with some emerging, more or less visible problems. In further 591 investigated units, 3 – 5 diagnostic features appeared and agriculture was classified to be problematic. In the last group of 451 investigated units, 6 and more diagnostic features were detected in the highly backward agriculture of these gminas. The highest number of negative diagnostic features (maximum 9) was found only in two gminas.

The areas in which none of the negative diagnostic features exist are mainly: Great Poland, Kujawy, Chełmno-Dobrzyń Land, Lower Vistula Valley, the north-western part of Mazowsze, and some other but rather few gminas situated in upland areas in the southern part of the country. These areas occupy territories characterised by a big share of favourable farming areas, low fragmentation of farms, high level of mechanisation, and big share of farm managers with professional (agricultural) education, big share of private individual farms with the high commercial agricultural production. These areas exhibit close and positive relations between the high level of farmers' training and the high performance of the farms. The areas with none of the 11 negative indicator features are also characterised by a small share of population at an age above 65 among users of private individual farms, low share of fallow and uncultivated land in the total area of arable land. These are also the areas of relatively high use of chemical fertilizers and as compared with other agricultural areas in the country, the areas of high pesticides use, high share of farm animals, high level of land and labour productivity, and a high commercialization of agriculture.

In nearly 1/3 of gminas in Poland, agriculture shows some problem symptoms (one or two negative indicator features). These areas are mainly located in the north-eastern and central-eastern part of the country, in the Opole province, Lower Silesia, and in the southern part of Mazowsze voivodship and also in numerous gminas situated on upland areas in South Poland, Lubush Land (west) and Lakeland Districts of North Poland. Within the negative features one can find there agriculture in gminas with big percentage of fallow and uncultivated lands in the northern and western part of the country, low commercialization and small scale of private individual, semi subsistence farms in the south.

The problem areas of agriculture (3 – 5 negative features) are mainly agricultural areas of numerous gminas occurring in the south-eastern part of the country, in the central and northern parts of the Świętokrzyskie voivodship, some gminas in the Lublin voivodship situated along the eastern border of the country and some borderland areas of Podlasie. The number of gminas with agricultural problem areas is situated in central and West Pomerania, Lubuska Land, some gminas in the Sudeten Mts. and east of Warsaw. Among the adverse features of these agricultural problem areas there are fragmented and small-sized agricultural farms situated in gminas of the south-western part of Poland, the low level of farmers' education, the high share of arable land regularly uncultivated, the low level of commercialization of agriculture and the small number of farm animals per unit agricultural land.

In terms of agriculture, some 450 gminas are known as highly backward areas. Among 11 diagnostic features used for the identification of the problem area, 6 or more of them were found in each of the investigated units. These highly backward agricultural areas were situated in the Western Carpathians and in the belt of gminas stretching from Krakow to Częstochowa through the eastern section of the Silesia voivodship (the Kraków-Częstochowa Upland). The second relatively large area where agriculture had numerous negative characteristic is located at the piedmont of the Carpathians: the third area was found north of the Kielce voivodship (the Holy-Cross Mts.) with some individually occurring also in the Łódź voivodship. Besides, big problems characterized the agriculture of about a dozen of border gminas situated in southern part of Lubuska Land and on the Polish-German border north of Zgorzelec, as well as some gminas in the centre of Mazovia Lowland, in the Lublin voivodship and in the Sudeten Mts.

The high concentration of negative features of agriculture in the above mentioned areas was influenced among other things by the following factors: low quality of agricultural production space, excessively fragmented and small sized individual agricultural farms, low level of professional education of farmers measured by the low share of farm managers with post-primary school education in total number of farm managers, unfavourable age structure of individual farm users and very high share of fallow and uncultivated land, often exceeding 40 percent of the total area of arable land. These are also areas characterised by a very low level of animal breeding (below 20 of conventional animal units per 100 ha of agricultural land). These are areas where the deterioration of macroeconomic conditions for agriculture during the transformation period resulted in most of small agricultural holdings to close down their cattle and pig breeding operations.

4. Conclusions and major changes of Polish agriculture

The spatial distribution of agricultural problem areas corresponds to a high extent with the distribution of gminas, characterised by very high shares of rural

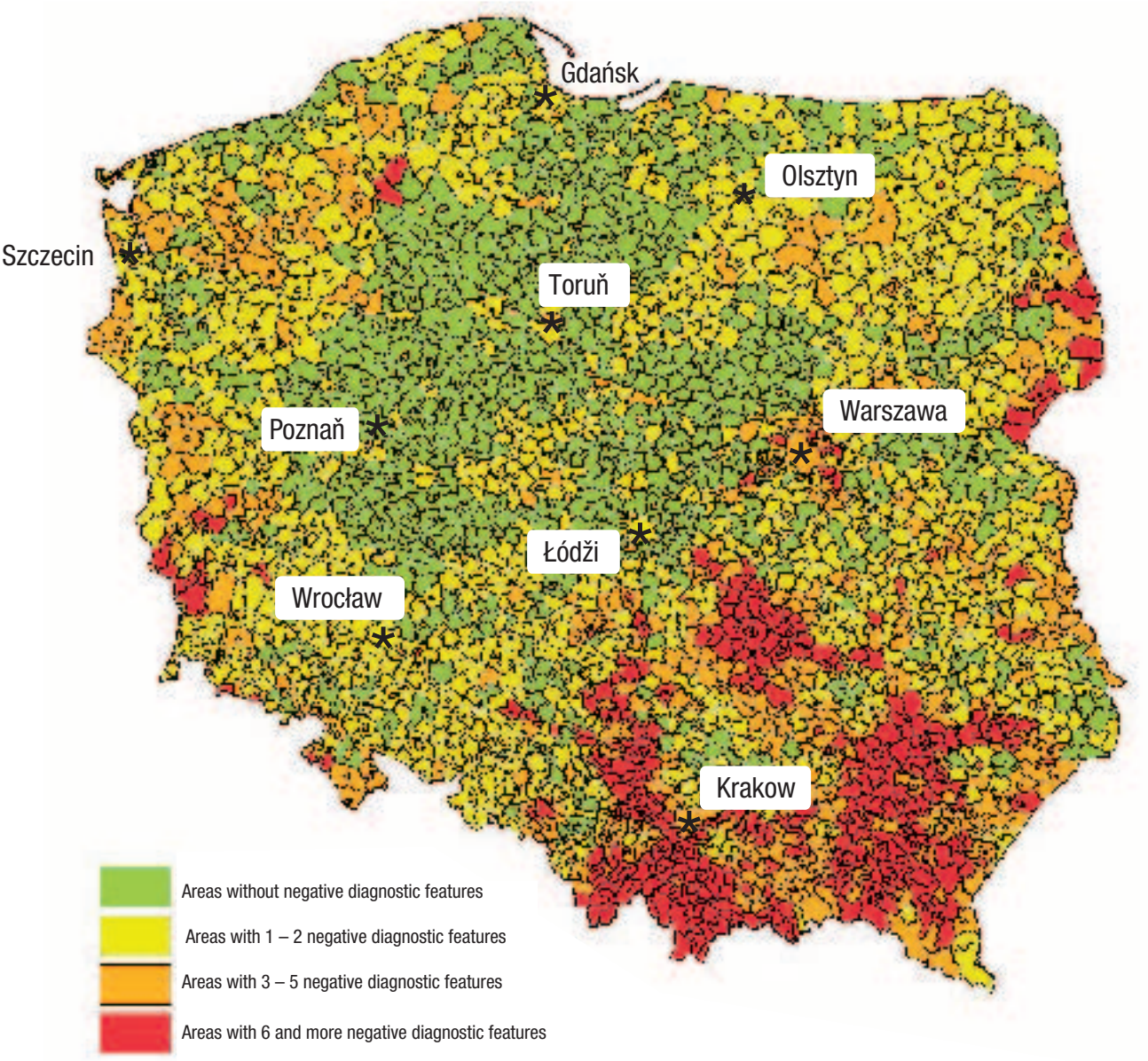

Fig. 1: Agricultural problem areas in Poland in 2002

households whose major income (above 50 percent) is represented by pensions and retirement pays. These areas cover especially the biggest concentration of problematic and highly problematic agricultural areas in South-Eastern Poland, characterised by a large share of farm owners aged above 65 and by a high share of farms in which the commercial agricultural production is less then 10 thousand zloty (about 2300 euro) per annum.

The spatial distribution across the country of above described problem areas and less-favourable areas (LFA) elaborated by Bielecka and Ciołkosz is very similar. The highly backward and backward agricultural problem areas and less-favourable areas (LFA) for agriculture are situated in the Carpathians, Sudeten Mts. and the Holy-Cross Mts. (extremely unfavourable conditions) and in very numerous investigated units located in Eastern Poland, as well as in some voivodships situated in Northern and Western Poland (unfavourable).

The conducted analyses of spatial distribution of about 40 of important characteristics of agriculture showed their crucial changes, especially in the period of transformation. Unfortunately, a part of these changes influenced the extensive agricultural land use and agricultural production and was forced, next to deterioration of economic condition for agriculture, also by external condition, including difficulties with exports of agricultural produce to Eastern European countries and a severe competition of western food products on the Polish market whose production and exports are highly subsided.

Progressing extensification of Polish agriculture after 1990 can be demonstrated by the following facts:

1 Very big decrease of agricultural land – from 18,720 thousand ha in 1990 to 16,899 thousand ha in 2002.
2. Decrease of arable land in the same period from 14,878 thousand ha to 13,038 thousand ha.
3. Sown area decreased from 14,242 thousand ha in 1990 to 10,764 thousand ha in 2002. Only in 1996 – 2002 the sown area decreased almost by about 12.5 % .
4. Increasing share of cereals in total sown area was observed – from 59.9 % in 1990 to 77.1 % in 2002, caused by the shrinkage of cultivated area of other plants. There was a high decrease in the share of root plants in sown area (potatoes from 1,835 thousand hectares in 1990 to 803 thousand hectares in 2002 and sugar beets from 440 thousand hectares to 303 thousand hectares at the same time).
5. There was a sharp increase of fallow lands and uncultivated lands from 162.9 thousand ha in 1990 (1.1 % of total arable land) to 2,300 thousand ha in 2002 (17.6 percent of arable land). There are various reasons for the increase of periodically non-cultivated land area. They are connected with the deterioration of macroeconomic conditions of agricultural production in the period of transformation. In the vicinity of large agglomerations the reasons of excluding lands from agriculture are different and they usually depend on a wish to replace the function of agriculture with a different function.
6. Decrease of financial expenditures for fertilizers and pesticides. There was a decline in using chemical fertilizers from 164 kg/1 ha of agricultural land in 1989/1990 to 93 kg/1 ha in 2001/2002.
7. Decrease of animal breeding. The number of cattle heads in Poland decreased from 10,049 thousand in 1990 to 5,533 thousand in 2002 and sheep from 4,158 thousand heads in 1990 to 345 thousand in 2002.
8. Gross agricultural production in 1990-2002 declined by 12.3 percent.

The recent Polish membership in the European Union gives some hopes for the future, connected mainly with direct payments to farmers and possibilities to use other funds (structural and regional) for the development of infrastructure in rural areas. On the other hand, the closer connection of Poland with the highly developed economy of West European countries will result in an inflow of modern technologies to our economy - also to agriculture.

There are some first advantageous events connected with the Polish membership in the European Union resulting in the growth of farmers‘ income and in the increased exports of food and agriculture products from Poland to West European Countries.

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THE CATASTROPHIC FLOOD IN FEBRUARY/MARCH 1784 – A NATURAL DISASTER OF EUROPEAN SCOPE

Jan MUNZAR, Libor ELLEDER, Mathias DEUTSCH

Abstract

The flood in the late winter of 1783/84 is one of the most important extreme examples of its kind, not only for the territory of the Czech Republic, but also in a number of European countries. Spanning over a vast expanse, this natural disaster has earned a privileged position in the history of European floods. Not only did it hit the Vltava (Moldau) and Labe (Elbe) river basins, but also the Rhine, Danube and part of the Oder (Lusatian Nisa) river basins. In western Europe, at the same time, the waters of the rivers Seine, Loire and Maas rose high above their banks.

The winter preceding this catastrophic flood was extremely snowy, severe and long. Around 23 February 1784, there was a sudden outbreak of warm air in western Europe, which caused rapid thawing of the snow and later also of the ice. The heavy rainfall that followed the thaw was a crucial factor in the onset of the floods. On 27 and 28 February, the ice cover on most of the rivers broke, almost simultaneously for both the main and secondary rivers. In most cases, the high-flood-water wave was the highest on 28 and 29 February or 1 March 1784 (Tab. 1). Apart from the vast territory that was flooded, the "flood phenomenon of 1784" was due to its extraordinary dynamics and record-high culminations. For instance, the water level of the river Vltava in Prague rose by ca 4 m within a mere 12 hours. This record was not broken even during the rain flood of August 2002, which shifted the long-term record-high culmination flow rate of the winter 1784 flood to a second place rank. For the Mosela R. in Trier and the Rhine in Cologne a/R., however, the 1784 flood has remained at the top of the list up to the present.

The extent of the damage, including casualties, shows the great danger of the extraordinary dynamics of mixed-type floods, including the 1784 flood. On that score, studies of similar extreme situations are of crucial importance for advance warning systems and for flood protection in general.

Shrnutí

Katastrofální povodeň v únoru/březnu 1784 – přírodní pohroma evropského rozsahu

Povodeň koncem zimy 1783/84 patří nejen na území České republiky, nýbrž i v celé řadě států Evropy k nejvýznamnějším extrémům svého druhu. Její územní rozsah zajistil této katastrofě výsadní místo v historii evropských povodní. Zasaženo bylo nejen povodí Vltavy a Labe, nýbrž také povodí Rýna, Dunaje a částečně i Odry (Lužická Nisa). V západní Evropě byly současně silně rozvodněny řeky Seina, Loira a Meusa (Maas).

Zima, která tuto katastrofální povodeň předcházela, byla neobyčejně sněžná, tuhá a dlouhá. Kolem 23. února 1784 došlo v západní Evropě k náhlému vpádu teplého vzduchu, který vedl k rychlému tání sněhu a později i ledu. Rozhodujícím momentem pro vznik povodní byly následné silné deště. Na většině řek došlo k rozlámání ledové pokrývky ve dnech 27. a 28. února, a to na hlavních a vedlejších tocích téměř současně. Maximální povodňová vlna se vyskytla většinou ve dnech 28. a 29. února, popř. 1. března (Tab.1). Kromě mimořádného regionálního rozsahu vytvořily „fenomén povodně 1784" také její mimořádná dynamika a rekordní kulminační stavy. Např. na Vltavě v Praze stoupla hladina řeky během pouhých 12 hodin o cca 4 metry. Tento dlouholetý rekord nebyl překonán ani za dešťové povodně v srpnu 2002, která dosavadní extrémní průtok zimní povodně 1784 odsunula na druhé místo. Ale např. na Mosele v Trevíru a na Rýně v Kolíně nad Rýnem si povodeň 1784 své prvenství udržela dodnes.

Nebezpečnost mimořádné dynamiky povodní smíšeného typu, kam patří i případ z roku 1784, dokazují způsobené velké škody včetně ztrát na životech. Studium podobných extrémů má proto zásadní význam pro varovnou povodňovou službu i protipovodňovou ochranu vůbec.

Key words: *winter flood 1784, Central and West Europe, documentation and impacts*

1. Introduction

When frogmen fished out a torso of an angel from the river Vltava (Moldau) near Charles Bridge in Prague at the end of the 2003/04 winter, it was more than symbolic. The torso was the missing part of the sculpture of St. Wenceslas lying in the water for 220 years, since the

catastrophic floods that had damaged the bridge in late February 1784. The extent and parameters of this flood has it as one of the most important natural disasters documented in the written history of Europe. Until August 2002 the flood had been an extreme disaster unequalled in terms of its culmination flow on the river Vltava in Prague for more than two centuries. It has similar importance also for Germany, particularly the Rhine river basin. The regional extent of this event, which occurred after an abnormally cold and snowy winter of 1783/84, was indeed unprecedented and in this light definitely outdid the floods of 2002. Also the amount and destructive force of the ice blocks, which the flood set in motion, was much more serious and presented a greater danger for the towns and villages and those who were afflicted. As this extreme event of late February 1784 has remained to be the greatest winter flood from the 18th century to the present, we availed of last year's 220th anniversary to remind of this extraordinary event, to give a detailed reconstruction of its course and to focus on the Bohemian part of the rive Elbe, especially the Vltava Basin (Elleder – Munzar, 2004). In the present article we shall attempt to integrate this catastrophic flood into the European context.

2. Hydro-meteorological conditions

2.1 Winter of 1783/84

The floods of late February 1784 were preceded by a very hard and snowy winter. On the list of the hardest winters in Central Europe based on monitoring air temperatures in Prague-Klementinum since 1775, this period still holds two "second places of honour": in the number of icy days and number of negative daily average temperatures. From November 1783 to March 1784 (incl.) 73 icy days were monitored in Prague, when only the 1829/30 winter, from many aspects the bitterest of all winters in the Czech lands, it was three days more (in 1928/29, "the bitterest winter of the 20th century", it was "only" 62 days). In the 1783/84 winter 93 days of negative daily air temperatures were monitored and for a long time came second; the bitterest winter of 1829/30 had only two icy days more (Kakos – Munzar, 2000).

In Prague the first frosts were monitored on 8 November; the chronicle from Městec Králové in central Bohemia states that in 1783 it began to freeze immediately after St. Martin's Day (11 November). Ice on the river Vltava near Mělník must have been 60 – l20 cm thick because carts with heavy loads passed over it (they also passed over the frozen Rhine). A source from Halle/Saale reported that frosts came on 14 November 1783 and stopped on 23 February 1784. The river Saale near Halle was covered with ice for a long time (20 weeks). Due to severe frost the river Elbe in Dresden was frozen from 29 December 1783 until almost the end of February 1784 and the ice was more than 110 cm thick. Also the Danube iced up in late December 1783 and soon the ice cover was 100 – 120 cm thick. Even in England frosts were monitored from the end of December 1783 continuously until the end of February 1784 and for a short time the river Thames was completely frozen over.

Concerning snow, chronicles reported that most of the Czech lands were covered with snow, the snow cover in the lowlands being ca 60 to 120 cm deep. In Germany, for instance in Mannheim, snowing was monitored 29 times from 24 December 1783 to 21 February 1784, in some cases it snowed all day long. On 27 and 28 December snowfall was ca 45 cm in the area of the Rhine-Neckar and on 28 December the snow cover was 4 feet 9 inches deep (ca 1.5 m). In the neighbourhood of Würzburg the chronicle said that the snow was 6 feet deep (ca 180 cm). That winter a number of other European countries reported abnormal amounts of snow. On 24 February 1784 the Hamburg newspaper reported that information on the unusually frequent snowing and amount of snow that had fallen at the end of the past month (i.e. January) all over Germany, France, Italy, England, Holland and in all other countries was nothing short of credibility. On 30 January many villages in England were so snowed up that it was extremely difficult for the inhabitants to go out and move about (Glaser, 2001). A report from Norfolk informed that in early February 1784 the snow reached up to the horses' shoulders, a snow cover of more than 1 metre.

2.2 Weather at the end of February 1784

The chronicler F. Vavák described the weather in central Bohemia in the Elbe Basin as follows: "Winter with snow and frost held up until 24 February… On the day of St. Matthias (24 February) and on Ash Wednesday (25 February) dampness set in, thereupon on Thursday on the 26th in the afternoon until evening in rained in plenty and also the whole night to Friday and in a while water rushed in full speed from all parts flooding meadows, fields, villages… On Friday (27 February) in the morning the flower beds appeared above the snow and all the snow was turned into water, at least one cubit of it (ca 60 cm)."

If we trace the weather according to observations of the meteorological station in Prague-Klementinum (Fig. 1), we get a similar picture (Strnad, 1786). On 23 February around noon it warmed up to more than 0 ^{0}C. On the following days the average daily temperatures ranged within 3 – 6 ^{0}C, it was overcast with a relatively strong, mostly southwest wind. On 26 February it rained ca 40 mm (converted from the original tables) representing a hitherto unbroken February record for this station. It is more than likely that even heavier rainfall was recorded in Bohemia outside of Prague. Heavy rain with

Place	River	Break of ice Date/time	Water-level rise	Maximum		
				Date/time	water level	Q /$m^3.s^{-1}$/
Prague	Vltava (Moldau)	27.2./ 8 a.m.	27. 2/ 11 p.m.– 28.2./10 a.m.	28.2./10 a.m. – 4 p.m.	575 cm water-gauge by Charlesbridge	ca 4580
Děčín	Labe (Elbe)	?	?	29.2.	893 cm above zero of water-gauge	ca 4800
Dresden	Elbe	28. 2./ 9 p.m.	28.2./ 9 p.m. – 29.2./ 7 a.m.	1.3./ 2 – 6 a.m.	857 cm water-gauge "Augustbridge"	ca 5200
Wittenberg	Elbe	2. 3./ 9 a.m.	2.– 3.3. up to 3 a.m.	3.3./ 3 a.m.	1 ell 17 inches by "Elbetor" gate	?
Erfurt	Gera	27. 2.	27.– 28.2.	?	?	?
Oldisleben	Unstrut	?	?	27.2.	73 cm over the street	?
Halle	Saale	29. 2.	29. 2.–1.3.	1.3.	8 ell	?
Magdeburg	Elbe	25. 2.	4.3.	8.3.	534 cm (?)	?
Heidelberg	Neckar	22. 2.	26.– 27.2.	27. 2./ 3 p.m.	812 cm	?
Nuremburg	Pegnitz	?	27. 2. night	28. 2./ 10 a.m.	12 foot 12 inches over ground in "Neugasse" street	?
Würzburg	Main	?	?	29. 2.	928 cm	ca 2600
Trier	Mosele	?	?	28. 2.	29 foot 2.5 inches *	?
Koblenz	Rhine	22. 2?	27. 2. – 28. 2. afternoon	29. 3. morning	?	?
Cologne	Rhine	26. 2. afternoon	?	28. 2.	1360 cm water-gauge *	?
Venlo	Maas	22. 2. ?	24. 2 – 25. 2. morning	25. 2. – 2. 3.	38 foot 3 inches	?
Paris	Seine	20. 2.	23. – 24. 2.	3. – 4.3.	666 cm, water-gauge, "Pont de la Tournelle"	?
Dillingen	Danube	?	?	27. 2.	6 foot by "Donautor" gate	?
Regensburg	Danube	28. 2. morning	28. 2. – 29. 2.	29. 2. evening	To top of 1st arch of bridge	?
Linz	Danube	28. 2.	?	28. 2.	458 cm	?

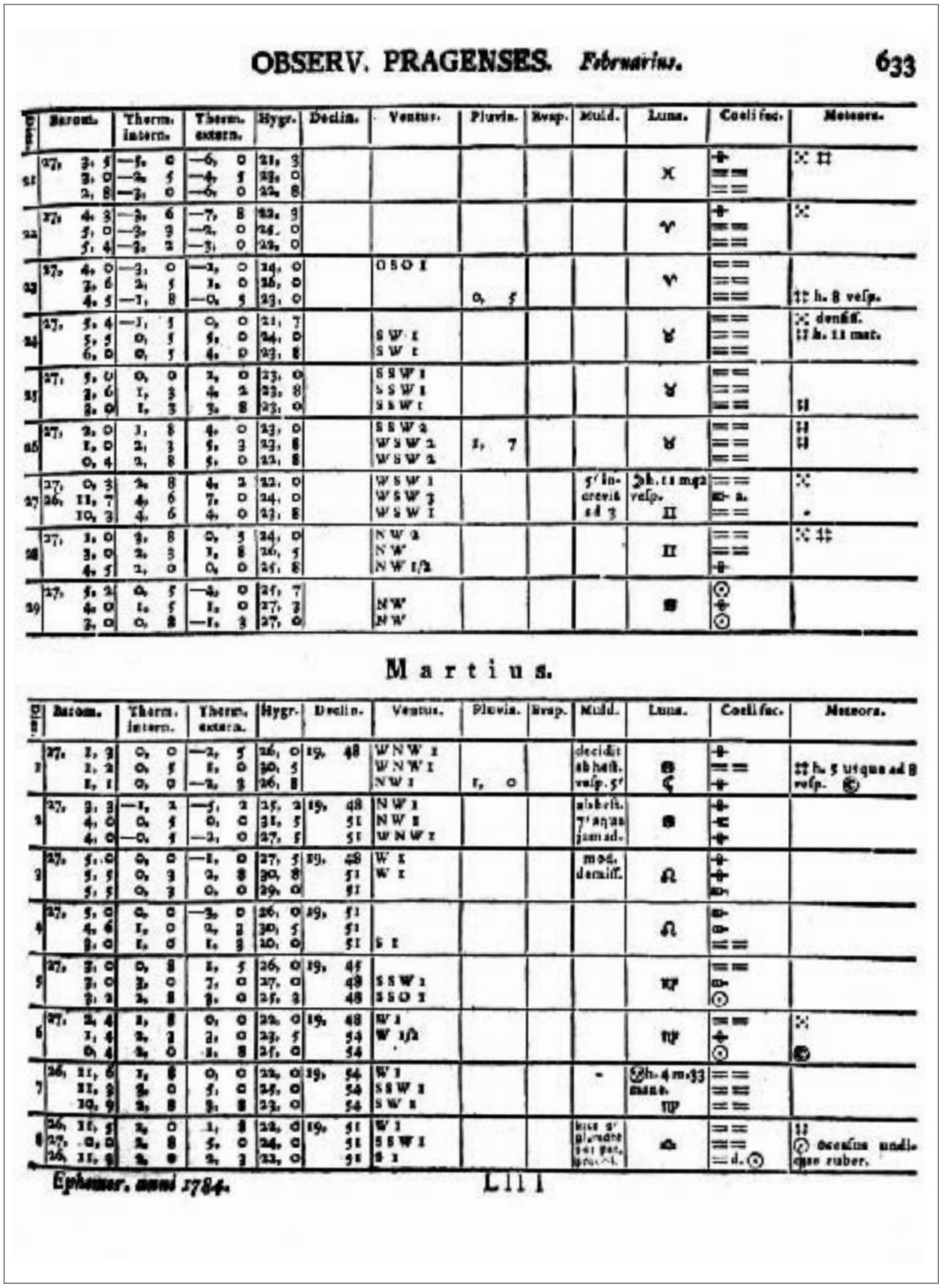
Tab. 1: The basic time data of the flood at the end of February and the beginning of March 1784 on selected European rivers as one of the main results of this paper.

** highest known level*

a strong, mostly southwest wind and maximal daily temperatures of 5.2 to 6.6 ^{0}C, on 27 February nearly 9 ^{0}C, very quickly "disposed of" the hitherto ample snow cover (Kakos, 1977).

The chronicle of the small township Langensalza in western Thuringia near the river Unstrut also recorded that thawing began on 23 February and that it rained on 24 and 25 February 1784 (HHOWAD). Using the Mannheim Ephemerids, at a regional level it was summed up that 21 February was the first day with no frost in Brussels and Marseille; in Düsseldorf, Würzburg and Munich 22 February; in Mannheim and Erfurt 23 February; in Prague 24 ^{0}C February and in Regensburg and Berlin 25 February (Fricke, 1988).

R.Glaser and H.Hagedorn (1990) gave a detailed elaboration of the meteorological causes and courses of the catastrophic flood in the Main Basin, which are common also for other countries of Central Europe.



