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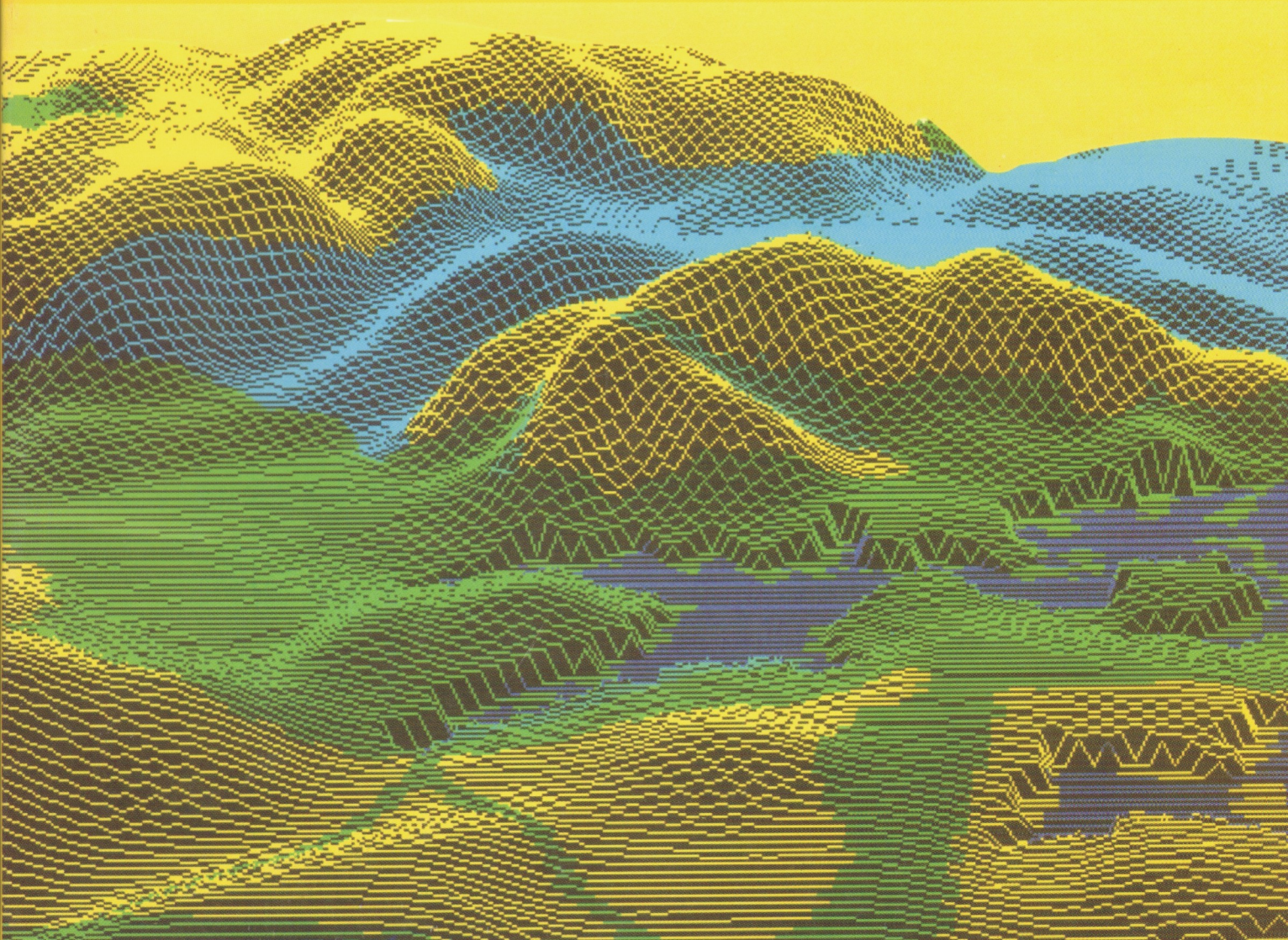

The Moravskoslezské Beskydy Mountains with specific forms of recreation in cottages

Photo: J. Havrlant

The recreational territory of Nýdek situated on the Czech-Polish border has got potential for development as an international ski centre and for other forms of tourism

Photo: J. Havrlant

Illustrations to the paper of J. Havrlant.

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PRESENT LAND USE CHANGES IN THE CZECH CULTURAL LANDSCAPE: DRIVING FORCES AND ENVIRONMENTAL CONSEQUENCES

Zdeněk LIPSKÝ

Abstract

Land use and landscape structure of the cultural landscape are changing according to the changes in the society. The paper summarises historical development of the Czech rural landscape since the Neolithic Age till the present, its etapization and a rough typization of the Czech rural landscape according to the length of its historical development. Attention is paid to the deep landscape structure changes during the last 50 years (socialist collectivization) and especially to the present trends in developments of the Czech rural landscape since 1989. Present land use changes are characterised by a decrease in the area of arable and agricultural lands and an increase in the area of permanent grasslands and forests. The results of the research also confirm cogently the trend of remarkable regional differences depending both on natural (climate, soil fertility) and socio-economic conditions. Ecological consequences of the present development of the Czech rural landscape are assessed as positive; however a danger exists of abandoning agricultural lands in marginal regions, breakdown of historical settlement structure and extinction of characteristic features and aesthetic values of cultural landscape.

Shrnutí

Současné změny ve využívání české kulturní krajiny: hlavní příčiny a důsledky

V příspěvku jsou shrnuty autorovy výzkumy změn ve využívání a struktuře české venkovské krajiny. Je uveden stručný vývoj české kulturní krajiny od neolitu do současnosti s jeho etapizací a přehlednou typizací české kulturní krajiny v závislosti na stáří historického vývoje. Pozornost je věnována zejména současným změnám ve využívání půdy, které jsou demonstrovány na příkladech z několika modelových katastrálních území. Výsledky potvrzují celkový trend úbytku zemědělské a zejména orné půdy a mírného přírůstku trvalých travních porostů v období po roce 1989. Charakteristické jsou velké regionální rozdíly mezi úrodnými nížinami s příznivými přírodními podmínkami, kde jsou změny ve využívání krajiny minimální, a mezi horskými a podhorskými oblastmi, kde dochází k masívnímu opouštění zemědělské půdy, zatravňování a zalesňování. Ekologické důsledky těchto změn jsou hodnoceny převážně jako pozitivní z důvodu snížení půdní eroze, zvýšení ekologické stability krajiny a celkové kvality prostředí. Sociální důsledky však mohou být rozporuplné s ohledem na ztráty pracovních příležitostí, úbytek obyvatel venkovských sídel a ztrátu charakteru tradiční kulturní krajiny. Státní orgány řeší tento problém podporou mimoprodukčních funkcí venkovské krajiny.

***Key words**: land use, landscape structure, cultural landscape, land use changes, Czech Republic*

1. Introduction

Landscape is changing all the time. Cultural landscape and its land use are a mirror of the state of the society. Any changes and developments in the society (social, economic, technological, political, demographic) are reflected first of all by the way of land use, i.e. by the secondary landscape structure, and consequently in the physiognomy, scenery and functioning of the landscape.

Czech landscape like other cultural landscapes of Central Europe has undergone a long-term historical development marked by longlasting permanent

interactions of nature and society. Each historical period carves its characteristic shapes, features and scenic views in the landscape, both in details and in the general appearance of the landscape. Some of these shapes and features sustain as historical traces in the landscape despite the changing way of cultivation and management, most of them, however, pass away and vanish. Many regional types of cultural landscapes in Bohemia, Moravia, Slovakia as well as in other countries extincted in the past. Their outlook so admired by painters and photographers has been preserved only in cadaster maps, archive aerial photographs and pictures. Reasons to this phenomenon are generally known: technological changes in the landscape management and cultivation, changes of ownership, intensification and extensification of agricultural production, countryside depopulation and other (Lipský, 1998). Although the ratio and the power of the natural and cultural (anthropogenic) processes are variable during the different historical periods and in the different regions (Fig. 1), anthropogenic pressures on the landscapes have been gradually increasing as to the power and intensity during the historical development. They became vital and necessary in the cultural landscapes to maintain them productive and stable.

2. Historical development of the Czech rural landscape

Czech cultural landscape is a result of a long-term development under a dominant anthropogenic influence. The most fertile lowlands and especially low loess hilly lands were settled, deforested and used as agricultural lands for at least 6000 years since the Neolithic Age.

It is difficult to assess the proportion of agricultural lands and forests which varied in accordance with the varying intensity of anthropogenic pressure on the landscape. After a temporary contraction of the agricultural area in the period of the migration of nations in the first half of the first millennium the expansion of the cultivated landscape continued during the Slavonic colonization from the sixth to ninth centuries. Slavonic agriculture with very small fields bordered by wide strips of grasslands and varied mosaic of cultivated crops, was relatively friendly to environment[1)].

During the medieval colonization from the twelfth to the fourteenth centuries, the area of arable and agricultural deforested lands was extended into highlands with worse soils and climatic conditions. The agricultural area was even bigger in comparison

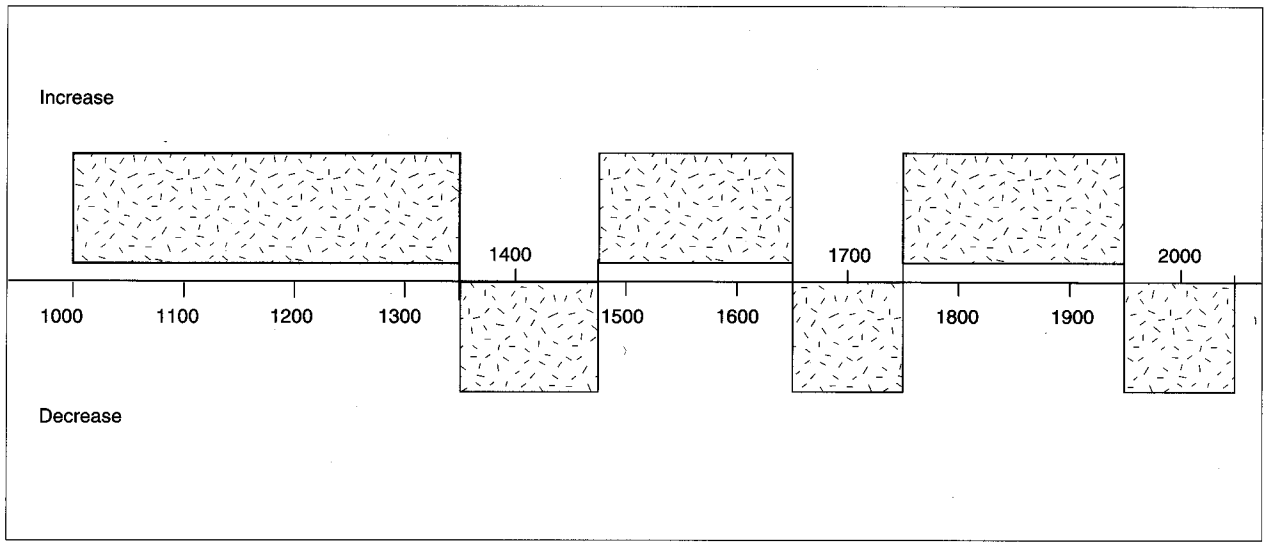

Fig. 1: Cycles in development of the area of agricultural land in Europe (after Rabbinge et al., 1996)

[1)] *Generally speaking, disturbance of natural vegetation, deforestation and the origin of agricultural landscape with open formations of the cultural steppe signify a fundamental reversal in the hitherto natural development of the landscape and in principle a deep change of landscape structure. On the other hand, substitution of monotonous natural vegetation by a varied set of cultural and semi-cultural formations (communities) contributed to increased diversity of the landscape (Ložek, 1990).*

with the present state in many parts of the country. Ecological consequences in the landscape were highly negative: disturbed water regime, disastrous soil erosion[2] and decrease in soil fertility (Stehlík, 1981). Medieval famines, peasant risings and Hussite wars as a reaction to this situation caused a decrease in the number of inhabitants and a temporary or partly permanent extinction of great numbers of rural settlements in areas with poor soil conditions. Many of these localities have again become covered with forest.