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Dieb.	Barom.	Therm. intern.	Therm. extern.	Hygr.	Declin.	Ventus.	Pluvia.	Nivp.	Mutd.	Luna.	Coeli fac.	Meteora.
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22	27, 4, 3 5, 0 5, 4	—3, 6 —2, 3 —3, 2	—7, 8 —2, 0 —3, 0	22, 3 24, 0 23, 0						♈	☉ ☁ ☁	☓
23	27, 4, 0 3, 6 4, 5	—3, 0 2, 5 —1, 8	—2, 0 1, 0 —0, 5	24, 0 26, 0 23, 0		O S O 1	0, 5			♈	☁ ☁ ☁	♯ h. 8 vesp.
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28	27, 1, 0 2, 0 4, 5	3, 8 2, 3 2, 0	0, 5 1, 8 0, 0	24, 0 26, 5 26, 8		N W 2 N W N W 1/2				II	☁ ☁ ☉	☓ ♯
29	27, 5, 2 4, 0 3, 0	0, 5 1, 0 0, 8	—2, 0 1, 5 —1, 3	25, 7 27, 3 27, 0		N W N W				♋	☉ ☉ ☉	

Martius.

Dieb.	Barom.	Therm. intern.	Therm. extern.	Hygr.	Declin.	Ventus.	Pluvia.	Nivp.	Mutd.	Luna.	Coeli fac.	Meteora.
1	27, 2, 3 2, 2 2, 1	0, 0 0, 5 0, 0	—2, 5 1, 0 —2, 3	26, 0 30, 5 26, 8	19, 48	W N W 1 W N W 1 N W 1	1, 0		decidit ab heft. vesp. 5'	♋ ♌	☁ ☁ ☁	♯ h. 5 utque ad 8 vesp. ☾
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8	26, 11, 5 27, 0, 0 26, 11, 3	2, 0 2, 8 2, 0	1, 8 5, 0 2, 3	22, 0 24, 0 22, 0	19, 51 51 51	W 1 S S W 1 S 1			hinc s' glaciatio per pat. [illegible]	♎	☁ ☁ ☁ d. ☉	♯ ☉ occaſus undique ruber.

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Fig. 1: Weather in Prague at the end of February / beginning of March 1784 according to observations made by A. Strnad, published in Mannheim Ephemerids (Strnad, 1786).

Reasons, which caused the extremely heavy floods, were the following:

a) Great amounts of snow in low and medium altitudes; a large part of the snow cover was apparently old and compact with a high water value and only part was relatively fresh snow.
b) Deeply frozen soil due to several months of frosts.
c) Very thick ice on all rivers, which caused ice blocking during the floods.

It is very likely that the immediate cause of floods in Central Europe was with great probability the passing of frontal systems from the west after 23 February with extremely heavy precipitation, strong southwest wind and relatively quick warming.

3. Flood in the Vltava (Moldau) River Basin

The sudden rising of water from the upper part of the Vltava Basin (Fig. 2) was corroborated in a report saying that on 27 February the river Otava gradually destroyed stone bridges in Strakonice and Písek (the highest recorded level was 469 cm above normal). On 27 and 28 February the water flowed in all the streets of České Budějovice, partly flooding the square.

In Plzeň (Pilsen) the flood on the river Radbuza came without warning between 8 and 9 a.m. on 27 February. The speed and dynamics of the advancing flood with floating ice was illustrated in a report, which said: "people standing only 100 steps from the ramparts had no time to reach the town gate" and by the fact that the water tore down all the bridges. At the same time also the river Litavka in Beroun rose up over its edges. Here the water of the river Berounka began to rise as suddenly as in Pilsen, after midnight from 27 to 28 February.

At about 10 a.m. half of the square was under water, in the afternoon all of it was flooded. The estimate of the culmination flow on 28 February at 3 p.m. was 2300 $m^3.s^{-1}$. (The flood marks partly preserved in Beroun show that the culmination level of "7 cubits and 3 inches", i.e. 428 cm above the "ordinary level", was comparable or slightly higher that during the floods in August 2002.)

In Prague the ice block was broken at about 8 a.m. on 27 February and then the ice receded relatively smoothly „until late at night" (Fig. 3). In the evening the water temporarily receded by ca 15 cm, but then at about 11 p.m. rapidly rose. At 2 a.m. on 28 February the water flooded the houses near the river and at 4 a.m. the streets of the Old Town quarter, the water level approximately reaching the level of the 100-year discharge (Q100). The rise of the water began to slow down later. The Stone Bridge (today's Charles Bridge) was damaged at 6 a.m. when one pier was undermined and the guardhouse with five soldiers collapsed into the water; four soldiers perished. Apart from Pötzsch (1784) recently also Glaser (2001) observed the course of the flood and the damage it caused in Prague and in Bohemia.

The reports on the time of the culmination of Vltava in Prague to a certain extent vary. According to Pötzsch (1784) culmination reached its peak on 28 February at 10 a.m., other sources say it was at 4 p.m. (the river Vltava in Prague culminated sooner, or at the same time, as the Berounka in Beroun and 24 hours later than in Pilsen). The water was said to rise 9 cubits (540 cm) over its edges. By and large this datum is in keeping with the monitored 5.75 m in the profile near the Křižovnický Monastery (Fig.4).

Schaller (1785) reported that between 11 p.m. of 27 February and 1.30 p.m. the following day the water of

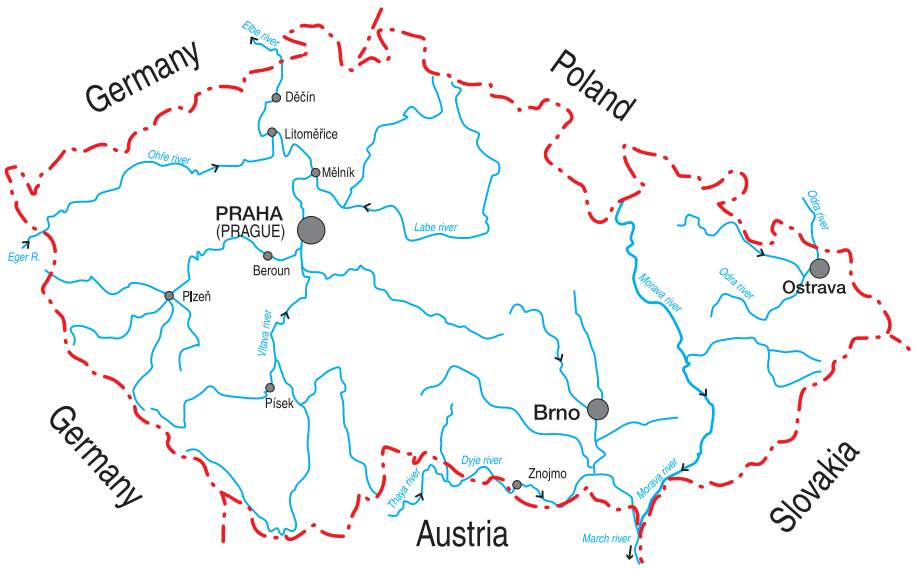

Fig. 2: Map of the Czech Republic with main water courses and localities mentioned in the text.

Fig. 3: Ice during the high water in Prague from 27 – 28 February 1784; A downstream view of the Charles' Bridge from the south. Copper-engraving by F. Erban , original size 16.5 x 35 cm (Museum of the Capital of Prague).

the river Vltava in Prague rose by "half a cubit" (30 cm) per hour, and this would mean a rise of 4.20 to 4.40 m. There is no reason to reject this exact observation, which is evidently realistic; it is, however, an unheard off speed in this profile. The amount of reports about the unusual dynamics and abrupt rising of the water level in Pilsen, Litoměřice and elsewhere support the credibility of this information. Comparison with the flood in 2002 is very difficult because it was monitored in a different profile where the rising speed was not more than 15 – 25 cm per hour, that is less than in February 1784.

The estimated culmination of the flow rate of Vltava in Prague during the 1784 flood was 4,580 $m^3.s^{-1}$ and was not exceeded for more than two centuries. It was not until the flood of August 2002 that the discharge was estimated as 5,160 $m^3.s^{-1}$, a new record. The case of 1784 is now second, all the same it remains to be a first

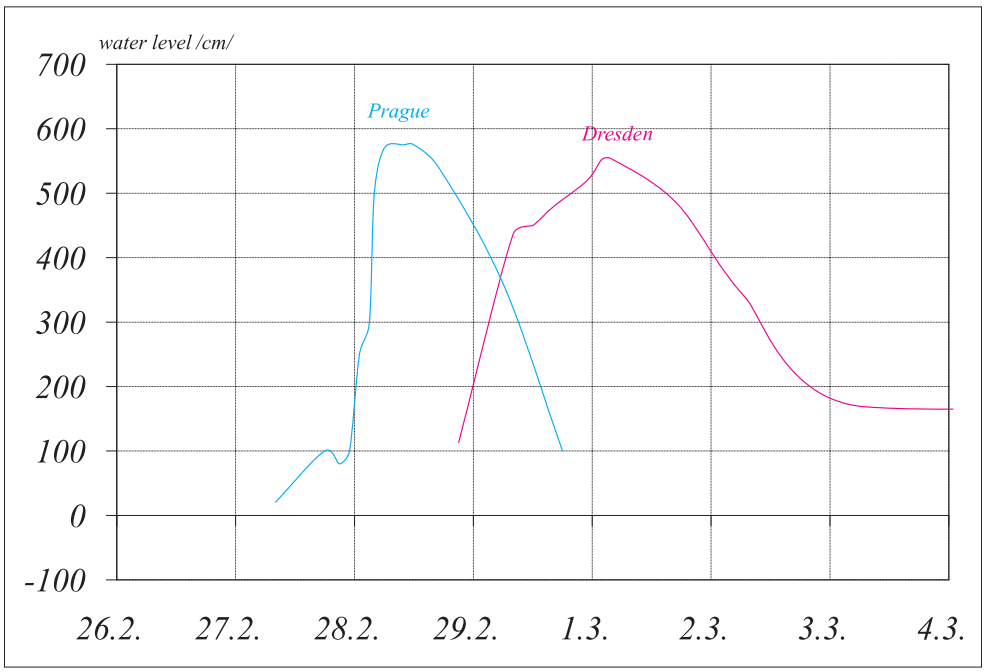

Fig. 4: Reconstruction of the 1784 flood course in Prague and in Dresden (old water gauge).

winter flood till now. (A clear comparison of flood-mark 1784 with other later cases see Figs. 5 and 6).

Flooded was particularly the Old Town of Prague, the Jewish Town, part of the Lesser Town and the entire Kampa Island where the high-water mark on the house "Picture of Our Lady" near Charles Bridge shows the water level. Fig. 7 shows the correlation between floods of February 1784 and of August 2002 too. It is amazing how the span of the flood corresponds with the disaster area of the case of late March 1845.

Of material damage it was namely Charles Bridge (the 6th pillar was undermined, 5 pillars and 3 vaults were damaged), weirs and mills disabling normal functioning of the town after the flood. There was a threat of impending humanitarian disaster because the bakeries of the Old Town were inactive and on top of that the population suffered from lack of firewood, which had been washed away. On 29 February when the Vltava water level declined, a crack on one of the pillars caused a sculpture of an angel on the left side of the statue of St. Wenceslas to fall into the water and there was danger of collapse not only of this sculpture but also of the figure of St. John on the opposite side (In February 2004 the statue of the angel was found in the river during static prospecting and was taken out after more than two centuries).

Demolition of the so-called Novomlýnský Weir and the following very dry summer with a low water level of the river Vltava allowed the repair of the only bridge in Prague (Fig. 8).

Salzer's documentation engraving with text shows that on one of the vaults there are two forgotten data on the water levels: "normal" = 4 cubits (less than 120 cm) above the river bed and the highest water level on 28 February 1784 = 26 cubits, i.e. almost 770 cm (Fig. 9).

Below Prague in Nelahozeves the water level was 5 cubits (3 m) higher than now; personal observers said it was the highest flood of 1771 (the difference in Prague was 1.6 m). A bridge was torn down in Veltrusy, the water flowed out of its previous bed and completely

Fig. 5: Unique documentation of culminating flood on the left Vltava (Moldau) River embankment in Prague on 14 August 2002 after the noon. (Photo: D. Karfík)

Fig. 6: Comparison of the Vltava (Moldau) R. culmination in August 2002 (Fig. 5) with floods in 1784, 1845, 1862, 1876 and 1872 (Photo: D. Karfík). With respect to the fact that the quay wall was under construction in 1870 – 1877, the extreme of September 1890 – the last high water before the case of 2002 – is not included.

destroyed the castle park. The chronicler from Ouholice recorded that "…the water began to swell so strongly that on 27 February it broke ice one cubit thick and on 28 February this ice raised the water so much that no personal observer lived to see such high water. This water rose half a cubit in my yard…".

4. Floods on the Bohemian part of the river Elbe

Reports from the Labe (Elbe) R. above its confluence with the Vltava R. are rather obscure, or contradictory. In his memoirs F. J. Vavák (1741 – 1816) from the central Elbe Basin described the situation in Prague at length and wrote "nothing worth remembering happened on the Elbe, although the water was also very high". The report of Ch. G. Pötzsch (1784) about the breaking of ice on the Elbe near Mělník on 28 February is evidently more credible: "In the neighbourhood of the town of Mělník where the high water of Vltava gushed into the Elbe and the (floating) ice broke the ice blocks on the Elbe, the ravage was just as stunning". On 29 February south of the confluence Elbe flooded the Úpor and Semilkovice farmsteads. Water rose 4 m and with the blocks of ice it rose even more. The Elbe burst and made a new river bed through the middle of the village Semilkovice; the gushing water with ice swept through the village and flooded it – nothing could be saved. The flood completely obliterated the old village of Semilkovice, which ceased to exist. Only a small chapel remained on the banks of the old arm of the river Elbe as a reminder of the tragic event.

Above Mělník the water passage of the Elbe in 1784 probably did not exceed the flood of 1845 when the peak discharge was 1,560 $m^3.s^{-1}$ (for this section this value can be taken as the upper limit for high water).

Records from Cheb, Karlovy Vary and other towns tell about the swelling of the river Eger (Ohře R.), the left tributary of Elbe near Litoměřice, on 27 and 28 February. For instance in Libochovice the bridge was destroyed and the water was 16 feet (470 cm) high.

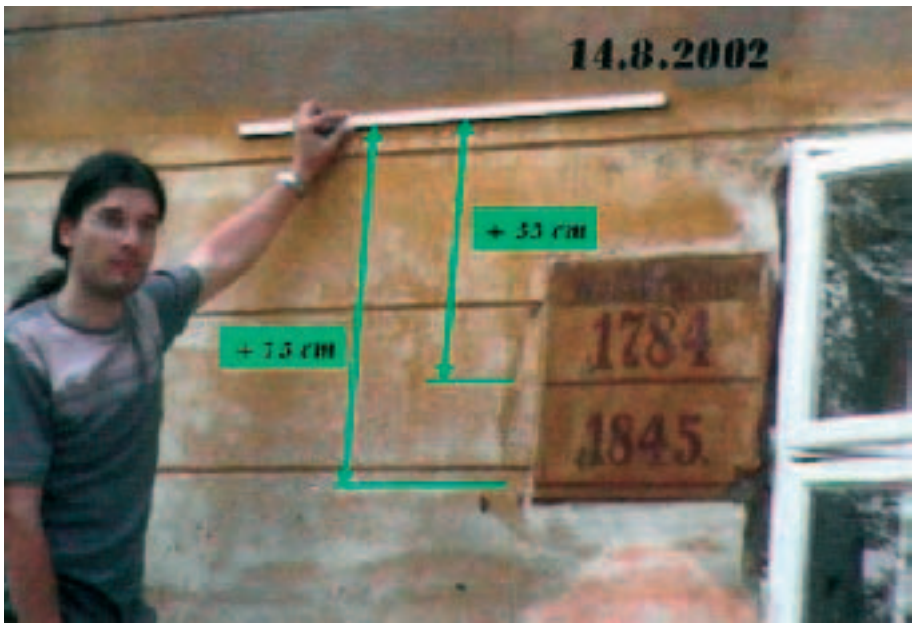

Fig. 7: Comparison of the Vltava (Moldau) R. water level in Prague reached on a Lesser Town house at the Charles' Bridge during the case in August 2002 with water marks of historical floods in 1784 and 1845 (Photo: J. Kubát).

In Litoměřice the ice cover broke on 28 February at 6 a.m. and at 1 a.m. the following day the water level rose without warning, 26 hours later than in the Vltava in Prague. The highest level was 3 fathoms and 2 feet. The bridge and 57 houses were seriously damaged and the mills were destroyed. Several hundred people were rescued in large boats.

In Děčín it was not far from the "Elbe R. flowing around the whole town". The height of the flood mark of 1784 on the castle rock corresponds almost precisely – only 2 cm difference – to the 1862 flood and discharge of 4,820 $m^3.s^{-1}$. We can thus estimate that the 1784 water discharge was ca 4,800 $m^3.s^{-1}$ (i.e. only 400 $m^3.s^{-1}$ less than in Dresden).

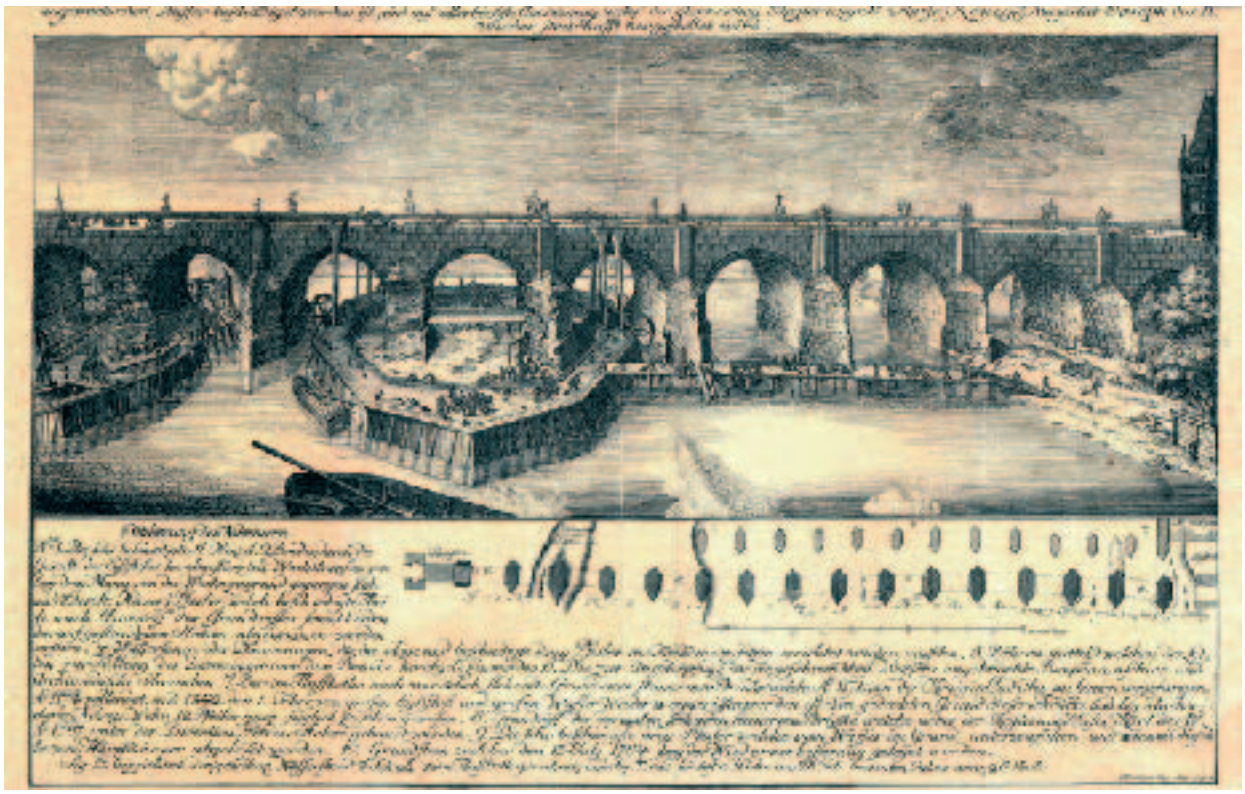

Fig. 8: Repair of the Charles' Bridge in Prague after the flood of 1784. Copper engraving by K. Salzer, original size 28.5 x 45.5 cm (Museum of the Capital of Prague).

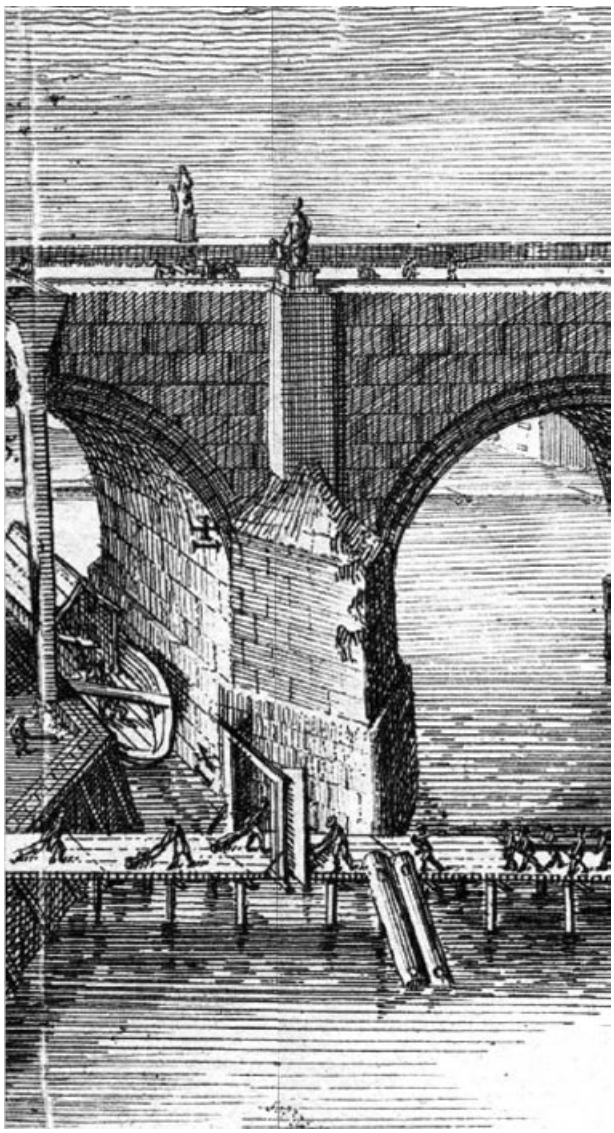

Fig. 9: An enlarged detail from the engraving by K. Salzer with marks for "normal water" 4 foot in the 1780s (x) and for water level 26 foot during the flood in 1784 (+).

In addition to heavy material damage, in Bohemia the flood of late February 1784 took a heavy toll of lives. It is difficult to estimate the exact number after such a long period of time but it is no exaggeration to say that there were dozens of victims (e.g. in Pilsen at least 13 – 14 victims); considerably more than in August 2002 when "only" 17 people perished during the flood in Bohemia.

5. Flood on the river Elbe in Saxony

The flood on the Bohemian-Saxon border came without warning as it did in Bohemia. In the night of 29 February to 1 March the houses in Bad Schandau were flooded up to the roofs and the church up to the altar. From here up to Pirna in some places the water was 20 to 25 cubits high, i.e. 12 – 15 m. In Pirna the ice broke "with horrendous cracking sounds" on 28 February in the morning and the water with ice floes caused very high floods of the suburbs and much damage.

In Dresden the ice broke on 28 February 1784 at 9 p.m. followed by a rapid rise of the water, the same as the Vltava in Prague. Fügner (1987) specified that the rate of the flow according to the data of Pötzsch was 32 cm per hour. During 11 hours the water rose by 3.47 m with the highest level on 1 March between 2 and 6 a.m. The high-flood-water wave in Dresden increased as rapidly as in Prague; in both cases 26 to 32 hours elapsed between the breaking of ice to culmination, but in Dresden the water rose immediately after the breaking of ice and lasted ca 12 hours, until 8 a.m. the following day when the water level was 7 cubits and 18 inches high. This was apparently the end of the most rapid rise, which then slowed down and did not culminate until the early morning of 1 March (Fig.4). The maximal water level was 9 cubits and 20 inches according to the old water level gauge, i.e. 8.57 m according to the present gauge. The corresponding discharge was estimated by Fügner as 5,200 $m^3.s^{-1}$.

The ice pack, caused not only by ice as such but also by some 40 ships, endangered the bridge in Dresden, which was damaged but survived. The daylong frost, which again set in as early as 1 March 1784 in Dresden and Prague, obviously contributed to a quicker receding of the water levels. By the evening of 2 March the water subsided by 2.7 m more.

In his remarkable monograph on the floods of the river Elbe, which appeared in 1784, in the same year as the disastrous winter floods, Ch. G. Pötzsch (1732 – 1805) a hydro-meteorologist from Dresden, published a schematic bar chart with baroque decorations as a supplement, which we have reprinted (Fig. 10 – see cover p. 4). It characterises the culminations of the floods on the river Elbe in 1501 until 1784, the last year specified in detail in eleven columns, and shows that as late as 28 February at about 5 p.m. – i.e. ca 4 hours before the ice broke – the water level in the river Elbe in Dresden had not reached the level of 2 Dresden cubits (old gauge). The chart documents that only one flood, comparable to the 1784 flood, occurred practically four centuries before, on 16 to 18 August 1501 (However this datum and information is from Meissen. According to records from Dresden only the winter flood of 6 and 7 February 1655 drew near to "our" extreme situation, when the water rose to 10 1/2, while in Meissen to 12 Dresden cubits.)

Shortly after the flood, J. F. Ursinus, a priest in Boritz, published a special print in Dresden called "A sermon after the appalling motion of ice with the flood we suffered on 29 February and in the days that followed". He gave this sermon on Reminiscere Sunday (i.e. on 7 March 1784) in the Count and Castle Chapel in Hirschstein and on the invitation of his friends, as the preface to the tract says, he published it. However it showed up to

Fig. 11: High water mark of the extreme from 1 March 1784 on the water pavilion of Pillnitz Chateau near Dresden on the right Labe (Elbe) R. bank, and a comparison with the floods of 2002, 1845, 1890 and 1862 (Photo: U. Grünewald).

be focused on theological and moral aspects of the event only, with no concrete data about the course and impacts of the catastrophic flood (Ursinus, 1784).

Large parts of Dresden were under water, 1 to 1.5 m, with corresponding damages.(The topical comparision of flood-mark 1784 in Dresden-Pillnitz with later cases present Fig. 11.) In Meissen the ice broke on 28 February in the evening and the torrential flood with ice hit the town the following day at 9 a.m. taking a toll of 9 lives (Schmidt, 2000; Glaser, 2001; Poliwoda, 2004). Near Dessau the ice cover broke on 2 March at 9 a.m. and water flooded parts of the town the following day.

A report from Erfurt says that in the Saale Basin, the left tributary of the Elbe, the river Gera destroyed the mills and bridges at the end of February/beginning March 1784 (Nonne, 1784; HHOWAD; Deutsch - Pörtge, 2000). Large parts of the town were flooded. The water also destroyed many weirs and dykes. On 28 February the ice on the river Ustrut, an important tributary of Saale, near the town Nebra destroyed the bridge over the river and large areas around the river. The flood inundated and/or destroyed houses, bridges, schools, churches etc. (Fig. 12). In Freyburg/Unstrut the water reached the streets situated higher. In Halle/Saale the flood began on 29 February. The water rose higher and higher and flooded the upper parts of the town; people had to use boats on the streets. On 1 March the water rose very quickly (Fig. 13). Mills had to be closed because of the ice and high water. There was no bread in the town and the situation became catastrophic. The floods receded approximately on 3 – 4 March (Deutsch, 2004; Pörtge – Deutsch, 2000).