The following stabilization of the landscape was connected with successful feudal agriculture in the 16th century. Removal of a monopoly in cereal production, development of efficient sheep breeding and fish farming resulted in a cultural landscape with a high proportion of grasslands and many artificial fishponds.

	1845	1900	Change
Arable land	47.5	50.5	+3.0
Meadows	10.1	10.0	-0.1
Pastures	7.6	5.0	-2.6
Gardens	0.9	1.3	+0.4
Vineyards	0.0	0.0	0.0
Total Agricultura Land	66.2	66.8	+0.6
Forests	29.2	29.1	-0.1

Source: Jeleček, 1984

Table 1: Development of land use in Bohemia, western part of the Czech Republic, 1845-1900, in percentage

The 17th century was characterized by a temporary abandonment of a half of the cultivated lands and by a penetration of natural succession communities (forest stands and shrubs) into the agricultural lands. This was caused by a markedly lower anthropogenic pressure on the landscape due to the strong decrease in the number of inhabitants and economic disruption in and after the 30-Year War (1618-1648). From the beginning of the 18th century arable lands started to increase at the expense of permanent grasslands in the Czech landscape.

Photo 1: Intensively used agricultural landscape of Central Bohemia with dominant arable lands and a minimum share of permanent greenery (Z. Lipský)

[2] *H.-R. Bork (1988) states on the basis of exact measurements of sediments and soil profiles in highlands of Germany that the average year soil run-off on slopes was 2250 tons per hectare in the decade of the most intensive erosion (1340-1350)! At that time deep gullies cut through the soil layer up to a bedrock were formed on slopes in the whole Central Europe. The are lasting up till now as inactive forms of relief making cultivation impossible (Lipský, 1991).*

We can precisely follow up land use and landscape structure changes and developments using detailed cadastral maps and statistical data since the first half of the 19th century for at least the last 150 years. The share of arable lands increased gradually until the end of the 19th century. The share of fallow (temporary unused) arable lands decreased from 28% at the beginning to 1% at the end of the 19th century. The area of used arable lands increased by 50 % during the whole 19th century. At the same time, permanent grasslands, especially pastures, were rapidly decreasing. The decrease in forest area stopped in the first half of the 19th century; during the second half of the 19th century the forest area was stabilised. The expansion of agricultural area also stopped in the second half of the 19th century.

At the beginning of the 20th century, arable land represented more than 75% of the agricultural land in Bohemia and Moravia - more than in any other comparable country in Europe at that time. Agriculture occupied two thirds of the country and in the most productive regions the share of agricultural land reached over 80 - 90%. The area of forest remained historically stable at about 30%.

The ratio between permanent grasslands and arable land developed ecologically unfavourable within the framework of the agricultural landscape. Many fishponds and most pastures on fertile soils were changed into arable lands. Meadows remained to a limited extent in wet alluvial floodplains, along streams etc. This situation was moderated and compensated by the small-scale landscape structure formed by small fields with a varied mosaic of planted crops. The land use was much more environmentally sensitive, despite the high proportion of arable land. Besides the traditional forms of agricultural production the variety of landscape structure, formed by a mosaic of little patches separated of linear elements, played a decisive role in the stabilization of the agricultural landscape.

The traditional character of the Czech rural landscape with tiny patches of fields, a thick web of country roads lined with fruit trees, so admired by painters and photographers, survived up till the half of the 20th century. Deep and dramatic changes during the period of the socialist agriculture in the 2nd half of the last century are described in part 3.

Since the fundamental change of landscape structure, flows and processes in the Neolithic time (when virgin forest stands started to be turned into agricultural steppe), three characteristic phases repeated in the historical development of the Czech rural landscape (Lipský, 1991):

1. Disturbance of ecological equilibrium resulting from an expanded anthropic pressure on land (relative overcrowding) caused by changes in the way of production (technological, economic changes, property relations). Examples: extension of the area of arable land in the Late Bronze Age caused by a relative overcrowding and accompanied by accelerated soil erosion and floods, culminating medieval colonization in 13th - 14th centuries with disastrous surface and gully soil erosion, substantial changes in the agricultural system at the end of the 18th century connected with a tilling of abandoned lands and removal of ponds and wetlands in the landscape or deep dramatic changes in the landscape structure with many adverse ecological consequences during the socialist collectivization since the fifties and during the intensification of socialist large-scale agriculture in the seventies and eighties of the last century.
2. Establishment of the secondary ecological equilibrium in the landscape responding to a temporary stabilisation of a given way of production, with relatively stable land use and fixed inputs and outputs (flows) of energy and materials into and from the rural (agro)ecosystem. Examples: primitive Neolithic shifting cultivation on small fields, agriculture of old Slavs with a diversity of planted crops forming a varied mosaic of small fields bordered by grass strips (6th - 10th centuries), successful and developed feudal agriculture of the 16th century or successful small-scale private agriculture of the 19th and the 1st haf of the 20th centuries, sustaining a varied mosaic of patches in the small-scale rural landscape.
3. Temporary and at some localities even permanent change in the hitherto development of the cultural landscape characterized by a significant decrease in anthropic loads and pressures on the rural landscape. These shorter periods were usually caused by economic and social disruptions accompanied by a decrease in the number of inhabitants (wars, revolutionary movements etc.). Ecological consequences are usually positive because of more space for natural stabilising processes, especially natural and semi-natural succession. Examples: a period of nation migration in the lst half of the lst millenium, the 30-Year War in the 17th century (characterised in Bohemia by 30 percent decrease in the number of inhabitants, a destruction and disappearance of many villages and a half of the cultivated land temporary left aside) or a period after the World War II. (evacuation of Germans from the borderland (Sudeten) after 1945, persecution of land owners under communist government after 1948). Afforestation and grassing on less fertile soils, extension of shrub communities and woodlands on steep slopes and wetlands in undrained alluvial floozdplains are among main landscape ecological changes.

	1900	1948	1968	1989	1999	Change 1968-89	Change 1989-99
Arable land	51.7	44.8	42.3	41.1	39.3	-1.2	-1.8
Meadows	9.1	9.2	8.2	7.2	8.0	-1.0	+0.8
Pastures	5.2	4.4	3.7	3.2	3.4	-0.5	+0.2
Gardens	1.3	1.7	2.5	2.8	2.8	+0.3	0.0
Vineyards	0.2	0.1	0.1	0.2	0.2	+0.1	0.0
Total Agricultura Land	67.5	60.2	56.8	54.5	53.6	-2.3	-0.9
Forests	28.6	30.5	33.0	33.3	33.5	+0.3	+0.2

Source: Statistical Yearbooks of the Austrian Monarchy and of the Czech Republic

Table 2: Land use development in the Czech Lands, 1900-1999, in percentage

But the development of the rural landscape was not so simple and at the same time we can find different phases and developments in different regions of the country. This fact was accepted both for the entire period of the socialist agriculture and for the present time (in the 1990s).

According to the historical development and to the length of the presence and influence of the man in the landscape, it is possible (very generally) to distinguish 3 different types of the Czech rural landscape:

1. Old agricultural landscape settled by man, deforested and used as agricultural land for food production since the Neolithic Age for at least 6 000 years. It corresponds to warm climatic regions of the country - Bohemian and Moravian lowlands and low loess hilly lands up to 300 - 350 m a.s.l. with the most fertile soils. People always empirically used the natural potential of soil for agricultural plant production. The present proportion of forest stands in this old cultural landscape is about 10 percent or less.
2. Cultural landscape developed in the 12th-14th centuries during the Medieval colonization of the wild landscape. Prevailing agricultural production on less fertile soils was combined with forestry. Cultural landscape was formed by a mosaic of arable lands (matrix), forests and grasslands on an undulated relief, under a moderate climate up to 600 - 700 m a.s.l. The present proportion of forests is about 25 - 40 percent.
3. Young cultural landscape in low mountains of the Central Europe was settled mostly with dispersed settlements during the 16th-18th centuries. Forestry, aimed at growing spruce monocultures under a cold humid climate, prevailed as the main economic activity. The present proportion of forest stands is about 50 percent or more and spruce forests function as a matrix of the landscape. Deforested land is covered mainly by grasslands on slopes. Dispersed (scattered) settlements and domestic animals on pastures are among typical features influencing the scenery and attractivity of these landscapes. Winter sport areas, hotels and recreation facilities recently changed the face of this type of the natural/cultural landscape.

3. General trends in recent land use and landscape structure changes

For the long time of previous historical development, agriculture played the main role in self - sufficiency in all regions of the country. Recent developments in land use, investigated with the help of statistical data show - in contrast to the development in the 19th century - a continuous decrease in the area of arable lands and total agricultural land during the whole 20th century (Table 2). The low share of permanent grassland continued on decreasing till 1989. But the total change of the landscape structure in the last 40 years was much more significant.

	Relative values (%)					Length of border lines (m)		
Year	Arable land	Permanent Grass-land	Orchards and Gardens	Forest and Shrubs	Other	Between different land use categories	Inside Arable Land	Length of fiel roads
1841	73	22	0	4	1	59605	42360	12660
1954	80.5	10	3	5.5	1	39790	40580	12410
1992	81	5	2	12	0	32615	3605	4890

Source: Measurements from cadastral maps (1841) and aerial photographs (1954,1992)

Table 3: Quantitative characteristics measured in a typical rural landscape of Central Bohemia (investigated area is 350 ha)

Photo 2: Water erosion on fertile loess soils remains a serious problem in areas of intensive agriculture (Z. Lipský)

There were many land use and landscape structure changes throughout history, but those that have occurred since the 1950s have no equivalent in terms of their speed and extent. During the transition to a large-scale socialist production, landscape structure changed rapidly resulting in a significant simplification. The agricultural landscape was considered only as a productive area. It was „cleaned" and subordinated to the requirements of heavy mechanization. According to official government instructions, plots of arable land were unified so as not to be interrupted by meadows, pastures, shrubs or other elements hampering efficient cultivation. The size of agricultural holdings increased 50 fold and most of the stabilizing elements in the large-scale open landscape were removed (Lipský, 1995).

Photo 3: Alluvial meadows in floodplains along water courses function as an important stabilizing and aesthetic element of the cultural landscape (Z. Lipský)

Photo 4: Wet meadows along small water courses are endangered by abandoning of regular agricultural use and by a process of succession of shrubs and trees (Z. Lipský)

The origin of the large-scale landscape formed by large collective open fields regardless of the fine natural structure of the landscape was the result of this recent development. As mentioned above, it was accompanied