According to Pötzsch (1784) heavy floods in the Elbe Basin appeared also on the rivers Flöha, Zschopau, Schwarzwasser, Zwickauer Mulde, Pleise, Elster and Freiberger Mulde. Of other basins in the north of Germany we can mention the river Spree, or the Lausitzer Neisse. The latter datum however is at variance with the publication of M. Schmidt (2000); in his survey of the floods he mentions no cases on the Lausitzer Neisse, the left tributary of Oder, or on the Oder, for 1784. We can agree that this holds true for the major part of the Oder Basin, which was outside the flooded region in 1784. Yet due to the thoroughness of Pötzsch's monograph it can

Fig. 12: High water mark of the extreme from 27 February 1784 on the building of old shed for sheep in Oldisleben on the Unstrut R. – an important affluent of the Saale R.: a) general view, b) detail (Photo: M. Deutsch).

Fig. 13: High water mark of the extreme from 1 March 1784 in Halle (on the so called „New Mill" in Mühlpforte Street) on the Saale R. as compared with other cases from the 17th century and from the beginning of the 18th century (Photo: M. Deutsch).

be assumed that as a contemporary the author had the opportunity to check the floods on the Lausitzer Neisse at the end of the 1783/84 winter; apparently the floods at that time were not of catastrophic dimension.

6. Floods in the Rhine River Basin

In the upper basin of the river Pegnitz, the left tributary of the river Main, the flood arrived on 27 February 1784 between 5 and 6 a.m., the water rising until 1 p.m. The water level then ebbed, but again rose in the night of 27/28 February during heavy rainfall; the flood waters rose to an unprecedented level at 10 a.m. on 28 February. Yet the first damages in Nuremberg were reported 24 hours earlier.

R. Glaser and H. Hagedorn (1990) gave a detailed description of the cause and course of the 1784 flood in the Main Basin. Among others they documented the exceptional number of preserved flood marks not only on the river Main, but also on the Neckar, Mosel and the Rhine down to Cologne/M. For the water gauge on the Main in Würzburg they estimated that the peak discharge of the Main in Würzburg on 29 February was 2,600 $m^3.s^{-1}$.

The river Neckar, the right tributary of Rhine had been covered in ice since late December 1783; the ice began to move for the first time as early as 4 January and the water rose up over its edges and overflowed; but already on the next day the frosts returned and the water again receded and in Heidelberg did not cause greater damage. The second movement of ice in Heidelberg appeared on 18 January and the flood that came with it caused greater damage. In the course of this second moving of ice the river Neckar below Ladenburg formed a new river bed. New frosts that came calmed the river. The next movement of ice was observed on 27 February and the floods that followed caused damage beyond belief. The water rose almost 4 m above normal; in Heidelberg the damage was catastrophic, nobody remembered anything the like of it. Many houses were under water up to the 2nd floor; mills, many houses along the river and bridges were carried away. Basing on experience with the two previous floods the town took a number of steps at the beginning of February; it is true that during the flood in late February, in addition to the bridge, 39 houses were destroyed, 290 buildings were damaged, many trees were uprooted and part of the town walls was demolished, but there were no casualties. In Neckarhausen on the other hand, one third of the village was destroyed within 12 minutes and 13 people perished.

The lower Rhine near Düsseldorf was frozen over completely as early as December. The ice cover endured for several weeks, but during January severe frosts alternating with thawing ice formed ice barriers – blocks thick as much as 3 to 4.5 m. These ice barriers considerably complicated the floods, which arrived at the end of February – and not only here. The Rhine remained to be frozen over until 23 February. Four days later high water levels were reported on the river Mosel. Damages severe beyond words were reported in towns along the river Main. For instance in Miltenburg the moving ice pulled down 13 houses with their inhabitants into the river. The water levels of 28 February 1784 on the river Mosel in Trier and in Cologne on the Rhine during the peak discharge have not been exceeded to the present day.

7. Floods in the Danube River Basin

The most detailed reports from the Danube Basin come from Regensburg in Bavaria where an ice pack was formed at the end of December 1783 under the historical stone bridge dating from the 12th century; very soon the ice was 1 to 1.20 m thick.

On 25 February the movement of enormous blocks of ice and extreme flood with unprecedented water level was reported in Kelheim. Two days later the town Dillingen and its neighbourhood were flooded up to 1.8 m and transport was possible in boats only. On 28 February a four-day long ice movement began in Ingolstadt, when the town was flooded and great damage was incurred on streets, bridges, buildings and vegetation; many heads of cattle drowned.

Regensburg was under the greatest hazard of flooding on 28 February, partly also due to the contribution of the river Regen (Řezná), which springs in the Czech Republic (Čertovo jezero, Železná Ruda). Flooding of the river Danube was also due, among others, to the rising of the water levels of the tributaries Lech (Augsburg), Isar (Landshut) and Inn (Braunau). After being frozen over for 60 days the water level of the Danube culminated on 29 February. The 20 to 40 m wide ice floes on the river smashed the ice guards by the stone bridge; in some places the water overflowed it, flooded the town and caused great damage.

This event soon motivated the publishing of an occasional print called "The gruesome picture of ravage in the course of the terrible movement of ice in 1784. A monument to Regensburg and mankind" (Fig. 14). The author was the prince's librarian and professor W. Rothammer (Knedlik, 2001). Although the publication mostly contains emotional philosophical passages, in contrast to the anonymous print from Prague and to J. F. Ursinus from Dresden, it contains concrete passages about the course and impact of the flood in the town and the surroundings where no food was to be had. It mentions that only one woman drowned (Rothammer, 1784).

This flood also hit Vienna; during the movement of ice between 29 February and 7 March the suburbs Leopoldstadt, Rossau, Erdberg, Weissgärber, Lichtenthal and low-lying parts of the city were flooded. The first ice cracks appeared near Nussdorf as early as 28 February and the ice began to move on the following day.

In terms of the vast expanse of land hit by the floods in central Europe, with the exception of the Vltava Basin and the Bohemian part of the river Elbe, the floods occurred in the eastern part of the Czech Republic only marginally, i.e. in south Moravia. Floods were reported only on the river Dyje (Thaya), the right tributary of the river Morava (March) and left tributary of Danube. Ice movement on the Dyje was recorded on 28 February 1784 at about midnight in the village Starý Šaldorf near Znojmo where it destroyed 4 houses and the inhabitants remained 30 hours without food. Of other damages it was for instance the destruction of the stone bridge from the 15th century in Znojmo (Anonymus, 1852).

8. Floods in Western Europe

The 1783/4 winter was unusually cold and snowy all over all Europe, yet there were great differences between Western, Central and Eastern Europe, the consequences of which were very important for the development of the post-flood situations in February 1784 (Nonne, 1784). Western Europe had more temporary spells of warmer temperatures and thawing. As a consequence of these fluctuations and the expected rainfall, floods were more frequent already in the winter.

Due to this situation floods were reported as early as the end of December 1783 floods on the river Loire, which hit Tours and Nantes. On the Elbe in Magdeburg a

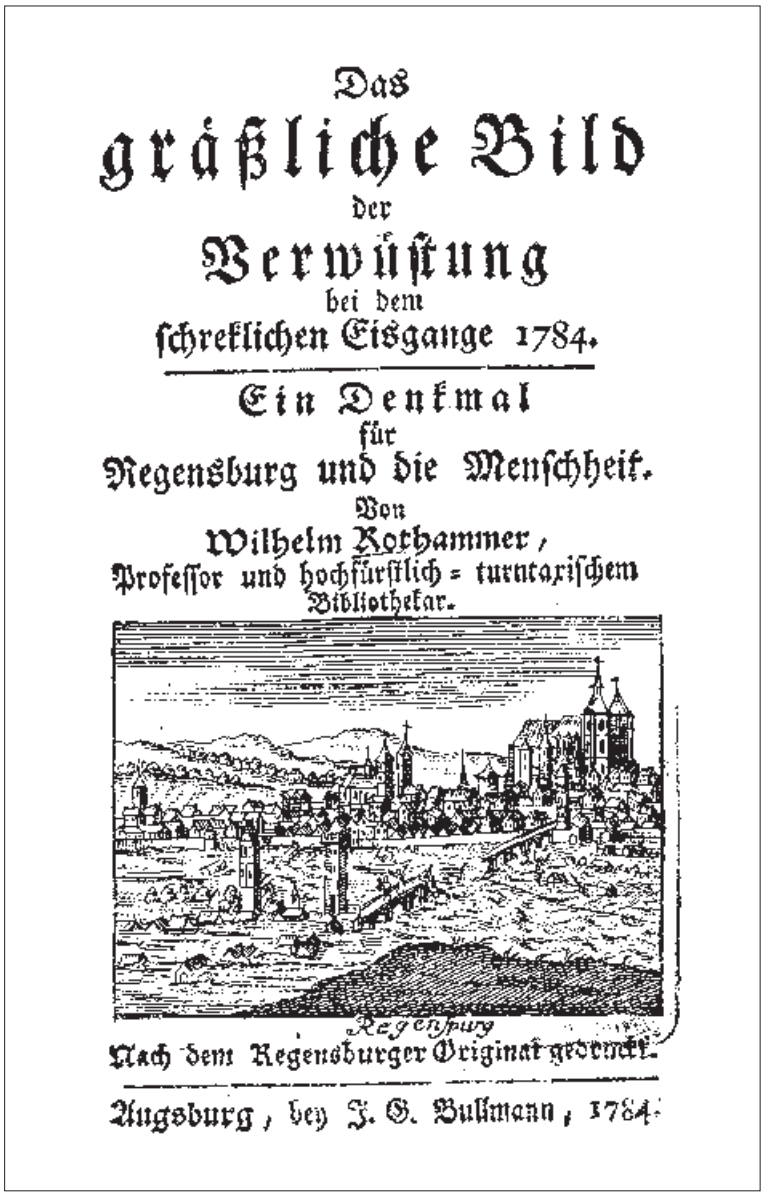
Das
gräßliche Bild
der
Verwüstung
bei dem
schrecklichen Eisgange 1784.
Ein Denkmal
für
Regensburg und die Menschheit.
Von
Wilhelm Rothammer,
Professor und hochfürstlich-turntaxischem
Bibliothekar.
Regenspurg
Nach dem Regensburger Original gezeichnet.
Augsburg, bey J. G. Bullmann, 1784.

Fig. 14: Front page of an occasional print on the gruesome scene of devastation during an appalling course of ice on the Danube River in Regensburg in 1784 (Rothammer, 1784).

Fig.15: Map of Europe with demarcated area affected by flood in the period from 20 February up t 8 March 1784: A) most affected regions, B) regions with floods of high extremity Q100 and more, C) presumable extent of affected area.

substantial Christmas flood was reported as well as on the river Neckar where the ice moved twice before the end of the year, etc.

The rivers Neckar, Rhine and Danube overflowed their banks again around 17 January 1784. On the river Garonne in southwest France heavy floods appeared in Bordeaux. Noteworthy is the report about the flooding of the river Guadalquivir in Spain in mid-January and the flood hazard of Madrid in the river Tajo Basin. Other flood hazards were recorded in the Poire Basin in early February (e.g. in the very heart of France in Blois on 2 February). At that time however the rivers in the Elbe, Rhine and Danube Basins were frozen again.

As early as 20 February the ice began to move on the river Seine in Paris, also the river Meaux was swollen. Maybe it is here that we can see the very beginning of the extensive flood, which went down in the "post-flood history of Europe". Afterwards the rivers Somme, Mosel and Maas flooded between 22 and 24 February.

Beginning 26 February 1784 floods were reported on the rivers in the Seine Basin (Paris) and their tributaries (Eure in Chartres), on the Somme, Maas, Rhine, Danube and some tributaries of the river Elbe. The floods hit central France, Picardy, Flanders and Rhineland up to Thuringia.

9. Conclusion

Although the flood in late February 1784 occurred in the early instrumental period, there are still many facts about its course that are more or less unknown. In the present documentation we managed to collect a number of less known and forgotten period information, which made it possible to prove the occurrence of this important hydro-meteorological extreme situation in the Vltava Basin and Bohemian part of the Elbe Basin and to give answers to some questions concerning the time and spatial course of the flood.

The immediate cause of the flood was the sudden warming up after a cold, snowy and long winter (strong wind and intensive precipitation), which gave rise to strong outflow in the Vltava , Elbe Basins and elsewhere. The vast expanse of flooded land considerably extended the area of the two basins and in itself was extreme because it also hit the Rhine and Danube Basins and marginally also the Oder Basin. At the same time in west Europe the rivers Seine, Loire and Maas were heavily flooded (Fig. 15, Tab. 1).

A number of reports in chronicles and also objective data from Prague and Dresden draw attention to the unusually steep high-flood-water wave and its rapid advance; quite logical were reports of the unexpectedness of the flood. Its dynamics and record-high culmination are moments, which created the "flood 1784 phenomenon". The vast expanse of land, along with all the damages it caused, has ensured this disaster a privileged position in the history of European floods.

On 15 May 1784 the Swiss newspaper "Zürcher Zeitung" considered this natural disaster in Europe "as more important and saddening than any disaster caused by war, because no war could destroy so much in such a short time" (Poliwoda, 2004).

New information could be of great importance for the anti-flood service because it points to the danger of floods of a mixed type (from thawing of snow and from rainfall), which includes the flood of 1784. For instance the fact that a mere 45 hours passed from the beginning of the causal precipitation in the Vltava Basin to its culmination in Prague is worth considering.

As a consequence of the catastrophic extreme ice flood in 1784 the first flood control measures were established during the following severe winter of 1784/85. For instance, according to the regulations of the Saxon elector, messengers on horseback were to report any breaking of the ice cover and flood approaching from Bohemia from the Saxon border near Bad Schandau. Also the garrison in the Saxon stronghold Königstein (on the left bank of the Elbe river on a sandstone rock in a height of 246 m above the river, ca 15 km from the Czech border) was to warn about the flood by signal artillery fire. Coincidentally however the ice, which had stayed on the river Elbe during this winter for 14 weeks, flowed away in the middle of April 1785 causing no greater problems.

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RNDr. Vilibald KAKOS

USE OF TELECOMMUNICATION AND INFORMATION TECHNOLOGIES BY INHABITANTS OF SMALL MORAVIAN TOWNS

Eva KALLABOVÁ, Bohumil FRANTÁL

„An essential component of the emerging global culture is the ability and freedom to connect – to anyone, anytime, anywhere, for anything..." (Conners, 1997)

Abstract

The issue of both the availability and possibilities of using the new telecommunication and information technologies is one of the key questions regarding the problem of regional development in contemporary "information society". Mobile phones, facsimile machines, computers, internet and other technologies, their currency, method and scope of use, as well as the related knowledge and skills, represent some of the basic elements which should make it possible for the Czech Republic to become an integral part of the modern information world as a dynamic, educated and competitive society. The major problem relating to availability of telecommunication technologies and to existing differences in possibilities of profiting from their use, is defined more as a question concerning social and regional differentiation, rather than one of general technological development. The authors, concentrating on data gathered from their own research, focus on use of telecommunication and information technologies specifically in relation to the inhabitants of small Moravian towns.

Shrnutí

Využívání telekomunikačních a informačních technologií obyvateli malých moravských měst

Jednou z klíčových otázek týkajících se problematiky regionálního rozvoje v současné „informační společnosti" je otázka dostupnosti a možností využívání nových telekomunikačních a informačních technologií. Mobilní telefony, faxy, počítače, internet a další technologie, jejich rozšíření, způsob a míra využívání, stejně jako znalosti a dovednosti s nimi spojené, představují jeden ze základních elementů, které by měly umožnit České republice stát se součástí moderního informačního světa jako dynamická, vzdělaná a konkurenceschopná společnost. Přitom hlavním problémem souvisejícím s dostupností telekomunikačních technologií a s existencí rozdílů v možnosti profitovat z jejich využívání není ani tak otázka všeobecného technologického rozvoje, jako spíše otázka sociální a regionální diferenciace. Autoři se ve svém příspěvku, který vychází z dat získaných vlastním výzkumem, zabývají touto problematikou, přičemž se zaměřují na využívání telekomunikačních a informačních technologií konkrétně ve vztahu k obyvatelům malých moravských měst.

Key words: *telecommunications, ICT, small towns, regional development, Czech Republic*

1. Introduction

The paper presents results of analysis of the data following from the research focused on relation of the inhabitants of small Moravian towns to the telecommunication and information technologies. From the technical point of view under the telecommunication device we understand in principle (see the Act No. 151/ 2000 Coll. "On Telecommunications and Change of Other Acts") "the technical equipment, incl., the lines for transmission, routing, connection and reception of the information of any kind on the lines through radio, optic or other means utilizing electromagnetic waves". It means that the telecommunications include both the "infrastructure", i.e. the telecommunication networks, lines and distributions of any kind, numerous transmitting and receiving devices and systems and also the so called terminal telecommunication devices (telephone apparatuses, answering machines, facsimiles, TV sets, radios, computer and modem cards, etc.). These terminal telecommunication devices were the very subject of our research.

Usage of the term ICT (information and communication technologies) which in principle coincides with our

specification of the issue has become accepted recently within the scope of the scientific studies regarding different aspect of the mass expansion and use of certain "new" technologies (personal computers, internet, mobile phones) in our modern society. Moreover, the term communication itself means de facto implicitly also the information, because the *communication* always represents a certain exchange of the *information*. Within the bounds of our study the term of telecommunication technologies shall thus in principle express only a wider scope of the research (from the technical point of view) encompassing, besides the new technologies mentioned above, also certain further, we can say, traditional telecommunication devices.

2. Theoretical Specification of the Problem

Use of the attribute mass, most frequently appearing in the collocations as mass society, mass communication, mass media (mass communication means) and mass culture, has become accepted since the second half of the 20th century in connection with the phenomenon of development of the communication and communication technologies as one of the phenomena accompanying globalization of the society. The basic characteristics of the mass society are as follows: rising role of secondary contacts, high specialization of social roles and statuses, anonymity, high mobility, break-up of the traditional bonds, contacts and institutions and importance of the role of mass communication (Maříková, Petrusek, Vodáková, 1996). In the mass society all people are in principle subject to the same (often contradictory) socialization and medial pressures without any differentiation and the individual shall decide what pressures and how deep will be internalized. The mass media (instruments of mass communication) represent the objects acting as one of the basic socialization mechanisms, affecting social behaviour of the individuals within a different scope, both positively and negatively, thus extending the forms of spending the leisure time (Keller, 1994).

Social organization of any society cannot exist without the well functioning communication fulfilling more basic functions in each society. It is the means for coordination of present activities, it serves as the means for orientation towards the more distant environment, represents the means for stimulation of the last experience and the means of anticipation and planning of the future activities. The contemporary society is characterized by the mass communication, where under the "mass communication we can understand a new type of mediating and a qualitatively new dimension of information exchange, where the organizations, institutions, sections and groups represented by specific people are in contact as the informers and receivers." (Maříková, Petrusek, Vodáková, 1996). The mass communication affects thinking and actions of people as well as the way of their living, takes part in the processes of socialization and enculturation, fulfills the function of promotion, propaganda, social control, spending of leisure time, recreation and entertainment. The telecommunication devices and the new information technologies (internet, teletext) are considered the most important intermediary of the mass communication in the modern society. "Today millions of technologically empowered individuals are able to participate freely in international transactions and enterprises, social and economic." (Kahin and Nelson, 1997).

In connection with dynamic development of the telecommunications (accelerated during the last two decades) and/or in connection with mass introduction of new communication and information technologies into the everyday life of people the term *information society* or the *global information society* is nowadays used frequently (Musil, 2003). The term should stress the fact that – besides the issues of the technical development – the issues and problems of ethic, moral, political and juridical character appear and have to be resolved, because development of the latest technologies establishes a wide spectrum of possible impacts on the whole human society.

Importance of the phenomenon of development of the telecommunication and information technologies in the modern society is also supported by the fact that within the framework of geography and/or economic geography there are the separate "schools" detached which are focused on research of these technologies, the so called *information geography* or *geography of telecommunications*. Development of the information technologies becomes the key issue even within the bounds of the *urban planning studies*. The research studies are focused both on history of development of the telecommunications and the telecommunication policy, history of internet and on development of the computer hardware and software (network technology) and the related new organizations and institutions. Influence of these developing technologies on functioning and development of the society and the everyday life of the individuals represents another field of research. The questions like "What is the influence of telecommunication technologies on regional development of the society?" (Goddard and Gillespie, 1997), "How do the telecommunication systems transform the urban environment?" (Moss and Townsend, 1999), "What is the impact of development of the telecommunication technologies on changes in the social stratification of the society and in the unemployment rate?" (Richardson and Gillespie, 2002) etc. belongs to the key subjects of research of the contemporary geography of telecommunications.

Significance of development of the telecommunications for the inhabitants in small towns consists on the one side in making the information and culture available for a wider social stratum and on the other side in the possibility of the people to join in the activities available only to the inhabitants of the large cities in the past. "Technologies, such as telecommuting, teleconferencing, and electronic mail will, it is argued, eliminate the differences between home and office and city and country by providing the benefits of urban life without confronting the problems of the city such as commuting, crime, congestion, and pollution". (Moss, 1987).

Availability of the telecommunication technologies becomes at the same time the main issue connected with development of telecommunications; it is not only the issue of the general technological development, but rather the issue of social nature in this case. "Contrary to popular predictions of their decentralizing impact, digital communications contribute to new and more complex forms of corporate integration, reinforcing center-periphery problems on a global scale. We contend that the "distance shrinking" characteristics of the new communications technologies, far from overcoming and rendering insignificant the geographical expressions of centralized economic and political power, in fact constituted new and enhanced forms of inequality and uneven development" (Gillespie, 1988). "Telecommunications is creating a new urban hierarchy, in which those cities that are already information-intensive are becoming even stronger as telecommunications hubs. New communications technologies can also be used to foster economic growth in outlying communities; however, taking advantage of those opportunities requires a recognition of the specific, and often subtle, needs of information-based industrie." (Gillespie and Hepworth, 1986). "Not all cities will benefit from telecommunications technologies; rather, those cities whose economic life is based on the exchange of information, both face-to-face and electronically, will be strengthened by the capacity to participate in the increased global marketplace for business services through communications technologies." (Chinitz, 1984).

Computers, internet and the related other modern technologies and processes (e.g. internet shopping or work, internet advertising, etc.), the methods and scope of their use and also the related knowledge and skills represent one of the basic elements thanks to which the Czech Republic could become the integral part of the modern Europe and world. On the other side the differences in the possibility of access to these technologies create the so called *digital divide* (see e.g. Anderson and Tracey, 2001) among those who are able to profit from the possibilities offered by these technologies and among those having no such possibility. The differences in the possible access to and in use of these technologies can result in a new kind of social differences and deepen the existing ones, based on education, age, profession or financial situation, etc. In this field different scientific studies have the unlimited space opened not only from the geographic, but also sociological, psychological, etc. points of view.

3. Socially Geographic Determination of the Research

Research of use of the telecommunication and information technologies was carried out[1] in the inhabitants of three small towns (Frenštát pod Radhoštěm, Frýdlant nad Ostravicí, Fulnek) located at a greater distance from the regional metropolis (30 – 45 km) Ostrava being the center of the industrial agglomeration (Fig. 1). Inhabitants of the towns above represent the target set; members of families of the pupils and students of the addressed educational facilities of these towns became the sample. In total 1390 filled questionnaires were obtained for process and analysis. The age and education structure of the respondents reflects the chosen sample (parents and/or grandparents of the pupils and students of the coordinating schools and/or the pupils and students themselves, whose share is overestimated in the sample). This is why there is a certain risk of distortion of the results as the consequence of non-representativeness of the sample and the presented conclusions cannot be generalized for the basic population without reservation. On the other side, this sample of the population covers (by 3/4) the people in the pre-productive and in the first half of the productive age where the interest in the future development and prosperity of their space of living and incorporation into this process activities can be awaited. Taking in view the fact that a similar comparative research focused on all aspects analyzed below has not been carried out yet at the nation-wide level, certain results of our research can be applied for formulation of the general trends of use of the telecommunication and information technologies in the Czech Republic anyway. At the same time the results can become the pulse for realization of other more complexly focused researches concentrated on relation of the contemporary population to these technologies.

In order to have the full picture attached you will find brief characteristics of the towns where our research was carried out: All three towns are related closely with tourism. Fulnek has historical architectonic monuments, the remaining two towns are the setting-off points into the all-year-round attractive recreation zone of the

1 The partial research was the integral part of the grant project of the Academy of Sciences of the Czech Republic No. IAA3086301 "Geography of Small Towns" which was realized in 2002 by the method of questionnaire investigation.

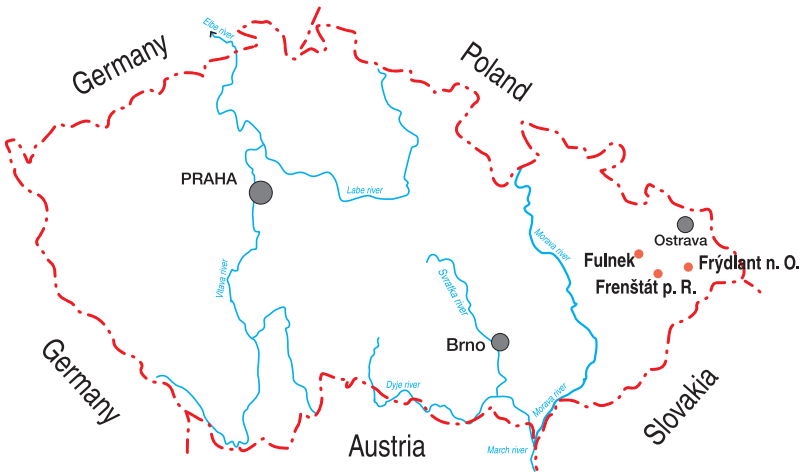


Fig. 1: Area under study

Beskydy mountains. Frenštát pod Radhoštěm (11,361 inhabitants) is the town of el. engineering industry (two divisions of the Siemens company) privatized successfully by the foreign capital inflow. Three secondary schools (2,000 apprentices and students) represent the intellectual background of the town, but also a relatively wide selection of study opportunities for the young generation. Frenštát has a good traffic connection with other towns and the demand for living does exist here; the perspective of its development is based on support of its multifunctional character.

Frýdlant nad Ostravicí (9,791 inhabitants) having a long-time metallurgical tradition is one of the sub-urbanization cores of the Ostrava region. Material decline of the metallurgical industry in the last decade (in the period of 1989 – 1996 one half of the employees, i.e. 1,000 people, were dismissed from the metallurgical plant Ferum) has pushed the town into the necessary conversion into the center of services focused on servicing the adjacent countryside region. Strengthening of this function was also supported by the recent administrative reform where Frýdlant has become one of the municipalities with extended powers. Care of the new prestigious residential zones and attractions connected with the richer clientele thus becomes the integral part of its administrative background. The education function is of stagnating character in Frýdlant; only one secondary school (360 students) is here; the educational establishment (150 apprentices) was closed in 2000.

Fulnek (6,053 inhabitants) is the town famous through Jan Amos Komenský (1618 – 1621 managed the fraternal choir and school in the town) and through the mechanical engineering manufacture (the company Romo – white household goods – was the dominant employer here). Loss of eastern markets after the year 1989, collapse of manufacture and bad financial management brought the flourishing company with 2400 employees nearly to bankrupt (300 employees in 2001) and indebtedness. Other companies in the town are insignificant from the point of the employment rate, the education function is represented by the secondary education establishment with 250 apprentices; a special boarding school is of regional importance. The offered tourism activities (centre of the town is the listed protected zone) do not pulse the tourists for more than one-day stay in the town, but can become a certain development potential for the future of the town.

Not a single town accommodates any factor (university, central authority, scientific institution) that would predetermine the changed (particularly higher) frequency of use of the communication media compared with other small towns. Indicators of the technical equipment and furnishings of the flats and the standard of living here also do not exceed the average of the republic anyhow, they are closer rather to the urban (quicker diffusion of innovations) than to the rural environment.