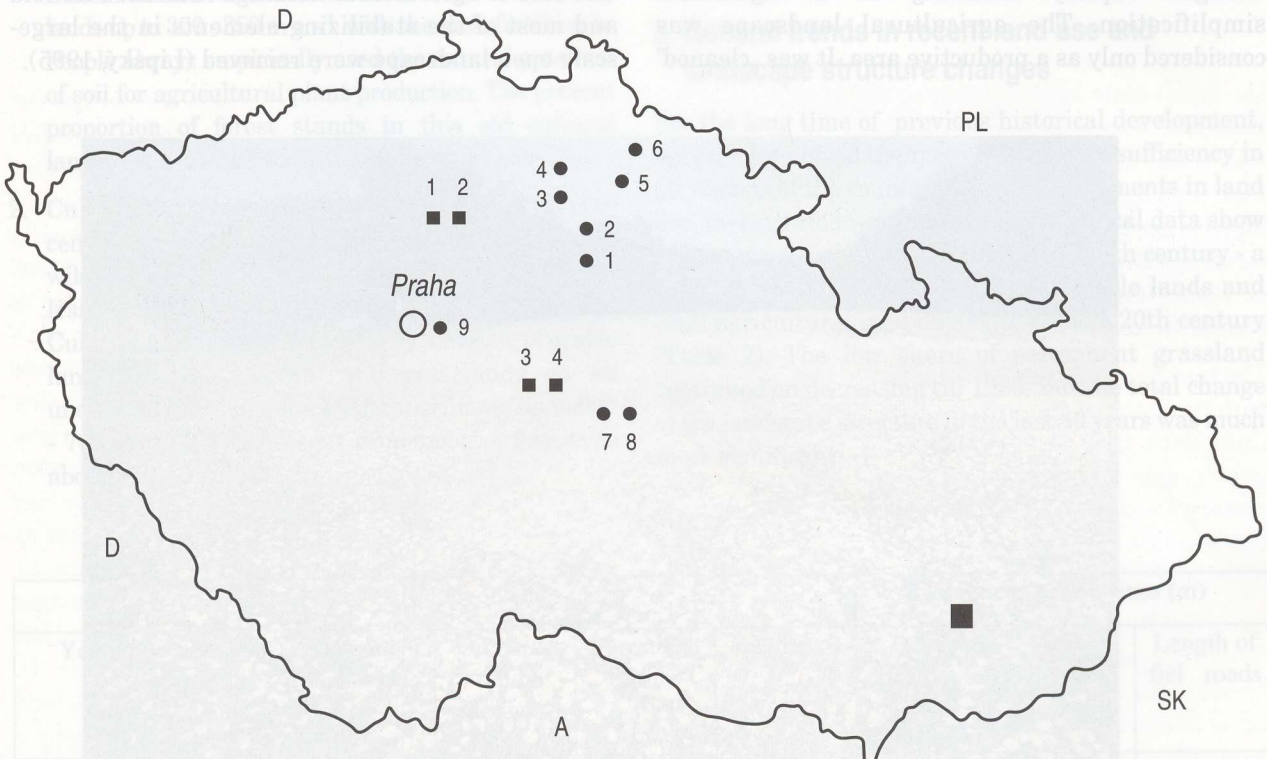

Fig. 2: Model areas in the Czech Republic

Name of the cadaster	Average altitude (m a.s.l.)	Average annual temperature (°C)	Arable lands		Permanent grasslands		Change in arable lands 1990 - 1999	Change in permanent grasslands 1990 99
			1990	1999	1990	1999		
Kozojedy	250	8	88.0	88.0	1.7	1.7	0	0
Češov	260	8	69.8	69.2	1.4	2.0	-0.6	+0.6
Roveň	400	7	56.5	47.0	11.4	21.4	-9.5	+10.0
Troskovice	400	7	27.7	23.9	9.1	12.9	-3.8	+3.8
Poniklá	600	5.5	21.5	15.1	38.5	45.0	-6.4	+6.5
Víchovská Lhota	700	5	20.3	9.7	51.0	61.5	-10.6	+10.5

Table 4: Main changes in land use in percentage of total cadaster areas, 1990-99

by many ecologically negative consequences. Characteristic features and specific regional differences between landscapes were wiped out, and specific regional small-scale landscape types vanished.

A result of the official preference of mere productive function of the agricultural landscape was monofunctional simplification of the landscape structure. Revolutionary changes in the landscape (micro)structure are not reflected in the ratio of agricultural lands and forests which remained roughly at the same level. This was caused by the strong protection of arable and agricultural lands supported by the planned system of government grants to agricultural production. The system was aimed at achieving self sufficiency in basic foodstuffs and in fact it stimulated agricultural overproduction. Agricultural production was also supported by government subsidies on poor soils and in economically marginal mountainous and sub-mountainous regions. Generally speaking, the value of government subsidies was three times higher than the value of taxes levied from agricultural land.

Recently, the speed and extent of landscape structure changes had a decisive influence on the landscape stability. It is evident that the development of the Czech rural landscape was dominantly influenced by political and social changes in the society and by technological changes in the system of agricultural production. We can find many common features with the development in other European socialist countries resulting from the same economic and political conditions (state or collective ownership). Nevertheless, there also exist many similarities to West European countries resulting from international technological developments crossing over state boundaries (productivity, intensification, mechanisation) irrespective of the state system.

The degree of collectivization and state directive management of agriculture was highest in the former Czechoslovakia in comparison with other socialist countries. Another specific feature is the fact that the Czech Republic (and former Czechoslovakia) is a mountainous country within the former cormmunist Central and East European countries. The share of highlands and mountains used as agricultural lands is much greater than in Poland, Hungary, East Germany or Ukraine. Landscapes like this are very sensitive to changes in land use.

Dramatic changes in the landscape (micro)structure were investigated in a typical rural landscape in Central Bohemia using old cadastral maps and aerial photographs. As a result it can be stated that land use statistics are not able to convey deep changes in landscape diversity, size, connectivity, quality, integration or isolation of patches, areas and corridors. The statistical values for each category of land use do not provide a perfect idea of the actual space composition of landscape structure elements (Lipský, 1995). A striking decrease in the length of boundaries (Table 3) corresponds with a strong decrease in landscape diversity and stability, and with an increase in the size of blocks of fields during the last 50 years.