4. Telecommunication Technologies and Small Town Inhabitants[2]

The complex analysis of the process of mass communication includes several aspects of examination to be combined differently, depending on the purpose of research. Attention is paid usually to the following five aspects (see e.g. Keller, 1994 and/or Maříková, Petrusek, Vodáková, 1996):

- analysis of the communicator (author/producer of the message – individual, organization, institution, etc.)
- analysis of the message (content as well as the formal feature)
- analysis of the communication channel (media)

[2] *All diagrams, tables and data below represent the set of 3 examined towns.*

	Frenštát pod Radhoštěm	Frýdlant nad Ostravicí	Fulnek
Share of the population at the age			
pre-productive	18.2%	15.8%	17.3%
productive	64.6%	64.7%	66.5%
post-productive	17.2%	19.5%	16.2%
Educational structure (persons older than 15 years)			
without any education	0.2%	0.2%	0.5%
primary and incomplete	20.4%	22.4%	30.3%
trade schools	41.3%	37.8%	42.9%
secondary schools	29.0%	30.7%	21.7%
universities	9.1%	8.9%	4.6%
Economically active			
In total /number of inhabitants of the town	5106/11442	4204/9801	2424/6075
of which commuting to work	1607	1998	1063
Labour market			
unemployment rate I/99	7.9%	12.2%	17.7%
unemployment rate I/02	11.0%	11.7%	17.6%
Balance of the inhabitants 2001 – 1991	276	83	-150

Tab. 1: Selected structural features of the population in Frenštát, Frýdlant and Fulnek in 2001
Source: Vaishar, et al., 2003

- analysis of the communicant (receiver of the messages, audience)
- analysis of impacts of the communication

Five telecommunication media (TV, telephone, mobile phone, facsimile, PC), where we are able to draw partial conclusions as to who, why and to what extent uses them, was the very subject of our research. Analysis of the message (content analysis) was examined for the communication through the mobile phones and internet where we managed to obtain (at least partially) the structured information about the content and/or about the method and motivation of their use. Analysis of communication impacts was focused on significance of the telecommunication technologies for the respondents' life. Neither the communicator was subject to analyzing nor the relations between the mass and interpersonal communication were examined.

4. 1. Analysis of the Communication Media and of the "Audience"

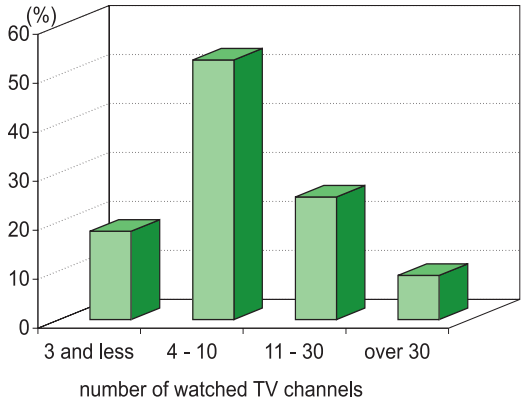
The question, how many TV channels can be watched normally in the satisfactory quality, was answered as follows: 4 – 10 channels by over one half of the respondents, 11 – 30 channels by less than one fourth of the respondents and only ca 9 % of respondents can watch more than 30 channels. At the same time nearly 16 per cents of respondents can watch only 3 or even less channels.

As far as the type of the received TV signal is concerned, over one half of the respondents can rely on the standard aerial, less than one third has its own cable connection and only 16 % own the satellite receiver.

It was possible to reveal important relations between the age of the respondents and their answers. In the age categories over 50 years not a single respondent receives more than 20 channels and the highest percentage (twice as high compared with the other age categories) of those who can watch only 3 or even less channels also belongs to this age category. In the age category over 60 years not a single respondent owns the satellite receiver and the highest percentage of them has to rely on the standard aerial only.

Nearly one half (47 %) of the respondents confirmed regular use of teletext in order to be informed correspondingly. Teletext is used by younger age groups much more frequently: over one half in the group of young people under 30 years, less than 40 % in the middle-aged group and only 15 % in the seniors (over 60 years). The men use teletext more frequently than women (56 % vs. 41 %).

a) number of TV channels



b) type of received TV signal

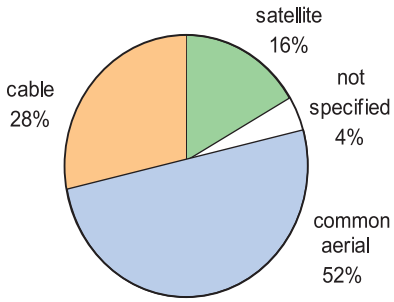


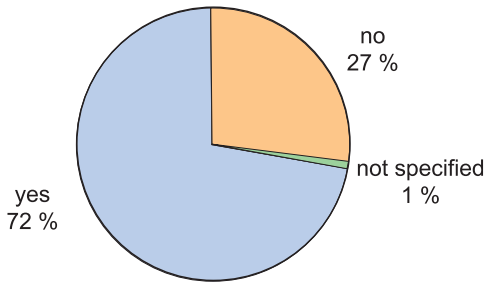
Fig. 2: Technical conditions for watching TV

When considering the diagrams below (Fig. 3a), we can see that nearly three fourths of the inhabitants of the small towns had the fixed telephone line available (owned). There were no statistically significant differences between the frequency of positive answers and the age, education or occupation of the respondents. From the diagram (Fig. 3b) focused on ownership of the facsimile it follows that only 7 % of households of the respondents own the device. The frequency is higher only in the category of private entrepreneurs (20 %). As far as the general use of the facsimile is concerned, the respondents with higher education (university – 30 %, secondary school – 15 %, others – 5 %) work with the facsimile much more frequently (both at home and at work); correlations with the kind of employment are also significant (among entrepreneurs – 30 %, employees – 15 %, in the category of "others" – 5 %).

For comparison below you will find results of the survey carried out by the Czech statistical office (CZSO, 2005) in 2003. As follows from the CZSO data (2005), the nation-wide average of the households equipped by the fixed telephone line amounted to 63 %, though there are material differences, depending on the region (the best results are reached by the capital Prague – 88 % and the Central Bohemian region – 73 %, the worst results are reached by the Ústí region – 45 % and the Olomouc region – 52 %). CZSO (2005) also draws attention to comparison of the established values with the values acquired during the pilot survey in 2002, where we can reveal a certain drop of the total number of fixed telephone lines caused by mobile network that has launched the Czech market.

The question, concerning the level of the telephone bill for the last month, was answered as follows: nearly one half respondents paid the sum in the range of 300 – 500 CZK (Czech crowns = ca 10 – 15 Euro) and over one fourth the sum of 500 – 1000 CZK (ca 16 – 32 Euro). The remaining fourth of the respondents lies at the opposite scale ends (less than 300 CZK (less than 10 Euro) and over 1,000 CZK (over 32 Euro). The university graduates (more than

a) fixed telephone line



b) facsimile

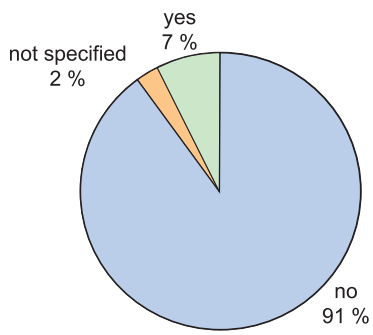


Fig. 3: Ownership of the fixed telephone line and facsimile

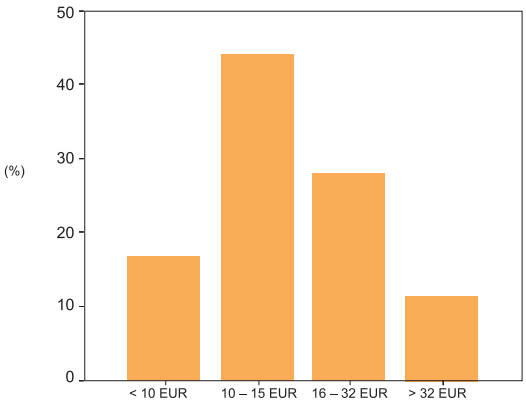


Fig.4: Levels of monthly telephone bills

60 % of them paid over 500 CZK /more than 15 Euro/, the others only ca 40 %) and private entrepreneurs paid more for operation of the telephone line. The average gross monthly wages in CR for the first half of 2004 amounted to 16,900 CZK (ca 536 Euro), i.e. ca 13,000 CZK wage net (ca 410 Euro) (Finance.EU a.s., 2005).

The mobile phone is used for communication by nearly 88 % of the respondents (see Fig. 5). The shown frequency of use of the mobile phone depends on the respondents' age with the statistic importance. The mobile phone is used nearly by 90 % of respondents in three age categories till 49 years (students and people of the productive age), in the age category of 50 – 59 years the mobile phone us used by over 60 % of respondents and in the category of 60 years and older – less than one third. There are no significant differences depending on education or employment.

Our results in principle agree with the data of CZSO (2005) survey which say that in Czech Republic 66 % of individuals older than 15 years have their own mobile phone. The technology is most popular in the age group of 25 – 34 years where the mobile is used by 87 % of individuals and in the age group of 15 – 24 years with 86 % of individuals. The lowest share of users of the mobile phone can be found in the age group over 65 years, where the mobile phone is used by 22 % of individuals only.

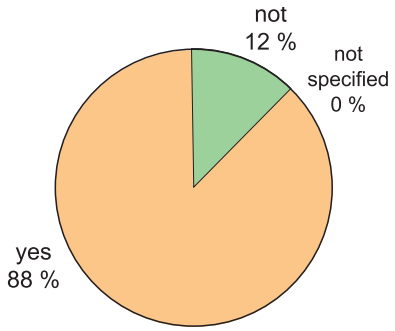
In the field of use of the mobile phones the Czech Republic thus occupies one of the first places among the European countries (CZSO, 2005). It is disputable whether it is the feature of the positive development and effective use of the new telecommunication technology or only the result of how easily the people can be persuaded and affected by the marketing strategies of the companies and ownership of a new mobile phone represents the integral part of their own image to a certain degree.

Over one half of the respondents has their own computer at home (in the household), less than one fourth of respondents does not own it (this item is not related anyhow with any characteristic, the frequency of positive answers is nearly the same for all categories). As far as relation of PC ownership with the kind of employment is concerned, the highest frequency of positive answers is among the businessmen, followed by the students and employees; unemployed persons and household individuals own the PC less frequently and the least share is among the pensioners.

It is necessary to take into account that the results are very likely distorted by choice of the sample for our research. We assume that the respondents with the pupils of the grammar schools/students of secondary schools creating our sample for the most part use the PC much more frequently and the resultant figures as most probably overestimated compared with the distribution in the basic population.

As follows from results of the CZSO (2005) survey mentioned above, the computer can be used by any member of the household only in less than one fourth (24%) of households in CR. The case of the fixed telephone lines alike, the highest percentage of households equipped by the computer is in Prague

a) mobile phone



b) personal computer

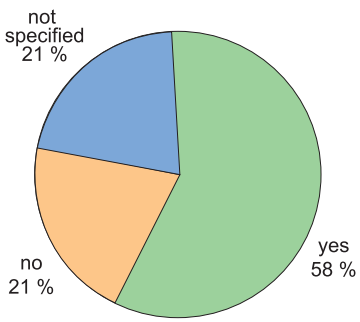


Fig. 5: Ownership of mobile phone and PC

(38 %), followed by the South Moravian region (30 %); the Olomouc region has the lowest number of households owning the PC (15 %).

We can form an idea about the development trends of use of the telecommunication technologies by the inhabitants of small Moravian towns by comparing the obtained data with the data of the census of 2001 (CZSO, 2005). From the specific data concerning "equipment of flats and recreation possibilities of households" for the Fulnek, Frýdlant and Frenštát towns we can establish that in 2001 only less than 15 % of households in these towns had the personal computer available (with less than 40 % possibility of internet connection) and only 15 % of respondents confirmed ownership of the mobile phone.

4. 2. Motivation and Methods of Use of Mobile Phones

This section is focused on analysis of methods and reasons (motivation) of use of the mobile phones.

As far as the specific differences in the reasons of acquisition of the mobile phone between men and women are concerned, we can state that the women confirmed personal safety more frequently, whilst the frequency of answers "working availability" and "expression of the social status" was higher in men. The frequency of answers confirming working availability (nearly 40 % of the university graduates, ca 20 % for all others) rises with the rising education. Working availability is confirmed much more frequently also by the private entrepreneurs (twice as high frequency compared with the category of employees and three times as high frequency compared with other categories).

As far as use of the mobile phone in general is concerned, results of data processing have confirmed that only ca one third of the respondents uses the mobile phone for the purpose other than for the common communication only, e.g. for obtaining the information through wap (internet) or through the telephone banking (GSM banking). Use of the mobile phone for the latter reason is most frequent among the respondents with the higher education reached and in the age category of 30 - 39 years.

motivation	Frequency of answers
common talks with relatives and friends	72.9%
working (service) availability	22.2%
personal safety	14.2%
replacement for the fixed line for financial purposes	5.1%
expression of the social status	3.4%

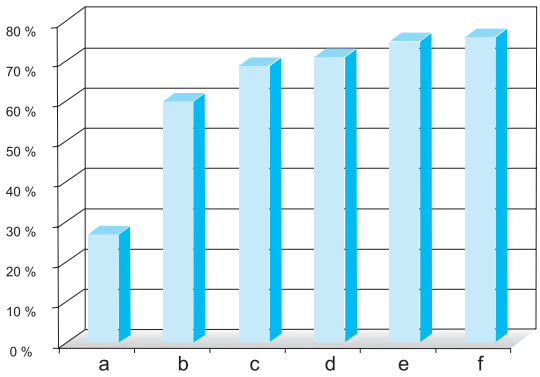
Tab. 2: Prevailing motivation for acquisition of the mobile phone

From results of analysis of the motivation factors for acquisition of the mobile phone it follows that the necessity of everyday communication with relatives and friends is the main reason for its acquisition for nearly three fourths of the respondents and one fourth of respondents confirmed the possibility of working (service) availability. Improved personal safety was shown by less than 15 % of respondents – the highest share within this kind of motivation can be found in the age category of the oldest people (over 50 years) as well as the of the youngest ones (under 18 years). Replacement for the fixed line for financial purposes was confirmed by 5 % of the respondents. The mobile phone is the means for expression of the social status and/or image in the society for 3.4 % of the respondents. The interesting fact is that the last reason for acquisition of the mobile phone was confirmed by nearly 15 % of the respondents among the youngest age categories (under 30 years), whilst the other age categories are under one per cent. Less than two per cents of the respondents also stated other factors for acquisition, e.g. the possibility of communication through short text messages (SMS), the possibility to utilize the GSM banking services, etc.

4. 3 Motivation and Methods of Use of Personal Computers

Nearly three fourths of the respondents have confirmed they use the computer at work and/or at school; use of the computer is inevitable for nearly 40 % of respondents as the integral part of their profession. Frequency of positive answers to the questions concerning use of the computer at work (school) and for professional purposes is proportional directly to the level of completed education. We can state that the level of completed education corresponds with the frequency of use of the computer at work and for professional purposes (the same findings are contained in the results of CZSO research, 2005). Private entrepreneurs (75 %) use the computer most frequently for exercising of their activities (business).

Nearly one third (30 %) of respondents also visits public institutions, such as libraries, internet cafés or offices to



a – work with graphic, hypertexts ,etc. (27 %)
b – current correspondence and records (60 %)
c – writing of longer texts (69 %)
d – work with internet and electronic mail (71 %)
e – study, teaching (75 %)
f – computer games and entertainment (76 %)

Fig. 6: Purposes (methods) of use of the personal computer

use the computer. Greater differences depending on the age of the respondents have arisen in this connection. In the category of respondents under 30 years (represented by the pupils and students in the majority of cases) these institutions are visited by ca 50 % of respondents, in the categories from 30 to 50 years – only 15 % of respondents and in the category above 50 years – not a single respondent. The highest percentage of visitors is among the students (50 %), the lowest one – among the employees (15 %).

6 % of respondents are even recognized themselves the "computer expert". The interesting fact is that that over 15 % of responding men a consider themselves the specialist, whilst less then 1 % of specialists can be found in the category of women; the words above can either prove subjectively higher self-confidence of men or objectively their deeper knowledge in this field.

The men of our sample work on the computer more frequently compared with women (as confirmed by the men); in greater details over 40 % of men spend more than 10 hours a week at the computer, whilst the share of women reaches some 15 %. The men also spend longer time by internet surfing. The similar research carried out by CZSO (2005) came to the same conclusion.

The respondents with higher reached education (secondary schools and universities) spend twice as long time by working at the computer compared with all other respondents.

Search for answer to the question how much time the respondents spend connected to the internet communication network was the integral part of our research. From the Fig. 8 it follows that the majority of respondents spend max. 5 hours weekly by internet surfing (see also the research CZSO, 2005), only some 15 % spend 6-10 hours by surfing and the remaining 10 % surf for over 10 hours per week. The men and the categories with higher education confirmed a longer time spent by surfing which corresponds to the values relating the number of hours spent by work on the computer.

During more detailed analysis of certain methods of use of the internet we came to the conclusion that over one half of the respondents have their own e-mail address; use of the e-mail address depends on age and type of profession to a high degree. In the age categories under 30 years nearly three fourths of respondents have their own address, whilst in the categories over 50 years the share reaches ca one third. We can say at the same time that use of own e-mail address is more frequent among the students, businessmen, followed by the employees.

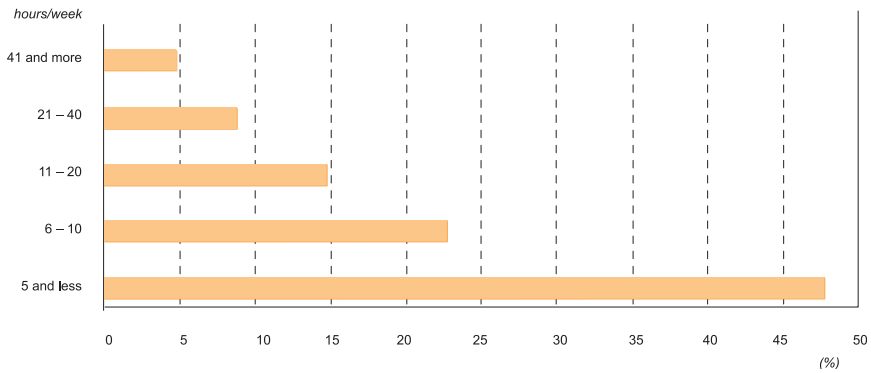


Fig. 7: The time spent to the computer work weekly

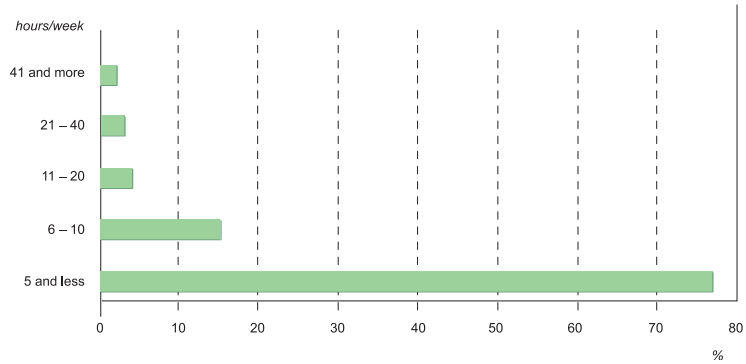


Fig. 8: Share of respondents' time per week devoted to internet surfing

Frequency of use of the electronic mail also rises with the rising education of the respondents.

Nearly one fifth of our respondents has already gathered a certain personal experience of internet shopping. Internet shopping is more frequent and common for the entrepreneurs and for the persons with higher reached education in general.

4. 4. Analysis of Communication Impacts

In this part we were concerned with analysis of impact of the telecommunication technologies on the life of the respondents and with analysis of the factors preventing from a more complex use of technologies in their lives.

The opinion of nearly one third of the respondents is that the telecommunication technologies failed to affect their lives materially. Frequency of such answers is of ascending character with the rising age of the respondents. The younger generation subjectively feels to be affected more by development of the telecommunication technologies. Nearly one half of the respondents considers the telecommunication technologies the factor enabling to settle the things from their home, thus limiting the necessity of their traveling and making personal contacts. The telecommunication technologies extend the horizon to nearly one fourth of the respondents, thus (on the contrary) increasing the frequency of traveling and personal contacts for them. This kind of answers is the most frequent in the age categories under 30 years. When comparing values of the answers in relation to the gender, it emerged that the men subjectively feel to be affected more by the telecommunication technologies than the women.

Nearly 85 % of respondents marked lack of finances the main factor preventing from a wider use of the telecommunication technologies. Lack of knowledge was stated by less than 9 % of respondents only, with three times more persons from the age categories over 40 years from among them. Lack of knowledge was confirmed more frequently by women than men which can again prove higher self-confidence of men subjectively or deeper knowledge of the men objectively. In adequate telecommunication infrastructure of the town is the main reason preventing from wider use of the telecommunication technologies for less than 7 % of respondents. The inadequate infrastructure was considered the main reason by the persons with university education three times more frequently compared with the others.

5. Conclusion

The modern society is characterized by a large and wide telecommunication network depending as a rule on the means of mass communication providing transfer of messages (information). It is based on the interpersonal communication, but is affected materially by the institutional structures and organization networks of often regional character – with parallel medial structure. Criticism of the mass communication based on the new telecommunication and information technologies in the world of our days stresses material surplus of the communication over the ability of the receivers to receive and integrate the information which fact does not lead to a wider knowledge, but results in the loss of orientation. Penetration of the mass communication into the private sphere at the same time breaches the balance between the private and the public sector,

Importance of telecommunication technologies	**Share of answers**
Enable to settle the things from my home, limit the necessity of traveling and personal contacts	47%
Extend my horizon , thus increasing the frequency of travels and personal contacts	23%
Do not affect my life materially	30%

Tab. 3: Importance of telecommunication technologies for life

because the pseudo-democratization character of the mass media addressing the same message in principle to all, calls the complementarity of the roles based on the age, gender social status, etc. in question. At the same time penetration of the mass media into the households reduces the importance of the interpersonal communication. This theory brought certain critics of the mass communication to the belief that its action materially reduces influence of the primary groups (the groups where the persons are interconnected by personal relations) as well as influence of informal human relations and that the audience of the mass communication is of the form of the homogenous mass, i.e. that individual members enter into the mutual links only negligibly, that the media affect each individual directly, that everyone is nearly helpless to their impact and that the real effect of the media is as intended by the producers.

Such view of the impact of the mass communication was questioned and modified by numerous researches. It became apparent (as confirmed by the corresponding results of our research) that the modern society is not a mass of anonymous individuals, but comprises a complex network of relations affecting their standpoints and opinions materially, it also contains a number of factors affecting the method how the people are subject to the influence of the media and telecommunication and information technologies in general, the method how the people perceive their messages and the level within which they want to be and really are affected. Better to say, we can claim that impact and response to the mass communication is affected by the social relations which the individuals are incorporated into.

On the other side the fears of the negative impacts of mass distribution of certain new technologies, concerning particularly the generation of the young people who are affected by development of telecommunication and information technologies to a very high degree, come true. In this connection we can speak (Kling, 1996) about certain social consequences of the so called process of computerization (implementation of the new technologies into the everyday life of the society) assessed and analyzed through the index of computerization (see e.g. Sak and Saková, 2004). The index of computerization is created by 4 characters: ownership of the computer, the number of hours spent at the computer, the number of hours spent by internet surfing and use of e-mail. From the researches carried out till now (Sak and Saková, 2004) it follows that the degree of the index of computerization corresponds with the changed system of values of the individuals and preferences of cultural and leisure time use. Rising computerization is accompanied by the rising preference of free space for acting to the detriment of safety, drops the importance of inter-human relations to the detriment of the preferred carrier at work as the source of the satisfaction in the society, the inter-human relations become "virtualized". The process of secularization and de-spiritualization goes hand in hand with the progress in the world of computerization.

It is undisputable that "invasion" of the new communication and information technologies causes radical drop of use of certain "traditional" communication technologies (media) in general, causes changes of the sphere of living, psychical and social fields of the individuals as well as changes of their style of living which can even result in certain negative consequences. Use of these technologies and the related knowledge and skills, access to the courses enabled by these communication and information technologies is considered more and more the key factor of economic and social development, both at the level of the whole society and at the individual level. The role of the telecommunication and information technologies can be raised - explicitly in relation to the inhabitants of small towns (but not only of them) - to facilitate viability of the ideas connected with realization of the business plans of the towns, but at the same time can become the means of communication of all those participating in the process. Its advantages consist in the possibility of understandable interpretation of the specific plans, in making the contacts between the interested participants of the process of development and in the re-appeared participation of the citizen after 1989. It is therefore necessary to find the adequate compromise between the effective use of these technologies and possible negative impacts.

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REGIONS WITH THE LOW-INCOME POPULATION IN SLOVAKIA

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Abstract

Slovakia was an egalitarian society until 1989. In the last fifteen years, however, important changes have led to what is referred to as the 'opening of the population's income scissors'. An increase in income and other inequalities present in the population, accompanied by various factors that lead to social stratification, is observed. Statistical data and public enquiries reveal that only part of the population has benefitted in the transition period, while a larger proportion has been negatively affected in terms of income. Income inequalities of individuals and households are also spatially differentiated, which indicates that levels of income are contingent upon geography, as well as conditioned by geography to some extent. Given such increasing income disparities and their spatial covariations, this research concentrates on the monitoring of household income levels and the spatial differentiation of income, with an emphasis on the identification of regions and districts with the highest concentrations of the low-income populations. The results concerning the level of income inequalities and the location of low-income populations are not only important for research purposes, but could also be applied to social, regional and communal policies, for the creation of social programmes, and as a baseline framework for policies oriented to objectives for the social inclusion of the low-income and poor populations.

Shrnutí

Regiony s nízkým příjmem obyvatelstva na Slovensku

Slovensko se do roku 1989 vyznačovalo egalitářskou společností. V posledních 15 letech však došlo k výrazným změnám, které můžeme označit jako rozevírání nůžek v příjmech obyvatelstva. V tomto období Slovensko zaznamenalo nárůst příjmových (ale i dalších) nerovností obyvatelsva, což výrazně (spolu s dalšími faktory) změnilo sociální stratifikaci společnosti. Část populace uskutečněnými reformami a transformací získala (dosahuje výrazně vysokých příjmů), zatímco větší část populace (podle statistických údajů i podle průzkumů veřejného mínění) „ztratila" a trpí nedostatkem finančních zdrojů. Nerovnost v příjmech obyvatelstva a domácností je i výrazně prostorově diferencovaná, což znamená, že úroveň příjmů je podmíněná i geograficky. Z těchto důvodů je příspěvek zaměřený nejen na sledování úrovně příjmu domácností (obyvatel) podle vybraných sociálně-demografických skupin, ale i na prostorovou diferenciaci příjmů s důrazem na identifikaci regionů (okresů) s nejvyšší koncentrací nízkopříjmového obyvatelstva. Dosažené výsledky jsou významné nejen z poznávacího aspektu, ale mohou mít i aplikační dopad v sociální, regionální a komunální politice, především při tvorbě sociálních programů a koncepcí zaměřených na zapojení chudého obyvatelstva a bytatelstva s nízkými příjmy do společnosti.

***Key words**: income and regional inequalities, low-income population, categories, identification, spatial concentration, Slovakia*

Introduction

After 1989, the process of income differentiation started in Slovakia. It connects with the socio-economic transformation and with the ongoing reforms. The related processes and phenomena such as privatisation, restructuring, development of business sphere on the one hand, and illegal activities such as „tunnelling" of firms, banks, financial institutions, speculative business, grey economics and market, crime, arms and drug trafficking and "white meat" trade on the other, brought a quick wealth and prosperity to a part of the population. However, economic and social consequences of the transition and reforms (restructuring of industry, inflation, decrease of production and export, increase of unemployment, a distinct price increase, etc.) also caused a rapid depletion of a large part of the population that finds itself now on a brink of poverty.

The generally low income level in Slovakia and other post-communist countries[1] causes dissatisfaction of a considerable part of the population and conditions its

[1] Slovaks are among the least-earning Europeans. In the scale published by the FedEE Slovakia ranks at the 35th position in a total of 48 compared countries with the income that makes up for 11 %. of the income in Denmark. The Danish earn most in Europe and the authors of the study used their income as a reference value of 100 %. Slovakia is behind Hungary (31st place with 13 %.), Czechia (32nd position with 13 %.), and Poland (33rd place with 11 %.).

material security. According to the most recent poll made by the Institute for Public Affairs between 12 and 24 November 2004 on a sample of 1,277 adults, as many as 80 %. of inhabitants (66 % in the preceding year) considered their living standard and social security their greatest problems. The level of (low) income is influenced by several factors, for instance, by the position of earning household members on the labour market, that is by their social and professional position, demographic features (household size, age structure of its members), cultural and geographic conditions (education and domicile), etc. A part of this low-income population (around 12 %) did not even reach the official life minimum income (net income of 2,900 SKK) in the study period (as of 31 December 2002). Apart from the fact that almost two fifths (39 %) of the population earned less than 6,500 SK of net income, it shows that together with the preceding population group, more than a half of Slovakia's inhabitants (51.4 %) earn relatively little[2]. Slovakia can be therefore considered a low-income country where only 28 % of inhabitants reach average net income (6.5 – 10 thous. SKK (Slovak crowns) per person) and only 20.7 % persons had a high net income of more than 10 thous. SK at the time of the study.

Geographical aspects of income disparity

Income and its level are just like other socio-economic phenomena subjects of spatial differentiation. A relatively distinct spatial income disparity and the related concentration of low-income population in certain areas, regions or settlements cause their backwardness and marginalization. This is the reason why it is important to study or to identify regions or settlements where households earn low income which affects the quality and other important aspects of their lives. Although there are some indications about the location of such areas (regions) as determined by the level of people's wages, the knowledge is limited and relates only to some population groups (in Slovakia only employees are monitored) and to larger territories (regions)[3]. The complexity of income level research and its multidimensional character indicate that a broader approach is necessary. Spatial income analyses so far carried out at a mezzoregional level do not provide relevant and precise information on the population's income due to a considerable generalisation. The purpose of this study is to identify districts with the low-income population by means of selected characteristics.

The conceptual framework

The relevant concept that is able to identify regions (districts) with the low-income population is the formalised (indirect) geographical-analytical method of the differentiated income level. This indirect concept is based on a deductive spatial analysis and on an interpretation based on the monitoring of the distribution of low-income socio-economic population groups. And it is the cognition of the location and concentration of these risk categories and subcategories that can provide important data concerning a mediated identification (localization) of low income by the studied territorial units. The basis of this multi-criterion method is that it applies the existing categories of socio-economic character, which relate to income and are statistically also recorded by the selected regional units. Such an evaluation of income disparity with the emphasis on the identification of spatial units with the occurrence of low income is based on „mediated" indicators, which characterise the low income. The evaluation is carried out in categories by choice of relevant, possibly objectified and typical traits of low-income subjects.

Application of the concept and procedures

The selected concept is well applicable also in our case for monitoring and identification of the spatial distribution of low-income population (max. net monthly income of 6,500 SK) at the level of districts. The applied method makes use of six important categories of socio-economic nature related to income. These categories are also statistically documented in terms of districts. In the framework of each category there is a subcategory that was selected both according to the criterion of dependence on low income and on its quantitative significance. The research was made at the mezzoregional level, i.e. in all 79 districts of Slovakia. Logically linked procedures were used in the analysis. Individual stages of the project can be summarised as follows:

a) Choice of category (subcategory) relevant to low income in each of six structures
b) Specification (quantitative reasoning in relation to low income) of low-income subjects
c) Establishment of individual limits for the assessment of spatial differentiation or concentration of each "risk subcategories" in terms of income
d) Establishment of the common limit within a framework of the group of all subcategories
e) Construction of an aggregative "risk" value which is expressed in the terminology of sets as a penetration

[2] For the purpose of this study, the low-income population is considered to be a population with less than 6,552 SK of net monthly income or less than 78,624 SK in the quoted year.

[3] The data of 2003 Microcensus about income in 8 administrative regions of Slovakia have not yet been published while the research into income disparities in smaller administrative units (districts and settlements) is not even considered in the near future.

of partial unfavourable values of the selected subcategories

f) Identification of districts in which the low-income subjects accumulate and concentrate (determined according to the occurrence of all six subcategories).

Selection and description of categories that indicate income

Income is to a considerable measure affected by social activity. Position of a person on a labour market or outside it markedly affects the income of households and their tangible assets. Generally said, households led by persons outside the labour market are characterised by lower income compared to households led by earning persons. The degree of social activity is then the correlate of income, which however interferes with the system of redistribution whether it concerns social benefits, retirement benefits, unemployment benefits, mother, parent or family allowances, etc. In spite of it, there are apparently significant disparities in household income arising from the social activity of household leaders. Several important facts become obvious when observing their social activity. The level of Slovak households income as related to social activity is illustrated in Fig. 1.

A factor significantly influencing the income of household and its members is the rank of the household leader in a social group. This paper presents an analysis of four most important social groups, dominant in the community structure. Factors determining income in Slovakia do not include only the activity on labour market but also its orientation and position within society – i.e. whether the person is a civil servant or working in the private sector, businessman, etc. The lower income of households (e.g. in a large part of households of the employed) depending on the state budget (households of civil servants) reflects insufficient sources in the state budget or high tax and levies. The income of these households is lower than that of businessmen's households which can cope better with the price increase or insufficient resources. Fig. 2 illustrates the income situation of households by social groups, i.e. by the professional ranking of household leader.

An important income-determining factor is household size (number of dependent children). More than elsewhere, in Slovakia the level of income per person decreases with the increasing number of children. Other factors also enter this relationship of dependence as many large households with three and more children contain unemployed persons, women on mother leave or housewives. The income of these households is apparently limited to a single salary with social or unemployment benefits being insufficient. More than 90 % of households with four and more children rank in the three lowest income zones with less than 78 thousand SK/year per person with the income of household clearly increasing with the decreasing number of children. The households without children do best, their share in the three lowest and the three highest income zones being 38.2 % and 29.6 % respectively. Households with three children in the three lowest and the three highest income zones represent for example 88.8 % and only 2.7 % respectively. Hence, the household size distinctly affects the income situation. It is also shown in Fig. 3 that offers some additional details.

Age is another income determining factor. The system of including professional experience used a natural salary increase with the increasing age. The rule that senior workers earn more at the same position than juniors is still true although there are other effects entering the process of income distribution. Important accompanying phenomena are the number of dependent children and the age of retirement. The income stratification is however still significantly influenced by the age of the household leader. This is demonstrated in Fig. 4 which depicts several important facts.

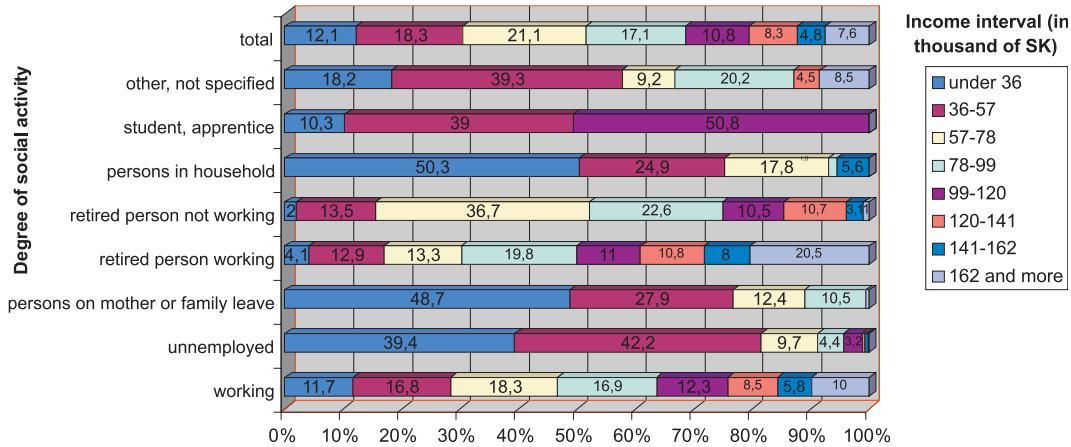

Fig. l: Households according to social activity of household leader and amount of net annual income per person in 2002 (%).

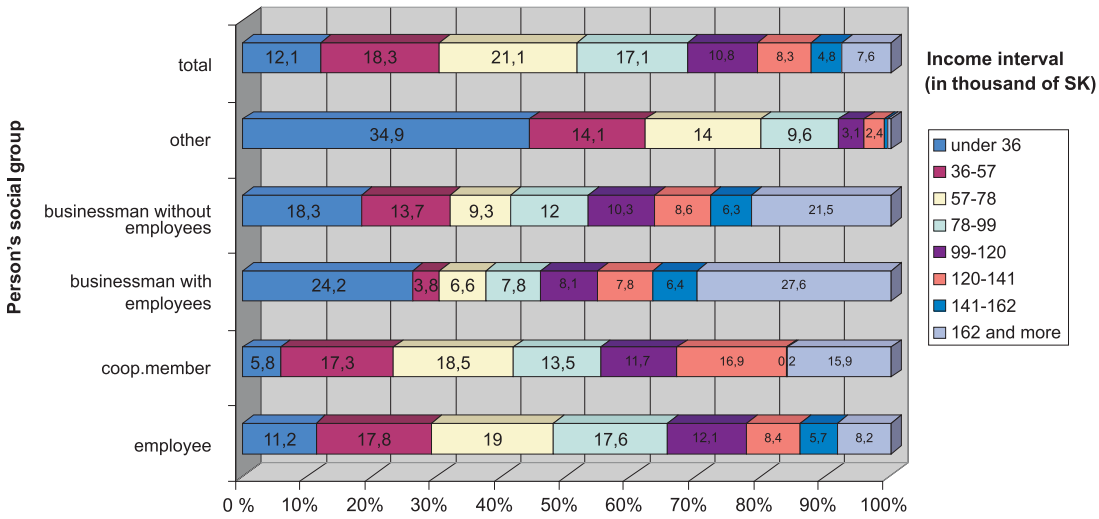

Fig. 2: Households according to social group appurtenance of household leader and amount of net annual income per person in 2002 (%)

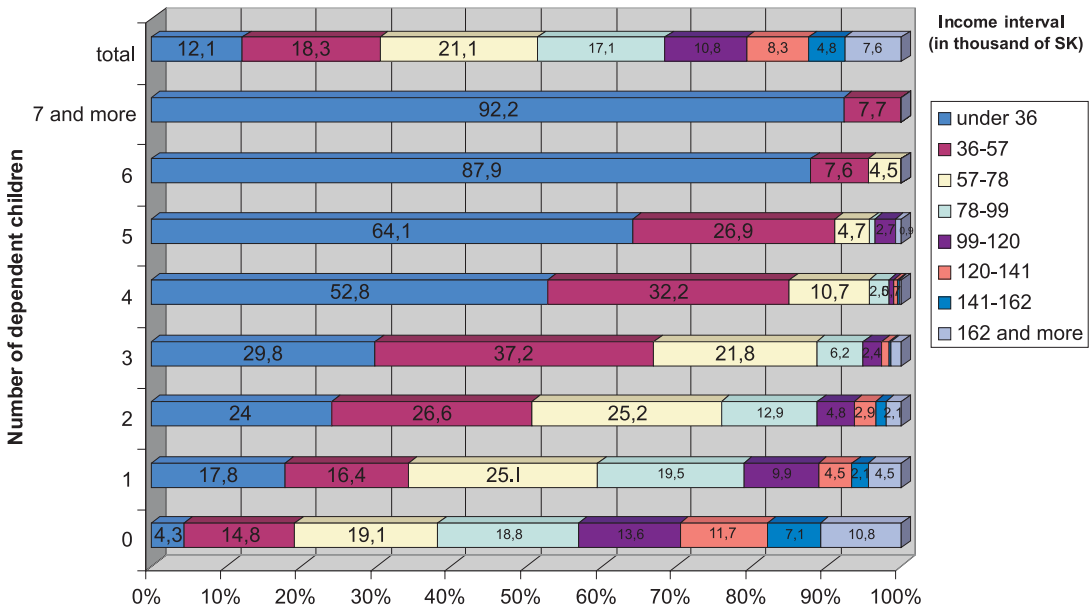

Fig. 3: Households according number of dependent children of household leader and amount of net annual income per person in 2002 (%)

Income is also determined by education. Inequality in skills, education and access to education is considered the "par excellence" inequality in advanced societies and it closely connects with income inequality and subsequently in the level and content of service and goods consumption (standard of living standard and life style). Universal education in Slovakia is becoming one of higher income determinants and an important tool of social promotion. In spite of it, the relation between education and income is a complicated problem in Slovakia similarly as in other societies under the process of transition. While the value of education in advanced societies increases with its higher level and reflects in the level of income, in Slovakia and in other economies under transition the lower performance of economy, job opportunities and the policy of wages do not make it possible to properly remunerate skilled and qualified workers, which results in a consequent status inconsistency[4] (Fig. 5).

[4] Disagreement between education, social status and income level. Income in Slovakia lags behind the achieved education and the socially accepted status.

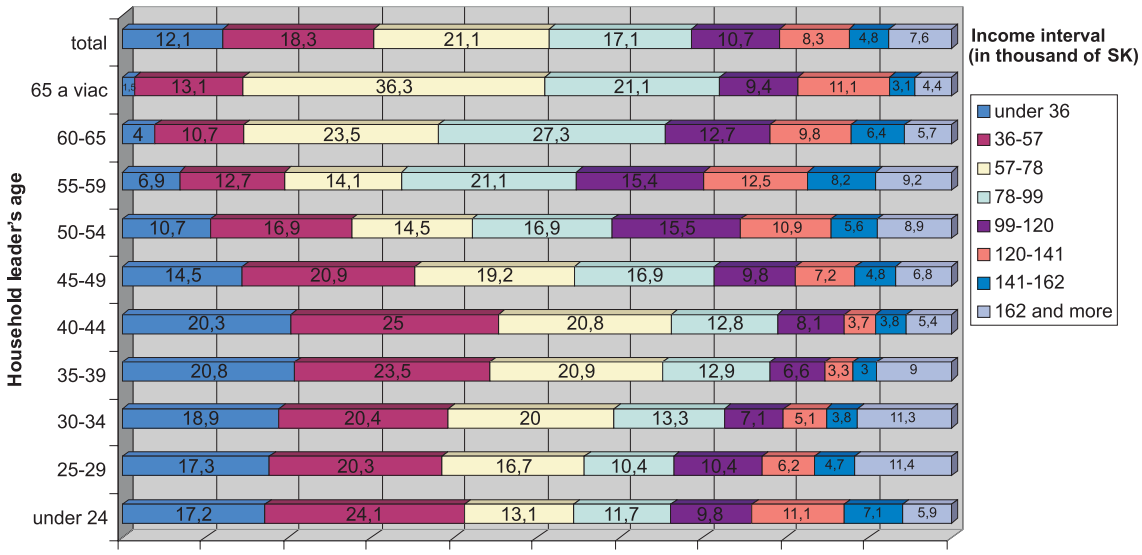

Fig. 4: Households according to the age of household leader and amount of net annual income per person in 2002 (%)

An important income correlate not only in Slovakia is the locality in terms of its size (population) and character (urban/rural). There are obviously important differences in the income of households depending on where they live (seat size an type). Generally it is supposed that the share of households with higher income increases with the size of the seat and that households of equal size with higher income have a higher representation in towns than in rural settlements. The fact is connected especially with the different function of the town (administrative, hierarchic and economic). And it is exactly this difference – the position of a town to a rural settlement that shows in more abundant jobs, i.e. in a higher employment and in higher performance requirements imposed on workers, hence in a better remuneration and a higher income of households. Fig. 6 shows the dependence of income diversity and on the size of settlements. The above six diagrams provide a good overview of the income distribution according to the respective studied features. The analysis of income disparities was followed by an analysis of low-income households in relation to the selected traits.

Characteristics of low-income households according to selected traits

Households with low income (annual income below 78 thousand SK/person) have a relatively high

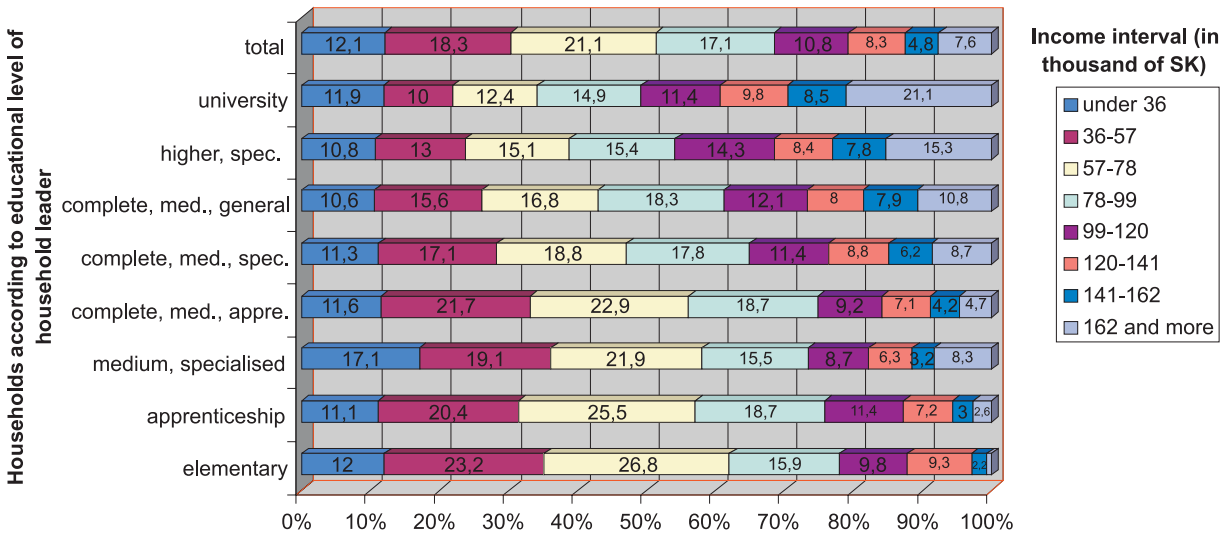

Fig. 5: Households according to social activity of household leader and amount of net annual income per person in 2002 (%)

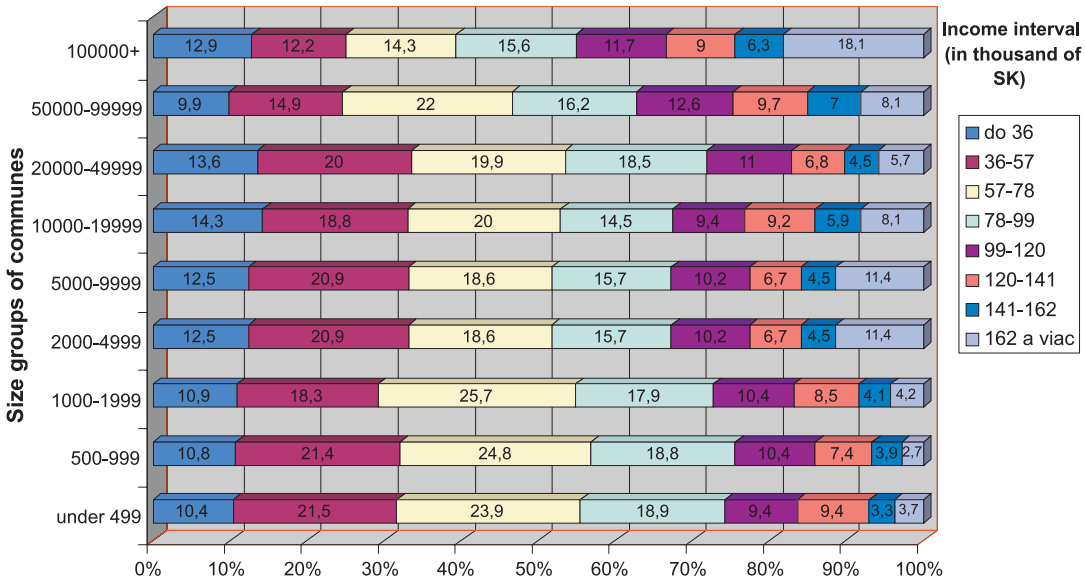

Fig. 6: Households according to size group of the commune of household leader and amount of net annual income per person in 2002 (%)

representation (51.5 %) in Slovakia. Low income can be observed also in households run by a housewife or by an unemployed person, person on mother leave or parent leave. These are persons/households that depend on different kinds of benefits provided by the State. As many as 93.3 % of households run by a housewife or a person of similar status are characterised by the above mentioned lowest income. The representation of households led by unemployed persons is nearly the same (91.3 %). The high percentage results from multiple reasons of which a major one is the exclusion of the persons from the labour market due to either objective (women on mother leave and men on parent leave) or subjective reasons. On the other hand, the lowest share of these low-income households is that of non-working retired persons (52.3 %) and working retired persons (30.3 %). The high proportion of low-income households (46.8 %) in the subcategory of earning persons (i.e. in Slovakia not only exclusion from the labour market but also poorly paid work[1] – shows that a considerable part of the earning population struggles with the family budget. Households led by a working person (48.0 %) are characterised by low income from the point of view of social status and the lowest share of low-income households consists of households of businessmen employing workers (34.6 %). The share of households with low income proportionally increases with the number of dependent children. All households with 7 and more children are low-income households. Childless households account for only 38.2 % of low income households. With respect to age, households led by persons aged 35 – 39 or 40 – 44 represent those with the lowest income. As many as 65.6 % of households led by a person of this age category are characterised by low income. The unfavourable situation in these households also relates to the fact that there are more dependents (children) in them while the difference between the paid work experience and the number of dependent children is considerably high, which unfavourably reflects in the income distribution. The fact is also corroborated by the decreasing percentage of low-income households led by older persons (less dependent children). Apart from the households of retired persons, the lowest number of low-income households (33.7 %) is led by persons aged 55 – 59. In terms of education, the low income with respect to the representation of households can be observed in households led by a person with elementary education. These households represent 62 % of the low-income households. The low-income households are almost proportionally represented in all size categories of communes (from 39.4 to 57.2). However, households with low income per person are observed to have a highest representation in communes with 500 – 990 inhabitants – 57 % of all households. It is caused by several factors (higher proportion of post-productive or pre-productive or unearning population groups at productive age, etc.). It is this higher representation of the above mentioned population groups and other factors such as economic and development potentials, etc. that influence the representation of low-income households in these settlements.

Specifications of subcategories according to selected structures

As it was found out, seen from the aspect of social activity, the lowest income was reached by the households led by a housewife. But it is the category that contains few members and it does not reflect any significant spatial distribution. This is the reason why it is more appropriate to observe the spatial distribution of the unemployed, as unemployment is the second to most

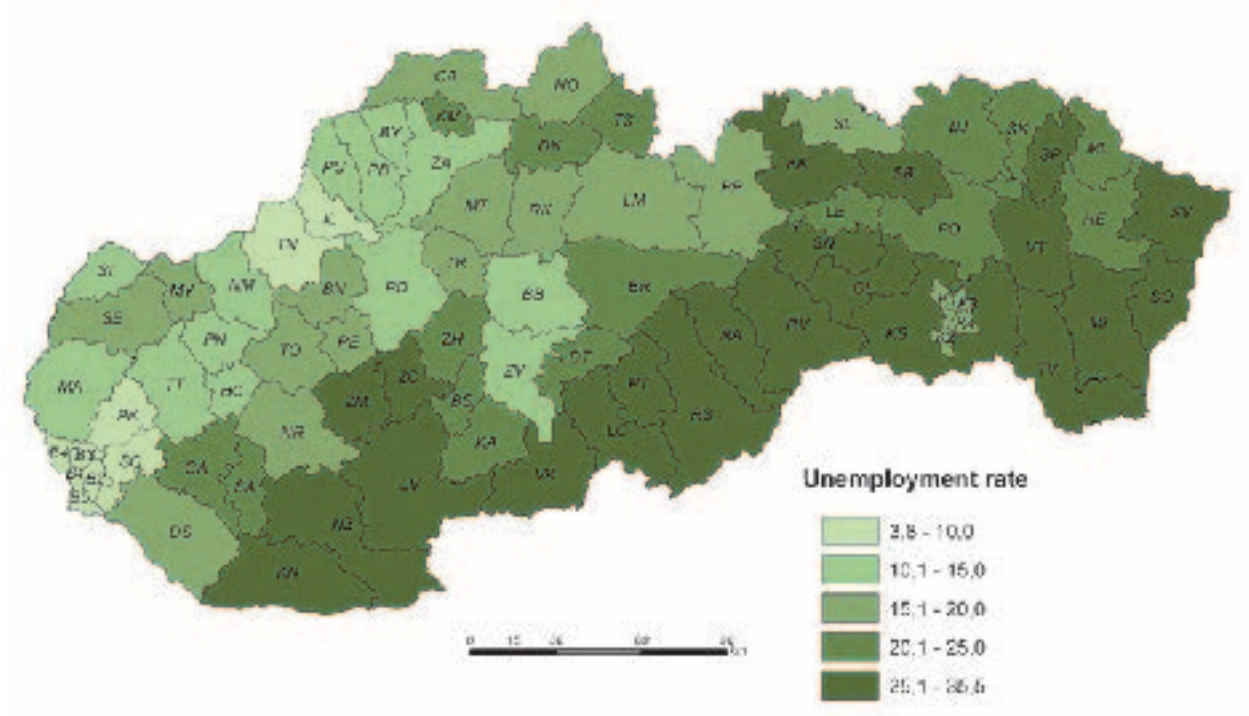

Fig. 7: Unemployment in districts of Slovakia

important social status, which determines low income. As already said, as many as 91.3 % of households led by an unemployed person do not reach the quoted income. The highest rate/concentration of unemployment is seen in districts where the unemployment rate has reached over 25 %. This limit does not directly reveal which districts are most probably those with low income (seen from the aspect of selected feature – unemployment). Fig. 7 shows that high unemployment concentrates in districts of southern and eastern Slovakia that form a continuous belt starting with the district of Komárno and ending with the district of Snina in the East of the country.