On the other hand, the natural structure of the rural landscape could not be entirely wiped out and forgotten. The tendency towards an absolute loss of dispersed tree and shrub vegetation in the agricultural „productive"

Name of the cadaster	Increment of built-up area	Ploughing of permanent grassland	Grassing of arable land	Increment of shrubs	Afforestation	Increment of gardens	Fallow agricultural land
Zbraslavice	0.39	1.35	3.3	1.03	0.87	0.13	5.04
Řeplice	0.04	0.07	4.38	0.39	0.16	-	1.43

Table 5: Changes in land use in percentage of total cadaster areas, 1990 - 1997

areas was compensated for by an increase of its amount in localities and areas not suitable for modern, large-scale agriculture and heavy mechanization. Many areas which had been managed previously, such as small strips of meadows and pastures along forests, pathways, water streams, grassy balks and old orchards on slopes, were abandoned. Self-seeding trees, shrubs and other semi-natural communities began to grow and expand in these localities which became refuges for endangered plants and animals pushed out of the monotonous agricultural landscape of collective open fields.

affected by concentrating livestock and other domestic animals into large common sheds. Noteworthy is the more than doubling in the numbers of non-fruiting trees and shrubs in villages. Small villages surrounded by extensive areas are thus often the only places where some groups of animals can survive and reproduce. The boundary between the village and the surrounding landscape acquired a favourable ecotonal effect, manifesting itself in an increase in the species diversity. The results of faunistic investigations make for a landscape ecological paradox: villages as the centres of biological diversity in the agriculture landscape (Kubeš et al., 1992). Linking the villages into a territorial system for landscape ecological stability requires the restoration of the broken corridors in the agricultural landscape.

Increment of built-up area	Ploughing of permanent grassland	Grassing of arable land	Incremen of shrubs	Afforestation	Fallow agricultural land
0.05	-	3.34	3.90	0.43	20.18

Table 6: Present land use changes in percentage of total cadaster area, 1990 – 1997 (Běchovice)

Investigations in several agricultural regions of Bohemia demonstrated a significant increase both in woodlands and dispersed shrub vegetation (Kubeš et al., 1992). Basic changes also took place in villages in agricultural landscapes. The traditional rural community was broken down. Recent demographic developments were characterized by a strong decrease in the number of inhabitants and by a shift in employment from agriculture to industry and services. The formerly intensive activities around farms declined. Farming was

Recently, non-productive functions of agriculture and cultural landscape like recreation and tourism, landscape and nature conservation or drinking water accumulation and supply gained more and more importance. The present development of the Czech landscape corresponds to the European trend of

Photo 5: Young cultural landscape of montane agriculture in the North Bohemia with permanent grasslands and spruce forests (Z. Lipský)

decrease in arable and agricultural land and increase in forestland. The decrease of anthropic pressures on the landscape is certainly positive from the view of landscape ecology. There are and in the future certainly will be considerable regional differences between regions of intensive agriculture in the fertile lowlands with primary productive functions on one hand and highlands, mountains and foothills on the other hand. Farmland in these regions being not able to compete in food production can be expected to get released for other land use and other functions. Afforestation offers first, however it cannot be considered as a universal solution and the only use of the land unsuitable for intensive agricultural production. Afforestation and grassing will certainly represent a positive feature in the areas declared as zones of water source protection and protected water accummulation areas which cover more than 20 percent of the country territory.

Also a space for necessary landscape stabilisation, for establishing and complementing ecological networks in the landscape formed by protected areas, biocentres and biocorridors seems to be open. A certain problem and controversy stem from the fact the most land free for non-productive functions of the rural landscape is available in economically marginal regions (mountains and highlands) characterised by a relatively higher proportions of forests, grasslands and other landscape stabilising segments, while the utmost need for ecological stabilisation arises in intensively used and deforested areas.

Another topical problem comes from a risk of elemental abandoning of agricultural land cultivation in marginal regions, which intrinsically promotes the danger of rural region depopulation, breakdown of historical settlement structure, extinction of characteristic features and aesthetic values of the traditional cultural landscape (Jongman et al., 1995).

In the nineties of the 20th century the system of state subsidies and grants flowing to agriculture changed in the Czech Republic: from the subsidies to agricultural (over) production to the support and improvement of multifunctionality, i.e. at the strengthening the non-productive functions of the rural landscape (aesthetic, cultural, social, hygienic, recreational). Within the government programme of Landscape Management these activities are supported above all:

- Grassing and maintenance of permanent grasslands,
- Special management of protected biotopes,
- Establishment and management of ecological networks, riparian stands and grass strips along water courses,
- Sustainable management of agricultural land in national parks and landscape protected areas,
- Recovery of water resorvoirs (ponds) and wetlands in the framework of revitalisation of water courses,
- Keeping of the typical rural landscape character and keeping the landscape in cultural conditions (especially in economically marginal regions)

4. Present land use changes in model areas

4.1 Methodology

Our research objective was to verify or confute the above mentioned general trends of the present developments of the Czech cultural landscape, to substantiate regional differences in changes and to illustrate this by concrete examples. The changes are traced by a simple method comparing the present land use with the situation registered in a base map. The applied base maps show the land use by the 1990 in basic land use categories: built up area, gardens, orchards, hop-gardens, vineyards, arable land, meadows and pastures, fallow land, shrubs, forestland divided into coniferous, deciduous, and mixed stands, waterbodies. The present situation was observed by detailed field investigations at selected cadasters from 1997 to 2000. The scale 1:10 000 is detailed enough for recognising all changes in land use. All areas showing land use changes (field observations cf. with base maps) were digitised and their area was calculated. A further attention was paid to abandoned, uncultivated fallow agricultural land. The results were visualised in cartograms of present changes in land use made for selected cadasters.

4.2 Model areas

Model areas were purposefully selected in order to cover different trends of landscape development related to different natural and socioeconomic conditions. Model areas, especially cadastral units, represent several characteristic types of the cultural landscape as they were distinguished and delineated in preceding works of the research team (Lipský et al., 1997). At present, model areas cover approx. 30 cadastral units in different landscape types and 4 valleys in the Central Bohemia (Pšovka brook, Liběchovka brook, Jevanský brook and Nučický brook). River walleys and alluvial floodplains were chosen for a detailed research as the most dynamic landscape segments, from the point of view of recent and present land use changes. Besides, they play a crucial role in the landscape dynamics and ecological processes, from the point of view of landscape ecology as migration routes and corridors of flows of water

and energy. They are extremely important both from the natural and cultural points of view (Fig. 2).