In terms of social group appurtenance, a low-income group referred to as "Other" which is rather heterogeneous is followed by a group of 48 % employees. Among the employees, unskilled helping hands (see

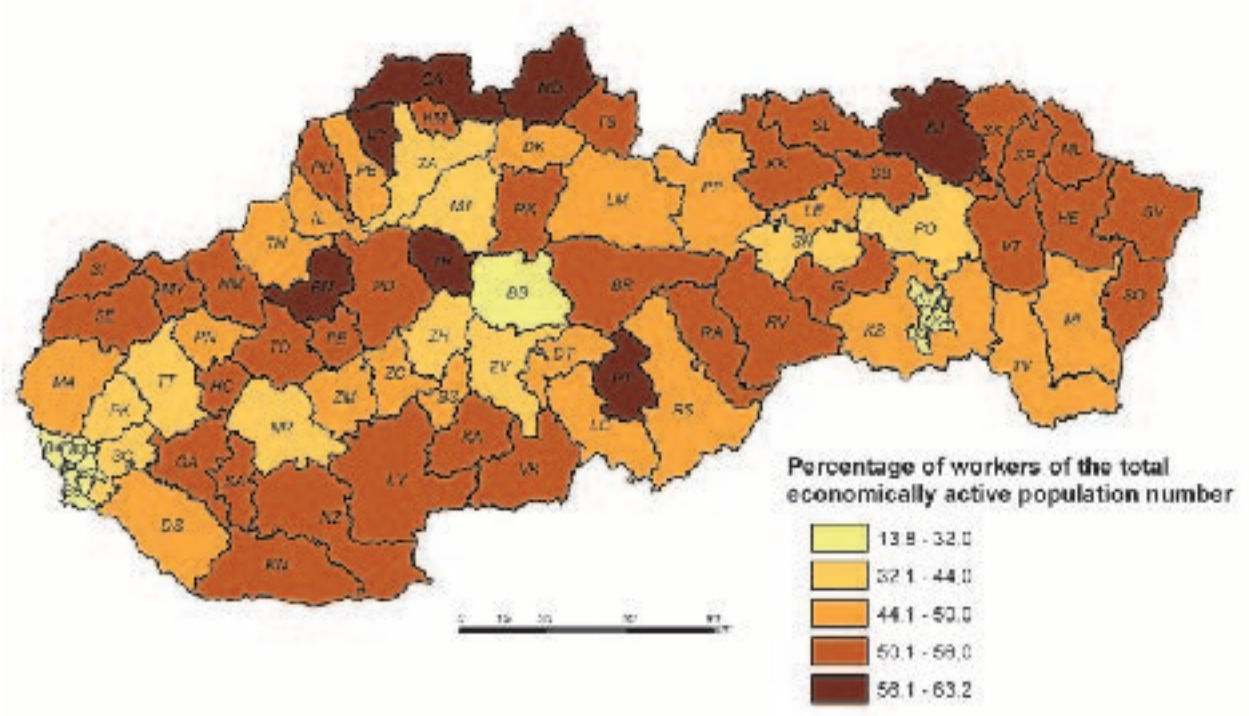

Fig. 8: Workers in districts of Slovakia

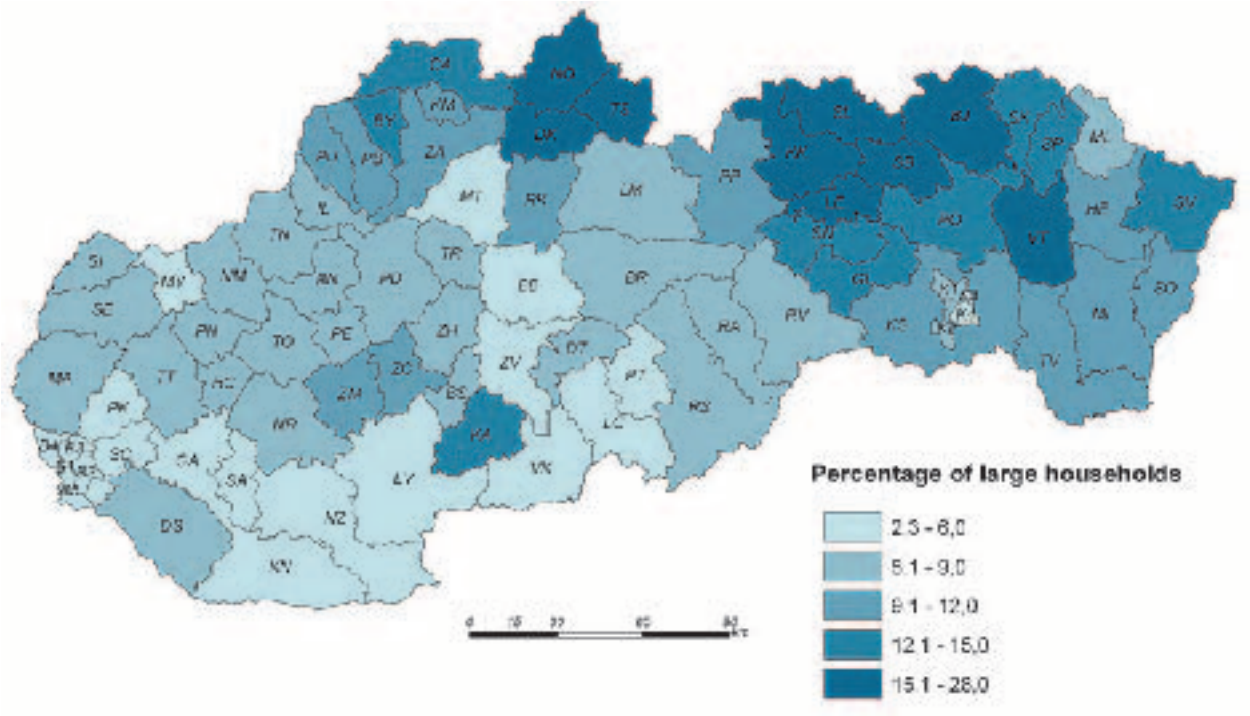

Fig. 9: Large households (3 and more children) in districts of Slovakia

Štatistická ročenka SR 2003) earn the lowest wages (their mean gross monthly wage was 7,260 SK in 2001). The same is true about qualified workers in forestry and agriculture – their gross monthly wage was 8,844 SK. The lowest income of skilled workers who are in the same class with tradesmen, was lower (11,689 SK) in that year than the average of all employees (12,542 SK). The share of workers in districts also indicates where the low-income population lives (see Fig. 8). As shown by the map, the subcategory of workers accumulates and its share is higher than 56 % in the region of Kysuce, districts of Čadca and Bytča, and in the region of Orava, district of Námestovo. Small districts such like Turčianske Teplice, Bánovce nad Bebravou, Poltár, and Bardejov are also characterized by the high concentration of workers.

As the statistics reveals, the income decreases with each child. The third child represents a qualitative break when the income distinctly drops. Each additional dependent child adds to the classification of the concerned household among the low-income ones. Due to this break in the redistribution of income with three children and due to a considerably high number of these households, the spatial distribution of the low-income population was studied by means of a spatial concentration of households with three and more dependent children (Fig. 9). Seen from this point of view, all districts in Orava - Dolný Kubín, Námestovo and Tvrdošín seem to rank at the worst positions. In all communes of Námestovo and Tvrdošín districts except for one, the share of large households was higher than 15 % which may indicate that the low-income households are more frequent in these districts. Another macro region of large households consists of six northern districts of eastern Slovakia.

As mentioned above, in terms of age, households led by persons age 35 – 44 have the lowest income per person. As many as 65.7 % of the households are characterized by max. net monthly income of 6,500 SK per person. The spatial distribution of married men at this age shows an important rate of concentration in districts of north-eastern Slovakia and a higher share of this category is seen in the districts of Považská Bystrica, Ilava, Košice I, Košice II, and Bratislava V (Fig. 10).

The low-income population is also characterized by the low level of education. As we found out, 62 % of households with basic education reach the lowest income. Fig. 11 shows where the population with elementary education concentrates. It also indicates the concentration of the low-income population. If the low-income population were judged only with respect to education, the districts of southern and north-eastern Slovakia would appear worst as more than 32 % of population is low-educated. The highest number of low-educated inhabitants concentrates in southern districts (from Dunajská Streda as far as Revúca). The second region with the high concentration of the low-educated population is in the East, in the districts of Kežmarok, Stará Ľubovňa, Sabinov, Medzilaborce, Gelnica, Košice-Province, and Vranov n. Topľou.

As far as the size structure of the seats is concerned, the lowest income level was recorded in households

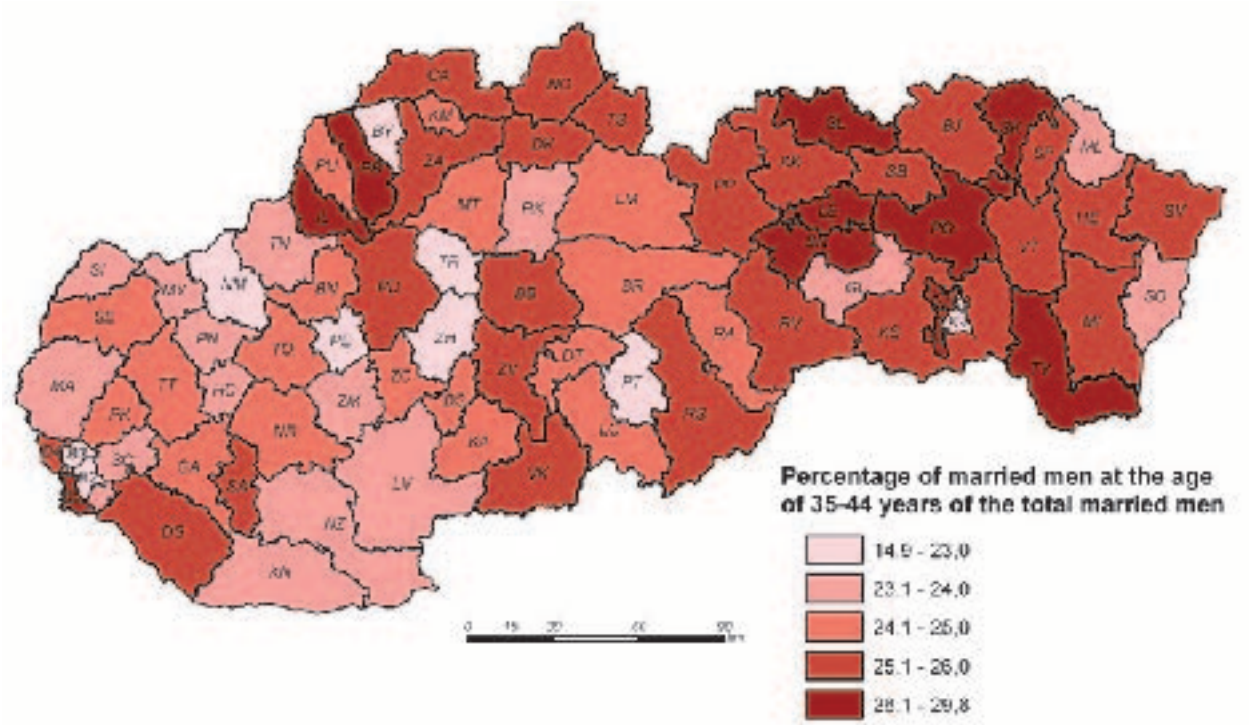

Fig. 10: Married men at the the age of 35 – 44 years in districts of Slovakia

living in communes with populations below 2,000. Small communes are typical of Slovakia while western Slovakia, the regions of Považie and Orava are exceptions. Communes of this size cover southern and eastern Slovakia. There are even districts where all communes except the district town count less than 2,000 inhabitants (Bánovce nad Bebravou, Turčianske Teplice, Krupina, Veľký Krtíš, Svidník, Stropkov, Medzilaborce, and Sobrance).

The complex "risk" limit and the identification of low-income districts

Although the individual selected subcategories made it possible to identify the low-income districts, it was only in terms of a single criterion or feature. This is the reason why it was necessary to set a common limit for all subcategories that should reflect all unfavourable values reached. If the original limits that were set separately

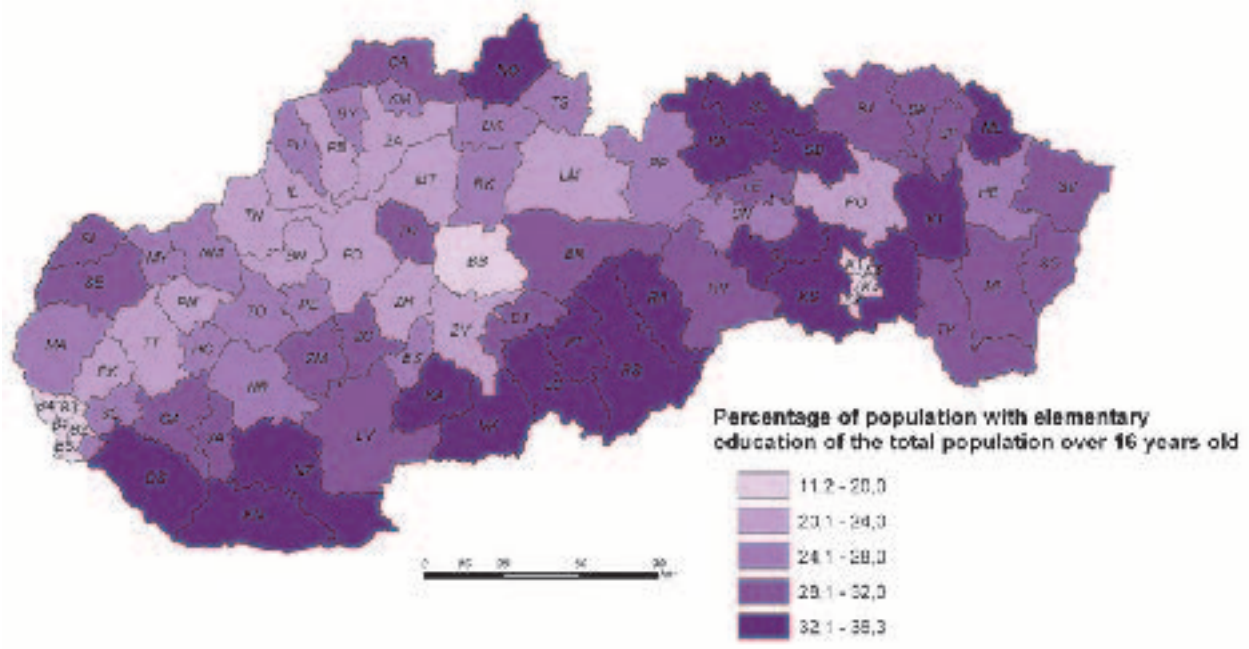

Fig. 11: Population with elementary education in districts of Slovakia

Administrative region	Number of NP* districts	Total number of districts in admin region	Percentage of NP* of districts	Pop. number in NP* districts	Percentage of population in NP* districts
Žilina	1	11	0.1	35 062	5.1
Prešov	8	13	61.5	472 145	59.8
Košice	3	11	27.3	319 899	41.8

Tab.1: Representation and population of low-income districts in Slovak administrative regions
Source: Statistical Office of the SR, own calculations
*NP = low income districts

for each subcategory were maintained, the identification of low-income districts would not be quite correct. As it was intended to use the selected subcategories as a whole, a single common limit was set. It in fact derives from the national average for all studied subcategories. The quoted standardization constituted a basis for the establishment of the "penetration" of unfavourable values and their spatial projection. In other words, the districts where all unfavourable values of all studied categories meet are most likely those with the low-income. By this way (through the standardization of common limit and by the establishment of accumulated unfavourable values in the studied administrative units – districts - it was possible to identify 12 districts in Slovakia, that can be considered low-income areas. In total, 827,406 people inhabit these districts, i.e. 15.4 % of the overall Slovakia's population. Fig. 12 shows that the low-income districts concentrate in eastern Slovakia (11 districts). Two thirds or 8 low-income districts concentrate in the territory of the Prešov administrative region. More than 472 inhabitants live in these districts, i.e. 59.8 % of the region's total population. The remaining three low-income districts are in the administrative region of Košice with almost 320 thousand inhabitants or 41.8 % of the region's total population (see Tab. 1). The only low-income district outside eastern Slovakia is the district of Tvrdošín in the Orava region with more than 35 thousand inhabitants (5.1 % of total population living in the Žilina region).

Conclusions

The obtained results lead us to a statement that the income level is considerably differentiated in Slovakia. This differentiation is determined by various factors, which also modify the differentiation of income

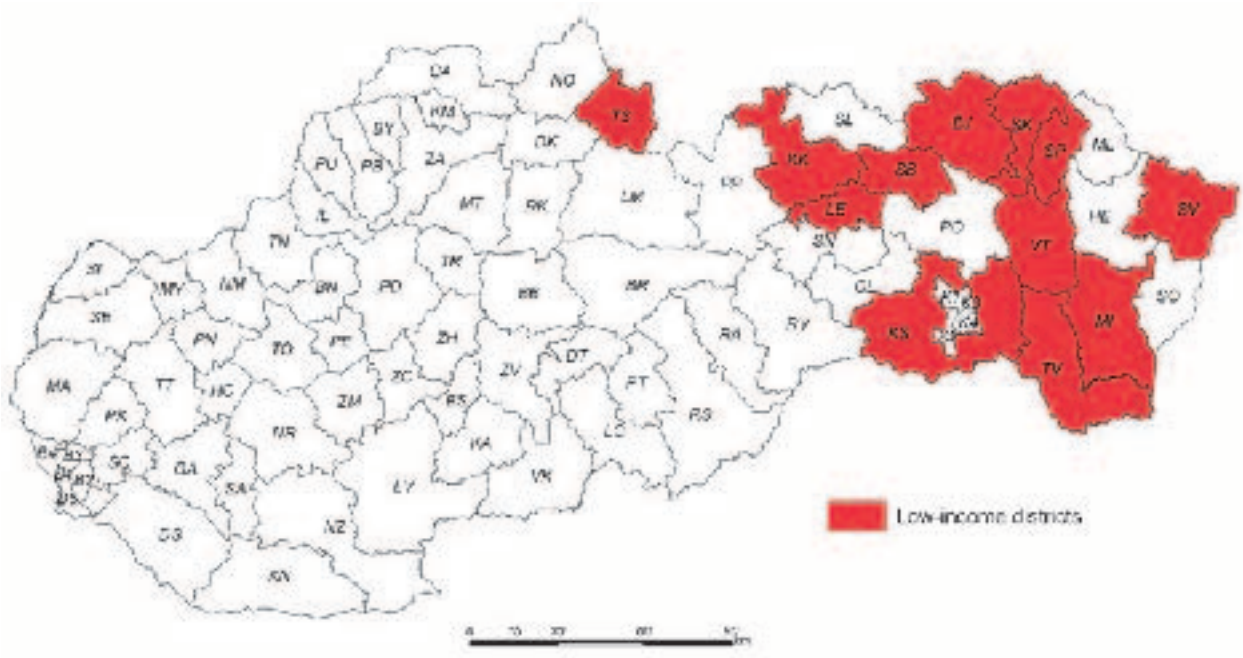

Fig. 12: Low-income districts in 2002

levels in regions. The important determinant of the low income is the level of social activity – labour market inclusion/exclusion of the person. Low income population concentrates in districts of southern and eastern Slovakia with high unemployment level. As far as the income distribution depending on social group is concerned, almost half (48 %) of employees do worst, as their income is low. The subcategory of workers who concentrate in the districts of Kysuce and Orava and some other small districts is especially affected by the low income. With respect to household size, the inhabitants of districts in Orava and eastern Slovakia where large households occur more than elsewhere, do worst again. According to the age, the low income occurs in households of people at an age category of 35 – 44 years. This subcategorie is frequent and spatially concentrates in the East of the country. The representation of low-income households is also determined by education with unfavourable values recorded in the districts of southern and eastern Slovakia.

The most important lesson learnt is the existence of 12 low-income districts that are characterized by accumulation of unfavourable values seen from the point of view of all subcategories. These districts can be considered actually existing low-income districts, which are located in the marginal areas of eastern Slovakia (above all in administrative region of Prešov).

Acknowledgement

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SELECTED SOCIO-ECONOMIC FACTORS AFFECTING LANDSCAPE STRUCTURE IN THE VRCHLABÍ AND VIMPERK REGIONS: ANALYSIS, CONSEQUENCES, SUSTAINABILITY

Pavel KLAPKA, Gabriela KŘEMENOVÁ, Stanislav MARTINÁT

Abstract

Changes in landscape structure are assessed on the basis of an analysis of selected socio-economic factors in two model regions: Vrchlabí and Vimperk. The resulting land use changes are discussed from the point of view of a sustainability concept. An attempt is also made to find relations between changes in socio-economic factors and land use changes.

Shrnutí

Vybrané socioeckonomické faktory ovlivňující strukturu krajiny v regionech Vrchlabí a Vimperk. Analýza, konsekvence, udržitelnost.

Článek se zabývá změnami sekundární krajinné struktury hodnocené na základě analýzy vybraných socioekonomických faktorů ve dvou modelových regionech: Vrchlabsku a Vimpersku. Výsledné změny využití území jsou komentovány z pozice konceptu udržitelnosti. Článek se rovněž pokouší najít vztahy mezi změnami socioekonomických faktorů a změnami ve využití území.

Key words: *landscape change factors, sustainability, Krkonoše Mts., Šumava Mts., Czech Republic*

1. Introduction

Secondary landscape structures are formed by several socio-economic factors that may undergo changes through the course of time. Every such a significant change of a particular factor induces a change in the landscape structure, its land use and can have an effect on the level of its sustainability. Regions with varied landscape features, history, economic and social conditions deserve attention in the first place. Two areas were chosen with similar environmental characteristics (they both include mountainous parts closer to state borders and foothills further to the inland, and both are situated in regions with less favourable conditions - LFA) which partly differ in their historical backgrounds: Vrchlabí region in the Krkonoše Mts. at the border with Lower Silesia and Vimperk region in the Šumava Mts. near the Bavarian border. However, changes in the two selected areas can be generalised for the whole mountain regions and their foothills.

We focused on analysing of two groups of quantifiable indicators: socio-economic indicators (population density, population changes between various censuses, and population quality changes - in our case expressed by ethnicity) and land use indicators (share of forested land in the total area, share of permanent grassland in the agriculture land, and share of agricultural land in the total area). A chief goal of our article is to attemp at finding correlations between the above-mentioned two groups of indicators.

2. Theoretical and methodological basis

According to R. T. T. Forman (1995) regions consist of various landscapes and landscapes are mosaics of different types of land uses (or ecosystems). The focus of our article is threefold: to analyse temporal changes of selected socio-economic factors affecting landscape structure (based on exact data), to assess consequences of these changes that may be reflected in the types of land uses, and finally to suggest whether or not is there any association of these changes with sustainability in both regions, which may put the matter into broader context.

If we research landscape structures that are not purely natural, human influence cannot be omitted (Richling, Solon, 1996; Miklós, Izakovičová, 1997) and it has the same importance as the physical geographical landscape features such as landforms, or vegetation (so called primary landscape structure). According to L. Miklós,

Fig. 1: Situation map

Z. Izakovičová (1997) the term secondary landscape structure denotes two characteristics: the actulal vegetation and land use, the latter being more central to our article, and their spatial distribution. These authors also propose a concept of tertiary landscape structure, by which they mean socio-economic phenomena in the landscape. Following this logic we intent to research the projection of tertiary landscape structure characteristics and their temporal changes in the secondary landscape structure and to pay attention to land use temporal and spatial development.

Thus, we try to introduce a temporal context into secondary landscape structure, which is sometimes being left out in favour of a spatial context. However, both temporal and spatial perspective are of even importance, when assessing development and sustainability of a particular landscape (Farina, 2000).

As a basic spatial unit for monitoring the temporal changes of socio-economic factors we use cadastral areas of municipalities[1] belonging to the above-mentioned regions, which are themselves delimited on an administrative basis (so called "minor districts", municipalities with extended authority). It could be considered an improper method of analysing landscape (even if it is "cultural") since ecosystem boundaries do not respect administrative units, but if socio-economic factors measured by statistical data are central to our research, the adoption of socio-economic spatial units, for which socio-economic but even land use data are accessible, seems to be justifiable.

Thus we have 15 municipalities in Vrchlabí region and 21 municipalities in Vimperk region. We used the 1921 and 2001 censuses for population and nationality characteristics (the former census is considered less biased in its nationality characteristics than any other inter-war statistics), and 1910 and 1961 censuses for population characteristics (in 1910 the population of the mountain regions reached its maximum, we consider 1961 as the year when last phases of the transfer of Germans were completed). Land use data originate from 1900 and 2002 censuses thus covering the whole century and enabling comparison of initial and today situations.

Having analysed the data we were offered a wide range of possibilities and combinations how to compare the results both in time and space. Since both regions are similar in their environmental characteristics and their histories do not differ significantly we can pursue the development trajectory of landscape of both regions across the 20th century. On the basis of spatial comparison between the two regions we are able either to generalise the obtained results for other regions or to disprove them as insignificant or random; we are also able to set importance of each selected socio-economic factor for the landscape structure changes and its sustainability.

Sustainable landscape or sustainable land uses are critical for life quality of both local communities and visitors and for the economic development in both regions (Rao, 2000). Sustainability assessment shall lie

[1] Historic data have been recalculated on the basis of present delimitation of municipalities.

in an intensity and form of anthropogenic impact on the landscape and its natural and cultural qualities. Doing so, we had sooner seem to get closer to an ecocentric position ("strong" sustainability sensu. Hunter, 1997) than to advocate an anthropocentric view.

We are aware that our approach to the assessment of landscape changes is only one of many. For the landscape changes assessment a wide spectrum of approaches can be used with various indicators. Important indicators not mentioned yet are for example tourist load, long-term recreation, changes in agricultural policy, various stakeholders´ impacts etc. (see Kupková, 1997; Bürgi - Russell, 2001; Kupková - Bičík, 2002). We are aware that the data used are related to cadastres which can cause a certain generalisation and they do not record the situation and changes within a cadastral area. On the other hand we find this approach as better applicable for larger regions. Statistical data distinguish a certain number of land use categories but they do not record qualitative changes within a particular category (e.g. forested land increase does not necessarily mean increase in ecologically valuable areas share if it is for instance expressed by introduction of spruce monocultures).

The extent of paper does not enable us to provide even short geographical description. General geographical characteristics of both regions are included for instance in the monograph by J. Flousek - J. Štursa - A. Raj, - J. Potocki, eds. (in print) - Vrchlabí region and in the study by M. Novotná (2001) - Vimperk region.

3. Analysis of socio-economic factors

We suggest that following issues were crucial for landscape structure changes during the 20th century: political situation, economic mode and socio-cultural conditions. We can look at particular socio-economic factors from different points of view. They can be divided into initiating and dependent factors according to their function. The former group can be further divided into naturally acting and disturbing factors according to their action on the dependent factors. Initiating factors exert indirect influence on the landscape by influencing the dependent factors, whose impact on certain aspects of the landscape structure is direct.

Let us take the economic mode first. We suggest that it can be considered as a normal initiating factor. The economic mode alone (in its wider macroeconomic sense and under democratic establishment) leads to the natural socio-economic development. This development was in the 20th century embodied by continuing industrialization, urbanization and in the second half of the 20th century by the shift of economic base from the secondary to the tertiary sector of national economies. However, the first two processes had been already inherited from the 19th century. All these processes have their reflection in the character of dependent socio-economic features, which is, however, hardly recognisable, since we take it as an ordinary phenomenon.

On the contrary, political situation should be ranked into disturbing initiating factors. It affects normal functioning of economy (Rondo, 1996) and thus diverts natural development trajectory. Political situation can either mitigate or highlight natural economic oscillations or it can cause entirely new ones. However, knowing that the term "disturbing" can bear negative connotations, it should be noted that politics can have also important positive indirect influence on landscape or land use type (see for instance a function of national parks, military zones with restricted access etc.) although its impact on economy can be viewed as controversial. In the Czech Republic the 20th century experienced four major political turbulences: the First and the Second World Wars and their consequences (population decrease, transfer of Germans), gradual communist takeover during 1945 - 1948 and its consequences (collectivisation), and fall of the communist regime in 1989 (restitutions, privatization). These processes, unlike the preceding ones, have very noticeable impacts on dependent socio-economic factors.

So as to conclude the introduction the initiating factors there is still one important remark to be made. Both economic and political issues often act together and influence one another. We do not think that a neo-liberal concept of economics necessarily leads to a desirable development of the landscape structure and to the most advantageous land uses. A deliberative political action can contribute to this more, as we can see in some western countries that were saved the political turbulences.

Socio-cultural issues can be seen as dependent, since they reflect economic and political changes. They typically have a direct impact on some elements of the landscape structure (as we have already mentioned above). Out of a wide range of socio-cultural issues we have selected two of them: area related quantitative population figures related (population density) compared in time (temporal changes) and qualitative population characteristics of the population in municipalities, both based on statistical data. In our case the latter indicator coincides with ethnicity, but in other areas the quality of population can be expressed differently (e.g. generally, mode of economic use of landscape). Nevertheless, migration trends after 1945 connected with the transfer of Germans, mainly politically conditioned, were based on ethnicity in this case.

It is indisputable that the number of inhabitants has a direct link to the type of land use and thus to the secondary

landscape structure. But a quality of population is also important to the landscape characteristics and it can be determined on the national basis (without any negative vertones, rather understood as a cultural quality). The German population possessed predominantly the "know-how" for agricultural utilization of mountainous areas and was generally more successful in it than the Czech element, while the Czech population was rather specialised in utilizing lower locations.

In order to refer to some other examples of socio-cultural characteristics we can mention socio-structural changes such as land reform in 1919, economic activity of the population, agricultural intensification or collectivisation. However, these are difficult to be expressed in figures because of their nature. On the other hand they should not be omitted when analysing exact land use data and can acquire a role of an indicator or a corrector, which helps an interpretation of "hard" data (consequences of their changes). This proves that even the above-mentioned dependent socio-economic characteristics can exert influence on one another, which makes the whole issue a complex one.

Sometimes we can experience even positive feedbacks in interactions among particular factors (initiating and dependent). Thus, change of economic mode can cause a population decrease; the population decrease can contribute to further economic mode adjustment etc. The resulting impact on the landscape is finally multiplied.

Analyzing the influence of population changes on the landscape we have chosen following years: 1910, 1921, 1961 and 2001. In 1910 the population reached its 20th century maximum (around 38 thousand in both regions) – see Fig. 2. An impact of the industrial revolution based on population density is clearly visible in the Vrchlabí region in the strip along the Labe River between Vrchlabí and Hostinné (textile and wood industries). In contrast, the population of Vimperk region still remained more dispersed. Average population density in the regions of Vrchlabí and Vimperk in 1910 was 131.8 and 71.6 inhabitants per square km, respectively.

After the World War I in 1921 the population decreased by 10.3 % in the Vrchlabí region and by 6.4 % in the Vimperk region. This decrease resulted from the war casualties (war actions, diseases) and war population behaviour (unwillingness to bear children). The population density did not experience any significant changes.

World War II and its consequences were crucial for both regions. The usual above-mentioned impacts of war events on the population were emphasized by the transfer of Germans. Fig. 3 depicts the situation in 1961 when the population reached its minimum in both regions. By this year, the last wave of German transfer was finished. It affected the population density that dropped in the Vrchlabí region to 72 inhabitants per square km and to 34 inhabitants per square km in the Vimperk region.

If we compare 1961 to 1921 populations (Fig. 6) we can see significant drops in mountain areas, while towns and lower settlements were afflicted less by the decrease (Vrchlabí, Vimperk) or experienced a minor increase (Hostinné). The German population was partly substituted by the Czech element originating from inland, but only in the case of Vrchlabí region since our western border was negatively affected by the "iron curtain" and a decision was made not to resettle these areas again. In the Vimperk region many settlements were abandoned and even physically liquidated (e. g. Pravětínská Lada – Gensauerhaid, Knížecí Pláně – Fürstenhut, Rabenhütte, Šerava – Scherau). Thus, the total population in Vrchlabí region declined by 22.2 %,while in the Vimperk region decrease reached 48.5 %. Maximum figures were recorded in Nové Hutě, Kvilda, Borová Lada and Strážný (around 80 – 90 % decline), in Vrchlabí maximum declines did not exceed 73 % (Strážné). Fig. 4 (see cover p. 2) shows the change between the population maxima of both regions (1910) and the population minima (1961).

Ensuing development of population (1961 – 2001) is illustrated by Fig. 7. We can say that it was the first time in the 20th century when this development showed usual demographic characteristics without them being considerably affected by political situation. Urban population was growing, while rural areas were gradually depopulated. While this entirely holds true in the Vrchlabí region, the situation in the Vimperk region is a specific one. We can see a population increase even in mountain municipalities (Borová Lada, Horní Vltavice, Strážný). This fact results from choosing the statistic basis in 1961 when the western borderland was nearly unpeopled until 1990. The population started to rise after political changes at the beginning of the 1990s. Nevertheless, total population of the Vimperk region decreased by 3.4 %,which shows that the population decline caused by German transfer and the existence of the "iron curtain" had not been compensated for yet. On the other hand, the total population in the Vrchlabí region increased by 7.2 %. The highest growth was recorded in urban centres (Vrchlabí, Hostinné, Vimperk), relatively lower, then, in some municipalities of Vimperk region, which was caused by their newly established recreational function after 1990 (Kubova Huť, Borová Lada). Present population densities are presented in Fig. 5 (see cover p. 2).

However, if we use the year of 1910 as a comparison basis, the situation is completely different (Fig. 8, see

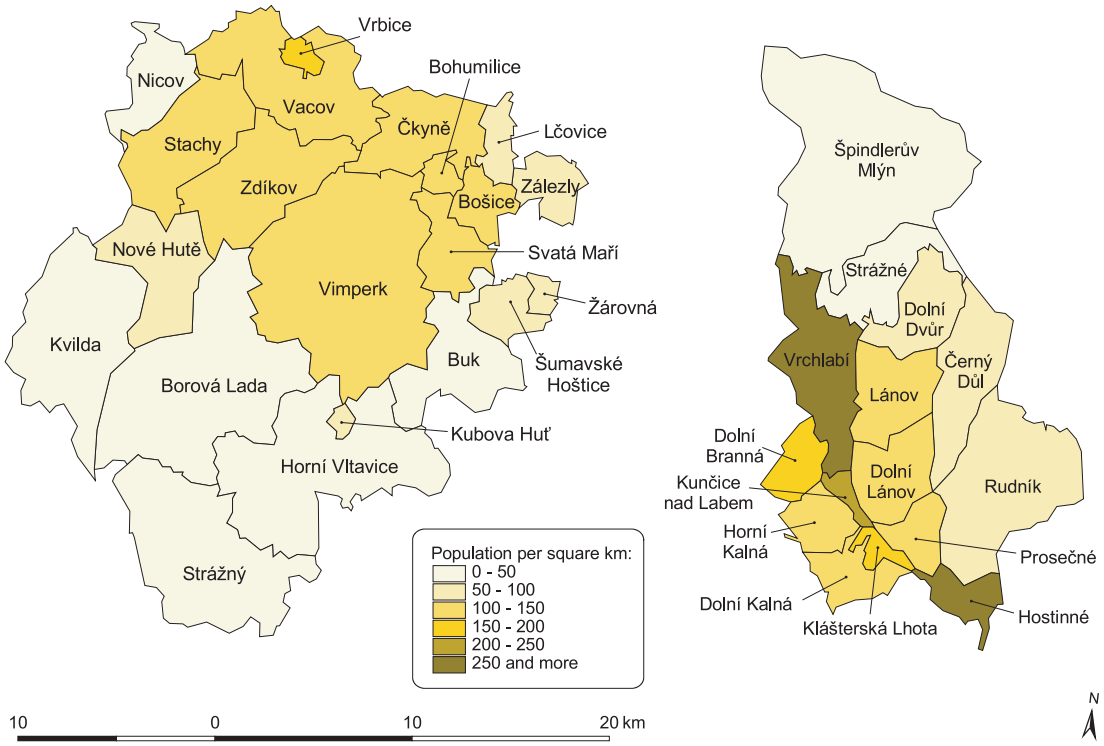

Fig. 2: Population density (1910)
(Source: Retrospektivní lexikon obcí ČSSR 1850 - 1970, díl I/1. ČSÚ, 1974)

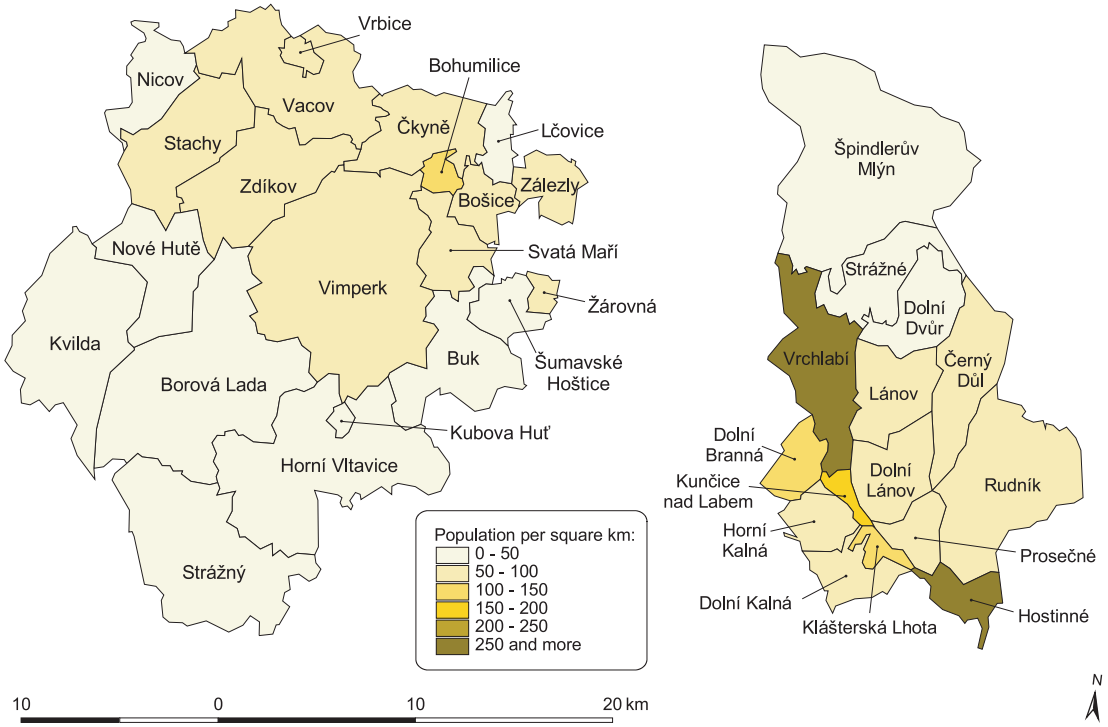

Fig. 3: Population density (1961)
(Source: Retrospektivní lexikon obcí ČSSR 1850 - 1970, díl I/1. ČSÚ, 1974)

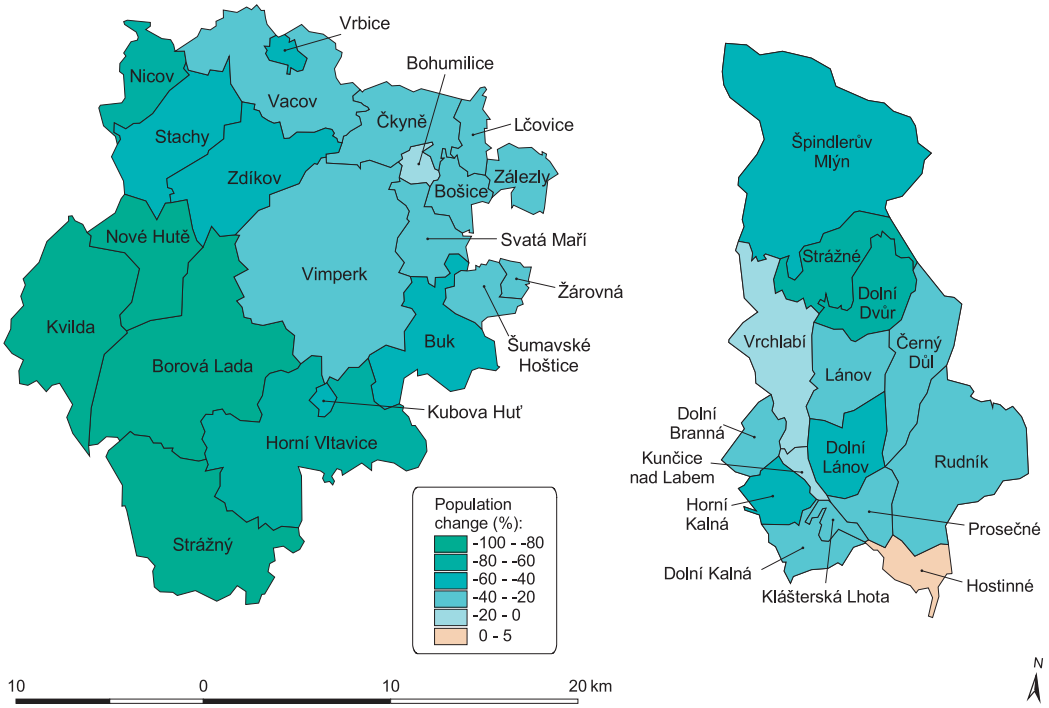

Fig. 6: Population change in 1921 - 1961
(Source: Statistický lexikon obcí v Republice Československé I. Státní úřad statistický, Praha, 192; Retrospektivní lexikon obcí ČSSR 1850 - 1970, díl I/1. ČSÚ, 1974)

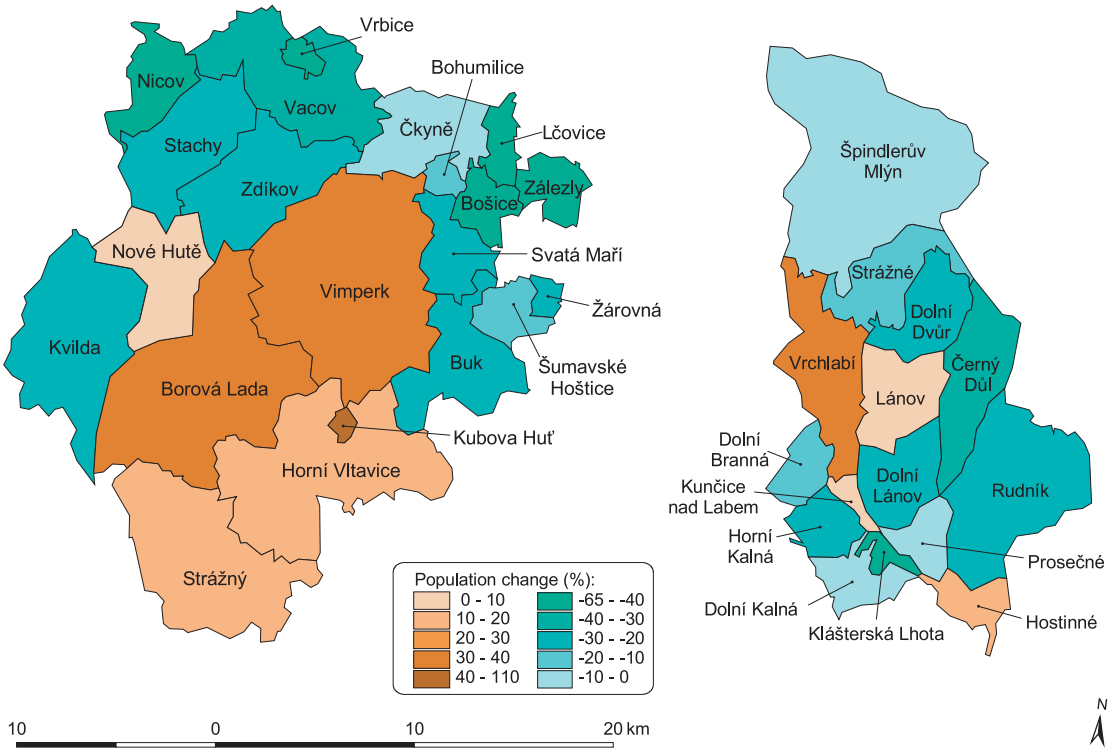

Fig. 7: Population change in 1961 – 2001
(Source: Retrospektivní lexikon obcí ČSSR 1850 - 1970, díl I/1. ČSÚ, 1974; http://www.czso.cz/sldb/sldb2001.nsf/index)

cover p. 3). Almost every municipality experienced a sharp decrease, especially in the Vimperk region where the total population dropped by 53.5 % (with local maxima around 90 % in Nové Hutě, Kvilda or Strážný). In the Vrchlabí region this decrease was less pronounced (25.5 %),with its urban centres of Vrchlabí, Hostinné, slightly growing (13 and 8.5 % respectively). The highest decrease in the Vrchlabí region was recorded in Dolní Dvůr and Strážné – both around 80 %.

Analysing a qualitative influence of ethnicity (according to mother tongue) on the landscape we chose the year of 1921 (Fig. 9). We assume that this year is likely to reflects a long-term national structure in a better way than 1910 and 1931 censuses. The share of German population reached 84.8 % in the Vrchlabí region and 44 % in the Vimperk region. In both regions there is a distinct ethnic boundary. While the Vimperk region is half-reaching into Czech-speaking areas, the Vrchlabí region only touches them on its southwest edge. It is also worth noticing that there is no municipality with a balanced ethnic structure, there is always a majority of one or another ethnic group of various significance. In some municipalities (Dolní Lánov, Lánov, Strážné in the Vrchlabí region and Horní Vltavice, Kvilda, Borová Lada and Nové Hutě in the Vimperk region) the German population exceeded 97 % of the total. A relatively more balanced relation can be found in Buk in the Vimperk region (5 to 1 in favour of the Czech ethicity) and in the town of Vimperk (4 to 1 in favour of the Germans). However, the latter example is somewhat misleading, since the area of today's Vimperk consists of 21 municipalities of 1921 status, whose national structure was more ethnically pronounced as in neighbouring municipalities.

In 2001, as a consequence of political turbulences since 1945, ethnic structure totally changed. The share of the Czech population does not decline under 90 %[2]. The share of German population in both regions is 0.5 %, with local maxima in Strážný (2.1 %) and in Černý Důl (1.1 %). However, absolute figures have more distinct information value. While in 1921 there were 15,797 Germans nationals in the Vimperk region and 28,467 Germans nationals in the Vrchlabí region, in 2001 these figures sharply dropped to 97 and 131 respectively.

4. Consequences

If we want to assess landscape or land use consequences that were caused by the changes of the socio-economic factors, we have to analyse land use changes first in a similar way as in the case of population and ethnicity characteristics. There are at least three types of consequences that can appear in the landscape structure and reflect different land uses: landscape fragmentation, landscape unification, and "minimal" change by which we mean the preservation of landscape structure development reflecting continuous undisturbed economic, political and socio-cultural evolution[3]. Being aware of the above-mentioned facts regarding socio-economic factors, this third possibility is assumed not to be very frequent. Landscape fragmentation and unification can result from various processes, for instance from, a landscape degradation through a loss of biodiversity, from a land use intensity decrease enabling secondary succession, by land reforms, cultivation technology change etc.

We have concentrated on the following land use categories, their temporal changes, and spatial distribution: forests and their share in total area, arable land and its share in total agricultural area, and, finally, permanent grassland and its share in total agricultural area. Water bodies, built-up areas, and gardens and orchards were considered as minor categories either representing only a very small portion of the total area or being quite constant during the period under examination. When analysing land use data we have to be aware that the mere analysis is insufficient without an interpretation of these consequences in the context of socio-economic factors changes.

Comparing the land use data from 1900 (state before land reforms in the 20th century) and 2002 we arrived at the following results. Fig. 10 presents the changes of arable land share in total agricultural land. Presently, there are 10,275 ha of agricultural land in the Vrchlabí region and 15,876 ha in the Vimperk region, arable land making up for 45.6 % and 30.6 %,respectively. Compared to 1900 data, the figures represent a decline by 9.1 % in the Vrchlabí region and a decline by 12 % in the Vimperk region.

The highest declines of arable land share in the Vrchlabí region in 1900 - 2002 were recorded in municipalities formerly inhabited by the German nationals (delimited according to 1921 census), independently of the degree of land fertility. On the other hand, in predominantly Czech areas of this region, which coincide with the most favourable agricultural conditions of both regions with relatively high soil fertility (Prosečné, Klášterská Lhota, Kunčice nad Labem, Dolní Branná, Horní Kalná, Dolní Lánov), the arable land share slightly increased. At higher altitudes the arable land share dropped almost

[2] We shall take into account that the nationality was an obligatory category in 2001 census. With regard to mother tongue the figures would be almost 100 % .

[3] See the preceding part for explanation of the nature of these factors.

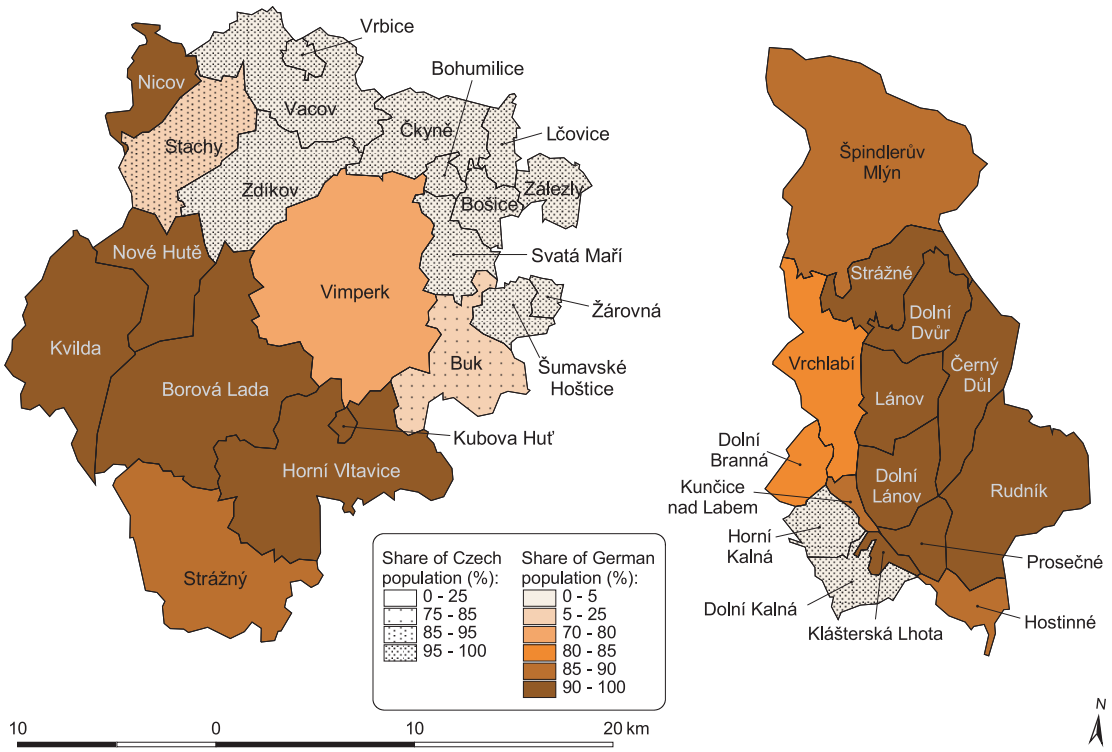

Fig. 9: National structure 1921
(Source: Statistický lexikon obcí v Republice Československé I. Státní úřad statistický, Praha, 1923.)
(Note: 1921 census surveyed Czechoslovak ethnicity, which in our case can be identified with the Czech population.)

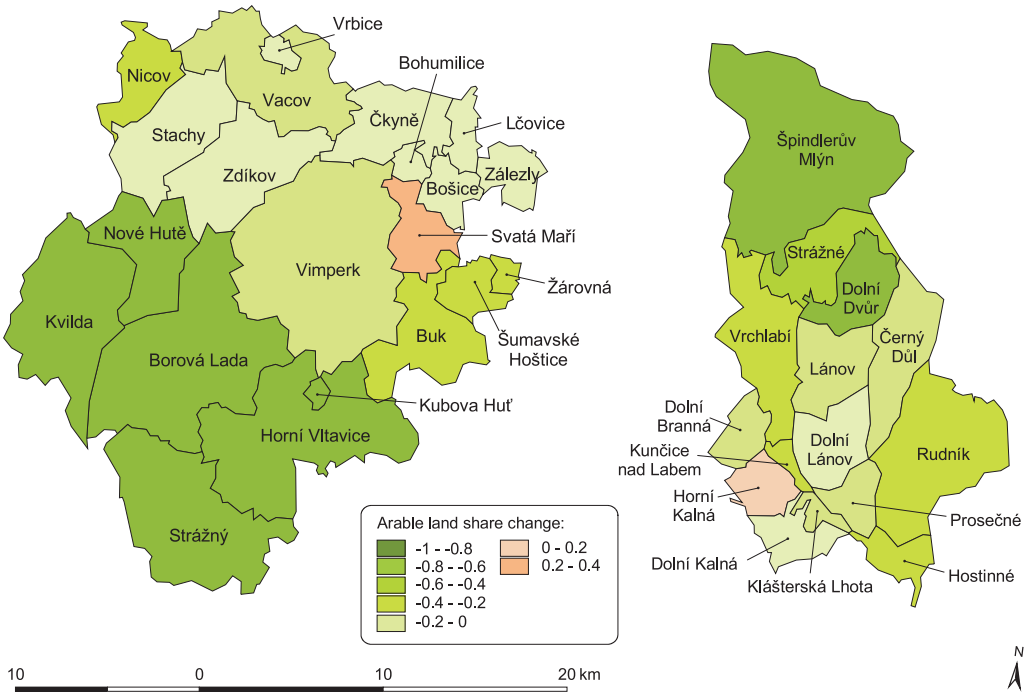

Fig. 10: Change of arable land share in agricultural land (1900 - 2002)
(Source: Lexikon obcí pro Čechy. C. K. statistická ústřední komise, Vídeň, 1904, http://www.portal.gov.cz)

to zero, which was caused both by the German transfer and by changes of agricultural policy.

As in the preceding case the highest declines of arable land share in the Vimperk region were also reached in areas formerly inhabited by the Germans nationals, which, unlike Vrchlabí region, correspond to the highest altitudes. Moreover, a considerable part of the same area was included in the military zone after 1945, which entirely prevented its agricultural use and further deepened the population slump to nearly a zero level. However, at the beginning of the 20th century arable land extended in the Vimperk region to higher locations than in the Vrchlabí region, so even Borová Lada, Strážný, Nové Hutě and Horní Vltavice showed a relatively high arable land share (on average 29 %). This fact resulted from more favourables local conditions such as landscape arrangement, and by the lower level of industrialization compared to Vrchlabí region.

Fig. 11 deals with forested land and its development. Presently, its share in the total area amounts to 54.5 % in the Vrchlabí region and to 59.6 % in the Vimperk region (2002), which are quite high figures. The share of forests in comparison to 1900 increased in total by 10.7 % in the Vrchlabí region and by 13.9 % in the Vimperk region in 2002. In both regions forests expanded in foothills of middle altitudes, while the increase was lower in the mountains as these areas already had a steady high percentage of forests.

Since both areas are not intensive agricultural regions, they rather show a high percentage of permanent grassland (Fig. 12, see cover p. 3). Its share in agricultural land increased by 11.1 % in the Vrchlabí region and by 12.6 % in the Vimperk region in 1900 - 2002. Presently, permanent grassland makes up for 50.5 % of agricultural land in the Vrchlabí region and even 67.1 % in the Vimperk region. The increase recorded in forests and permanent grassland was reached at the account of the share of arable land. This fact reflects contemporary trends both in the EU and in the Czech Republic. However, in the regions under study the change took place much earlier and was sharper in connection with population and ethic structure changes.