Model cadasters represent samples of the Czech cultural landscapes from the suburban landscape at the periphery of Prague (cadasters Běchovice, Horní Měcholupy, Petrovice, Křeslice and Pitkovice) over intensively used agricultural landscapes on fertile soils in lowlands, diversified forested- agricultural landscapes in hilly lands and highlands with medium intensity of agricultural cultivation to landscape of montane agriculture in the Krkonoše Mts. with prevailing grasslands on slopes, spruce forests and dispersed settlements with recreational functions. As to the span of the altitude, the model areas are situated between 200-900 m a.s.l. Average annual temperatures range within 9 to 5°C and the amount of precipitation 550 - 1 000 mm in the model areas.

4.3 Results

The set of model areas (cadasters) ranked by the altitude from lowlands of Central to mountains of North Bohemia from warm to cold climate, illustrate realistically a fair regional differences of current land use changes depending on natural conditions (altitude, climate, soil fertility). The results of our detailed field research in model areas confirm the general tendency to a distinct gradation of changes from lowlands to mountains. Intensive agriculture in lowlands with an absolute predominance of large arable lands continues practically without any important changes in land use. On the opposite, the biggest changes are registered in mountains and highlands with poor soils and unfavourable climatic conditions. Decrease in the area of arable lands, grassing and afforestation or abandoning cultivated agricultural lands are among typical features of the current Czech rural landscape evolution in these areas in the 1990s. These trends are very realistically illustrated in Table 4.

Another case of the current Czech rural landscape development is illustrated on the pair of neighbouring cadasters of Zbraslavice and Řeplice in Central Bohemia. Both cadasters are situated in the same natural conditions (forested - agricultural landscape in rolling hilly lands with medium intensity of agricultural cultivation on the soils of medium fertility, average altitude is about 400 - 500 m a.s.l.). In spite of identical natural conditions, present land use changes are fairly different in both cadasters. High intensity and diversity of changes in land use in the immediate environs of Zbraslavice is caused first by the disintegration of a local co-operative farm and secondly by the increased multifunctionality of the local rural landscape (considerably important summer and weekend suburban recreation, water sources protection zones). On the contrary, the significantly lower intensity of changes on the adjacent cadaster Řeplice is explicable by a continuous functioning of a local co-operative farm in the rural landscape, which has not faced the intentions of non-agricultural land use like recreation or housing yet. The differences of changes currently occurring in both cadasters are presented in Table 5.

Finally, the cadaster of Běchovice (Table 6) situated within the administrative limits of the capital Prague illustrates a high intensity of changes, namely abandoning of cultivated farmland, ruderalisation and desolation of rural landscape in the immediate vicinity of residential, industrial and communications areas. The driving force in this case is not represented by a low soil fertility (the locality is situated in a lowland with the favourable warm climate) but the disintegration of the socialist state farm, disinterest in agricultural cultivation of land, and strong intentions to utilize the land commercially for its economically advantageous location in Prague's environs.

The authors are aware of the fact the presented nominal values identifying the land use changes and coming from a limited number of cadasters cannot be overvalued. The methodology suffers from a certain shortcoming consisting in deduction of the present changes from the comparison of differences between the present situation and the base map, because the map is always a less perfect record of actual world. However the first results (the research is continued) support cogently the trend of important land use changes in the Czech rural landscape and their remarkable regional differences.

The major features of the current Czech rural landscape evolution can be summarised into the following points:

- decrease in arable lands
- increase in permanent grasslands at the expense of arable lands
- increase in uncultivated arable lands and unharvested grasslands
- succession occupation of uncultivated and unharvested lands by shrubs
- afforestation (both natural and artificial)
- expansion of municipal constructions into rural landscape

5. Conclusions: Landscape and ecological consequences of current changes in the landscape

The present development of the Czech landscape corresponds to the European trend of decrease in arable and agricultural lands and increase in forests. The only difference is that the process has started

earlier and has been gradual in the Western Europe. It is difficult to say what proportion of the farmland can be and will be taken away from agricultural use - rough estimates range from 10 % to more than 20 %. However, the real portion of abandoned farmland could be lower if we managed to decrease production intensity and to support other, non-productional functions of the agricultural land at the same time. At the present, about 350 000 hectares (approx. 8 %) of the agricultural lands are without any use and this area is increasing by 25 000 hectares every year.

he decrease of anthropic pressure on the landscape is certainly positive from the view of the landscape ecology. There are and, in the future, there certainly will be considerable regional differences between production regions of intensive agriculture in fertile lowlands on the one hand and of highlands, mountains, and foothills on the other. Further farmland can be expected to get released for other (non agricultural productive) land uses on less fertile soils in economically marginal regions. Afforestation offers first, however it cannot be considered as a universal solution and the only use of the land unsuitable for intensive agricultural production. Afforestation and grassing will certainly represent a positive feature in the areas declared as zones of water source hygienic protection and protected water accumulation areas, which cover more than 20 % of the territory of the Czech Republic (Lipský, 1996).

There also opens a space for the necessary ecological landscape stabilisation, for establishing and complementing ecological networks in the landscape formed by protected areas, biocentres and biocorridors. A certain problem and controversy stem from the fact most land free for the non-productional functions of the rural landscape is available in the economically marginal regions (mountains and highlands) characterised by relatively higher shares of forests, permanent grasslands and other landscape stabilising segments, while the utmost need for ecological stabilisation arises in the intensively used deforested areas of agricultural production. Therefore some specialists advocate a hitherto hardly realisable idea that the more intensive the land use is the more finance have to be disbursed on landscape protection and ecological stabilisation. Another topical problem stems from the risk of elemental abandoning of agricultural land cultivation in marginal regions, which intrinsically promotes the danger of rural region depopulation, breakdown of historical settlement structure, extinction of characteristic features and aesthetic values of cultural rural landscape (Jongman et al.,1995).