5. Sustainable land use

Sustainability is usually assessed as a relation between environment and society and its balance, to be more explicit, how and to what extent human activities affect environmental characteristics. We would concentrate rather on a so-called "strong" sustainability than on its "weak" form, which means that we advocate an

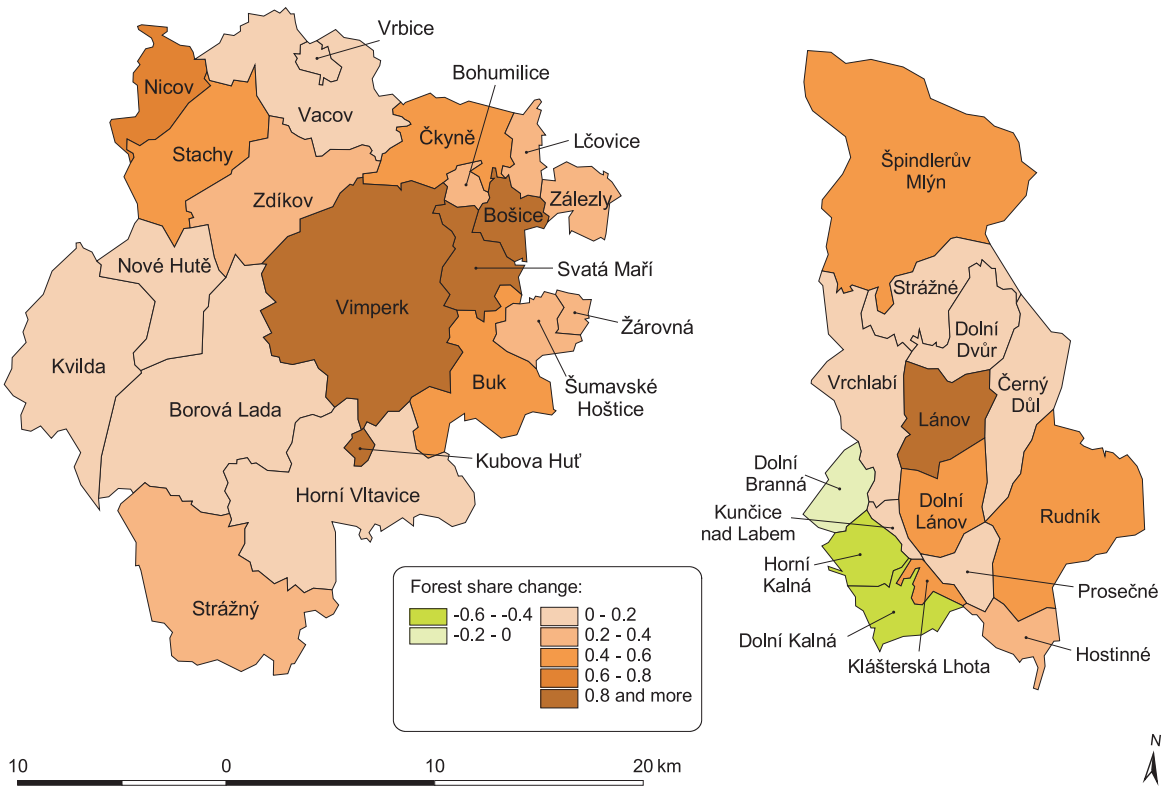

Fig. 11: Change of forest share in the total area (1900 - 2002)
(Source: Lexikon obcí pro Čechy. C. K. statistická ústřední komise, Vídeň, 1904, http://www.portal.gov.cz)

ecosystem approach stressing the primary value of the preservation of ecosystem, not their (excessive) utilization (Hunter, 1997).

The concept of sustainability also takes into account carrying capacity of particular landscape. P. K. Rao (2000) defines carrying capacity as a maximum sustainable load, which can be imposed on the environment without a loss of ability of the environment to support human activities. When the carrying capacity is exceeded, it leads to landscape disturbances, which have adverse effects on economy and on the existing land use (for instance tourism, agriculture etc.). Thus landscape or ecosystem resilience (sensu Míchal, 1994) is an important index of sustainability.

Sustainable landscape is defined as a landscape, which indicates concordance between its state and processes on the one hand, and its function on the other. Of course, such a landscape shall conform to the above-mentioned characteristics regarding carrying capacity and balanced man - environment relationship. Landscape processes in both regions showed the same features, but their interpretation can be different. What we can see as positive in one region can have negative aspects in the other. While in the Krkonoše Mts. the development of socio-economic factors affecting landscape was more or less continuous with certain negative qualitative changes, the Šumava Mts. experienced a sharp discontinuity. Its spatial landscape pattern changed, approximated natural conditions (introduction of forest succession stages), and the landscape became almost entirely uninhibited, which resulted in a different conception of its function. If a landscape without people shall have predominantly an ecological function, a phenomenon that can be understood negatively in a cultural landscape, can be seen as positive in such a case (e. g. secondary succession leading to climax).

In both regions considerable areas are protected as national parks and biosphere reserves. It sets certain rules for human behaviour in these areas, it certifies their environmental values, which could be seen as a positive influence of the political factor. But let us first focus on the situation in Krkonoše Mts. Since the 2nd half of the 20th century until today both the political situation and the economic mode had adverse effects on sustainability. Traditional land uses (regular cattle grazing, hay production and maintenance) were abandoned, which together with increasing environment pollution led to gradual degradation of various ecosystems, especially mountain meadows. Moreover, the Krkonoše Mts. started to be used for extremely intensive recreation of the "working class". After 1990 the situation slightly changed. Tourism unfortunately retained its negative quantitative aspect and there is still need for its regulation, but it partly gained also a positive qualitative aspect. Most owners reintroduced some methods of traditional land use (mountain agriculture), such as meadow mowing, which contributes to the landscape character preservation.

In case of the Šumava Mts. the political and economic changes in the 2nd half of the 20th century paradoxically contributed to "higher" level of its ecosystems sustainability. Under normal circumstances these changes would cause harm to the local population and thus could not have been seen as "sustainability friendly", but since the population figures in large areas of the Vimperk region decreased considerably, the changes can be considered as indifferent to people and positive to landscape.

The Šumava Mts. started to be used for recreational purposes since 1990 and the population slightly increased. So far, present-day land uses, intensity of human activities and landscape structure contribute to balanced relationship between the environment and society. On the other hand, the Šumava Mts. should learn a lesson and avoid mistakes that happened in the Krkonoše Mts. considering land uses and economic utilization of the mountain regions.

One of the economic modes of higher areas utilization in both regions that in a way respects strong sustainability principles is organic farming (Robinson, 2004). It is characterized by extensity and friendliness to environment, having also landscape maintainance function, it can motivate agrotourism development, but it must be supported by external resources in order to keep its functions (subsidies, tourism incomes). In our research we studied certified organic farms (according to

		share of org. agr. land in total agr. land	arable land	permanent grassland	share of org. perm. grassland in total perm. grassland (%)
Vrchlabí region	abs. (ha)	736.7	11.8	624.9	12.0
	rel. (%)	7.2	15.2	84.8	
Vimperk region	abs. (ha)	4674.9	3.5	4668.9	43.8
	rel. (%)	29.4	0.1	99.9	

Tab. 1: Organic farming in Vrchlabí and Vimperk regions (2003)
(Source: Inspection of organic farming, www.kez.cz.)

KEZ, o. p. s.)[4]. There are four entrepreneurial subjects in the Vrchlabí region and 25 subjects in Vimperk region. The majority of these organic farmers are engaged in rearing meat cattle. Organic farming is one of the most favourable types of land use utilization in mountain and submontane areas, which comes out from historic local agricultural forms. A high percentage of land cultivated by organic farmers in the Vimperk region (29.4 %) can be ascribed to the more favourable terrain configuration (vast plateaux, less dissected terrain, milder slopes) and probably also to the influence of Bavarian agriculture. An almost absolute majority of rural land used for organic farming can be found on permanent grassland.

6. Conclusion

All selected socio-economic factors, both initiating and dependent, proved to have a significant impact on the secondary landscape structure with their characteristics in both regions being similar. In general, lower population density could mean lower anthropic pressure on the ecosystems or landscapes. At the beginning of the 20th century the population was more dispersed, which mainly applies to the Vimperk region. In the 2nd half of the century, the population started to show clustering and two types of landscapes were formed: more densely populated areas with urban centres and almost unpopulated regions. However, it should be noted that there is still important pressure on the landscape by tourists and by second home users, which has been stressed during the last 50 years. Although we acknowledge the importance of the above mentioned groups, this article is focused predominantly on the local population and its quantitative and qualitative changes. However, in our opinion the degree of distortion caused by omission of the factor of tourism is not very prominent. The proportion of land use categories is not influenced by tourists and second home owners whose motivations are recreational, not productive.

Qualitative structure of the population, here expressed by ethnicity, is important too. While the German population was able to cultivate even higher located areas of both regions, apart from the overwhelming livestock production they could also grow crops, the Czech population was concentrated on the cultivation of more fertile areas. These areas are characteristic of higher share of arable land than higher altitude areas, which are distinct by a higher proportion of permanent grassland.

In the 20th century natural demographic development experienced several serious turbulences. German transfer after the World War II can be considered the most important for the landscape changes, since it affected both quantitative and qualitative population characteristics of regions formerly inhabited by Germans nationals. The population decline was only partly compensated for in the Vrchlabí region, but some parts formerly inhabited by the Germans in the Vimperk region remained deserted. The newly arriving population were not able to link to and to continue in traditional land uses, which had contributed to the high landscape ecological stability. The historical continuity of secondary landscape structures was disrupted.

If we analyse land use spatial changes during the 20th century, the former ethnic border becomes apparent even without knowing population and ethnic development. The areas formerly inhabited by the German population are represented by a very significant arable land share decline, especially in the Vimperk region (Fig. 13). On the other hand, the regions, formerly inhabited by Germans, experienced an increased share of forest. In areas formerly inhabited by Czechs this trend was not so distinct. The total share of agricultural land increased in the Czech regions and declined in German ones.

Sustainability is influenced by population figures, which is a quantitative characteristic, and by land use type, which can be seen as a qualitative characteristic. In the Krkonoše Mts. the political and economical changes (expressed in the above mentioned socio-economic factors) contributed to qualitative decrease in sustainability. In contrast land use development in the Šumava Mts. created a positive trend in sustainability[5].

While the socio-economic factors had similar influences on the landscape in both regions and land uses could be considered quite sustainable in the 1st half of the 20th century, the situation changed in the 2nd half of the century. Changes of socio-economic factors led to a sustainability deterioration in the Vrchlabí region and to its improvement in the Vimperk region. Sustainability today is determined mainly by tourism, to a lesser extent by favourable land uses such as organic farming. The former should be maintained in such a way that the carrying capacity of the landscape is not exceeded, the latter should be supported. However, the most appropriate human action in some areas of Vrchlabí and Vimperk regions, which are ecologically stable, is to do nothing, to stay outside the nature in order to preserve sustainable landscape.

We assume that knowledge acquired can be applied to the whole former German settlement in the Czech

[4] KEZ - Inspection of Organic Farming (www.kez.cz), 2003 data.

[5] However, we shall be aware of negative features of political decisions that affected German population after the World War II.

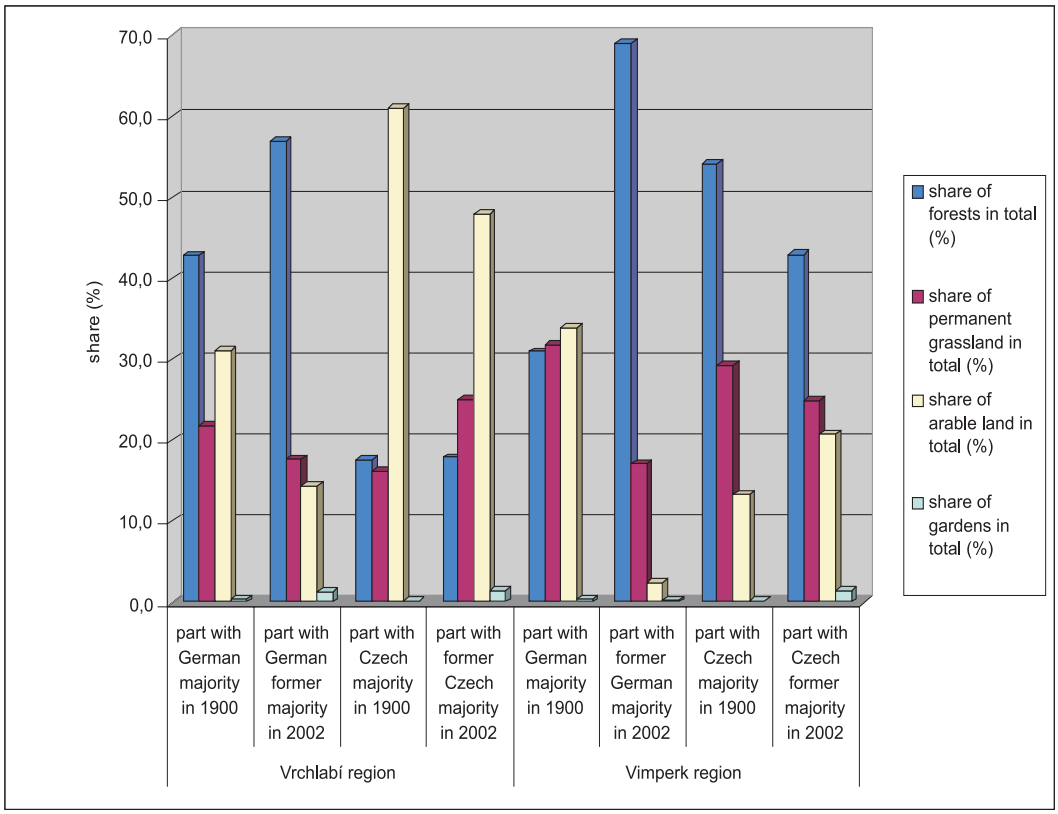

Fig. 13: Differentiated land use development (1900 – 2002)
(Source: Lexikon obcí pro Čechy. C. K. statistická ústřední komise, Vídeň, 1904. http://www.portal.gov.cz)

Republic, with slight differences between western borders ("iron curtain") and the rest of borderland, and for the Czech areas located in higher altitudes of border mountain ranges.

Acknowledgement:

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Reviewers

RNDr. Marie NOVOTNÁ, CSc.
RNDr. Václav POŠTOLKA

Reviewer´s note:

The assessment of landscape development and use exemplified by two studied mountain and piedmont "microregions" points exactly here to the idleness and considerable limitations of using (though very accurate) "hard data" on the development and population density in a certain region and official land use records by municipalities (cadastral areas). The analysis of land use changes and the understanding of these changes in particular (here in a concept of the "landscape structure") calls for working with the categories of "land users" whose increasingly important (landscape affecting) group are land users for the purposes of recreation, tourism and sports, as well as with the categories of a different concept of "area fragmentation" working with the particularly significant areas of nature conservation and landscape protection and/or other categories of protected areas. None of these unfortunately appear either in the evaluation of the two spaces or in comments to presented findings and conclusions, which is in my opinion an obvious defficiency not only of this particular paper but of most hitherto attempts at an evaluation of landscape development and land use as long as they make use of this stereotype which keeps them only on the surface of the issue by means of the "hard data" while ignoring a number of much more complex mechanisms of reasons and consequences of the rapidly increasing pressure onto the "landscape fragmentation". The structure of "land users" whose number is often markedly greater than the number of residents and their concerns (demands) differentiated in terms of time and space reflect ever more in an increasing load on the landscape and built-up areas. Both in the Vimperk region and in the surroundings of Vrchlabí this is the only and proper way of how to identify the high and in some cases extreme densities/intensities of land use, which would otherwise remain hidden at a traditional view through the living populations and their densities.

V. Poštolka

DEVELOPMENT AND TRANSITION IN A GLOBALIZED WORLD

Eva Kallabová, Viktor Klein, Petr Klusáček

The symposium organized on the occasion of the 65th birthdays of Prof. Dr. Dr. h.c. mult. Horst Förster and Prof. Dr. Gerd Kohlhepp took place at the Geographical Institute of Tübingen University April 29th, 2005. The topic was "Development and transition in a globalized world" and had the subtitle "Comparing Latin America and Eastern Europe". Approximately 100 participants listened to lectures and participated in discussions about the following thematic sections (with clear macro-regional emphasis):

- Current tendencies in urban development
- Structural changes of the rural space
- Changes in the development cooperation

The lecturers were important European scientists such as Prof. Dr. Axel Borsdorf (University Innsbruck), Prof. Dr. Sebastian Lentz (IfL Leipzig), Prof. Dr. Jörg Stadelbauer (University Freiburg), Prof. Dr. Günter Mertins (University Marburg), Prof. Dr. Ludwig Ellenberg (University Berlin) and Dr. Christoph Beier (GTZ Frankfurt), all of which deal with the study of regional disparities, social processes and the effects of economic transition in Eastern Europe or Latin America. The comparison of the respective globalization effects was the basic concept of the symposium.

Especially thanks to both honourees, Eastern Europe and Latin America have traditionally been research areas at the Geographical Institute in Tübingen for many years. **Prof. Dr. Dr. h.c. mult. Horst Förster** has been the chairholder of the Department of Eastern European Geography since 1991. He is also the president of the Institute of Danubian-Swabian History and Geography. As an expert on urban, economic and regional geography, he puts regional focus on Eastern Europe. **Prof. Dr. Gerd Kohlhepp** has worked in Tübingen since 1978 (chairholder of the Department of Economic and Social Geography). His research activities are focused on the dynamic processes in the developing countries with regional emphasis to Latin America and especially Brazil.

Fig. 1: Auditorium during the Symposium at the Geographical Institute of Tübingen University

Photo: E. Kallabová

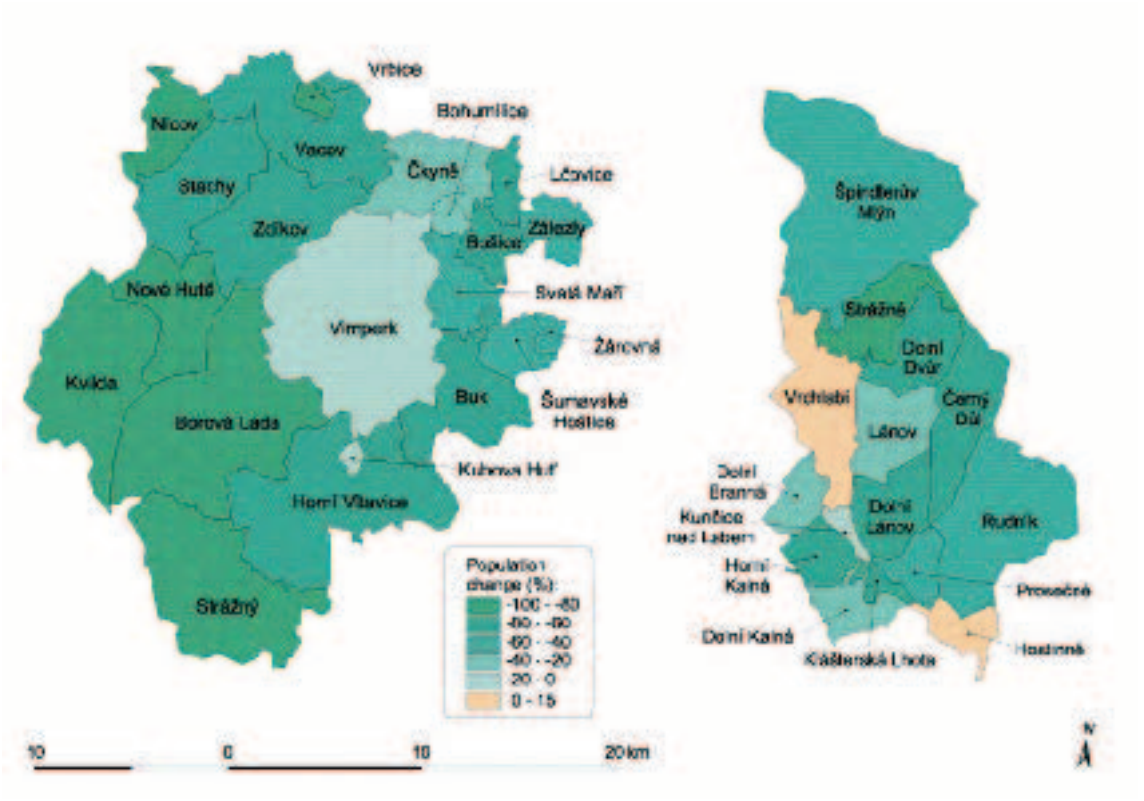

Fig. 8: Popuplation change in 1910 – 2001
(Source: Retrospektivní lexikon obcí ČSSR 1850 – 1970, díl I / 1. ČSÚ, 197; http: / / www.czso.cz / sldb / sldb2001.nsf / index)

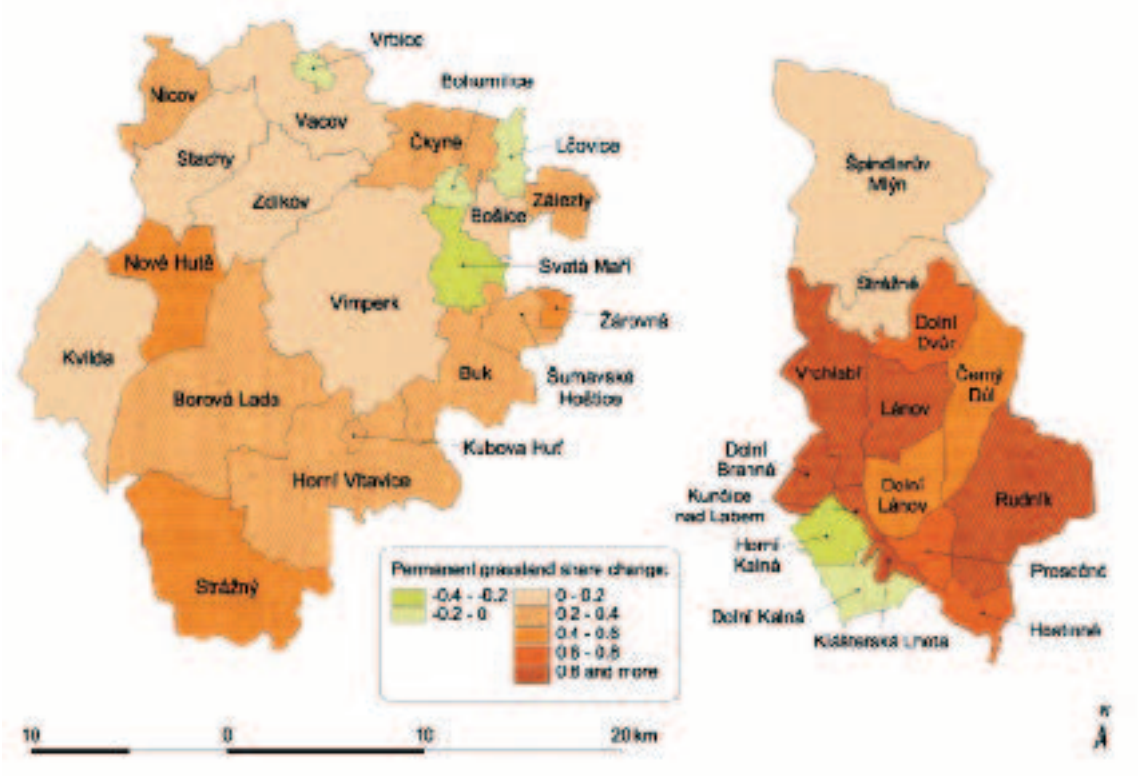

Fig. 12: Change of permanent grassland share in agricultural land (1900 – 2002)
(Source: Lexikon obcí pro Čechy: C. K. statistická ústřední komise, Vídeň, 1904; http: / / www.portal.gov.cz)

Illustrations to P. Klapka´s et al. paper.

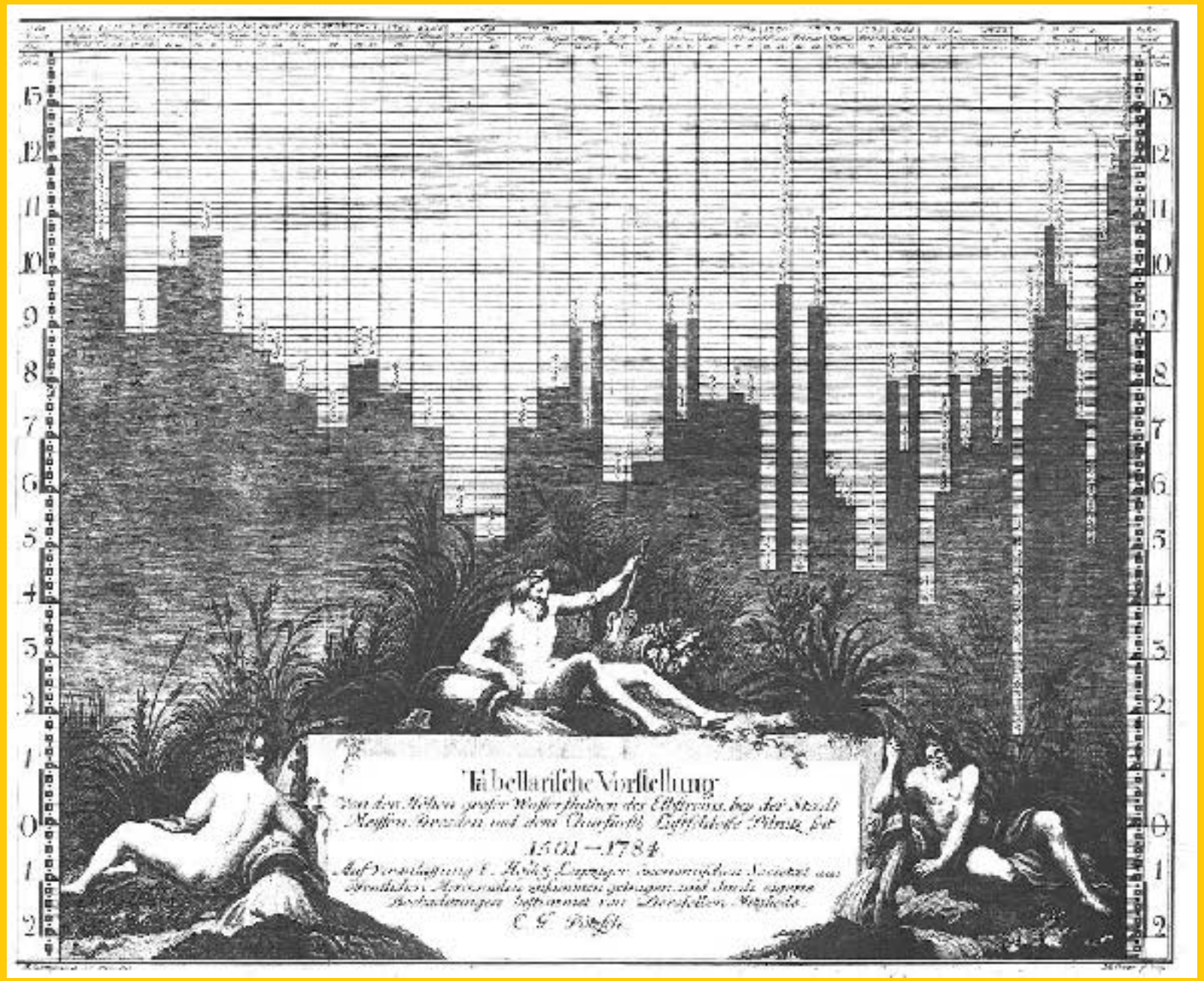

Fig. 10: Culmination water levels of high waters on the Labe (Elbe) River in Meiseen, Dresden and on the Chateau of Pillnitz in 1501-1784 according to C. G. Pötzsch (1784). Original size 42 x 49 cm.

Illustration to J. Munzar´s et al. Paper.