A significant polarity in landscape use originating during the socialist large-scale agriculture and continuing under present conditions is one of typical features of the current Czech agricultural landscape: the tendency to an absolute loss of dispersed permanent tree and shrub vegetation on intensively used fertile soils in the agriculrural productive areas, contrary to the process of abandoning agricultural lands in areas not suitable for large-scale agriculture and heavy mechanization especially in alluvial floodplains and on slopes of river valleys. These large linear structures play an extremely important role in the cultural landscape as the main stabilizing segments and bicorridors (migration routes) for wildlife. Former small strips of meadows and pastures along forests, pathways and waterstreams, grassy balks and old extensive orchards on slopes have been abandoned. Self-seeding trees, shrubs or other ruderal and semi-natural plant communities are growing and expanding in these localities which became refuges for endangered plant and animal species. Investigations in several agricultural regions of Bohemia proved a significant increase in woodlands and other permanent greenary in rural landscape.

Deep changes also took place in small villages in rural landscape. Recent demographic development is characterized by a strong decrease in the number of permanent inhabitants and by a shift of the employment activity from agriculture to services. Less and less people continue working physically in agriculture and in the rural landscape generally and so shaping it. But all people use and need the landscape and its sources in a way, both actively in their spare time or passively by simple water or air consumption. It is the reason why landscape management must become a matter of' the whole society.

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THE BESKYDY EUROREGION AS AN AREA OF TRAVEL AND RECREATION

Jan HAVRLANT

Abstract

This paper presents an analysis of the Beskydy region as a frontier area and focuses on the current state as well as on the developments in the field of tourism as they are currently viewed. The paper also reflects the functial utilization and provision of service infrastructure in the region. Furthermore, the paper outlines necessary developments of the already existing resort areas and centres in the Beskydy Euroregion and deals with prospects and priorities in the development of tourism, holiday activities and infrastructure that are based on the evaluation of the field survey, questionnaire research. The questionnaire method was used in order to find out broader interactions, specific problems and drawbacks of particular resort centres and social aspects connected with them.

Shrnutí

Euroregion Beskydy jako oblast cestovního ruchu a rekreace

Příspěvek analyzuje příhraniční oblast cestovního ruchu Beskydy z hlediska současného stavu a vývoje cestovního ruchu a rekreace, funkčního využití a vybavenosti oblasti potřebnou infrastrukturou. Nastiňuje potřebný rozvoj stávajících rekreačních prostorů a center v euroregionu Beskyd a zabývá se možnostmi rozvoje cestovního ruchu, rekreačních aktivit a infrastruktury na základě hodnocení výsledků terénního průzkumu, anketárního šetření. Metoda anketárního výzkumu byla použita ke zjištění širších interakcí, specifických problémů a nedostatků v jednotlivých rekreačních centrech i souvisejících sociálních aspektů.

***Key words**: tourism, Beskydy Euroregion, resort areas on the Czech - Slovak - Polish border, problems and needs for the development*

1. Introduction

The resort area of the Beskydy Mountains is situated in the borderland of the following districts: the Frýdek-Místek district (in the Czech territory), the Čadca and Kysucké Nové Město district (in the Slovak territory), and the southern part of the Silesian region in the Polish territory (Fig. 1). The resort area of the Beskydy Mountains belongs to considerably specific areas. On one side the territory is still divided by state borders into three neighbouring countries, on the other side it is an integrated nature unit dominated by the montane and submontane resort landscapes. The whole area has got excellent presuppositions for all-round contacts and interconnections within the newly established Beskydy Euroregion.

During the last decades in the Czech-Slovak-Polish frontier region a number of socio-economic, ecological, urban,

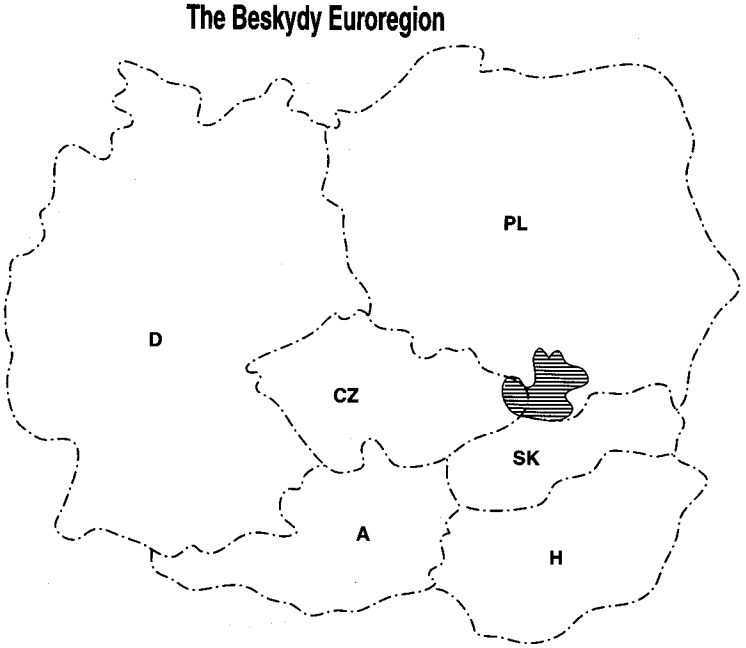


Fig. 1: Area under study

proprietory, ownership, borderline, traffic problems and others came into existence. These are the problems that call for urgent solutions at the turn of millennia. Taking into consideration the character and the function of the territory (there are protected landscape areas of the Beskydy, the Kysuce and the Beskid Slaski Mountains, nature preserves and resort areas of international importance that is even emphasized by neighbouring and industrialized regions of Ostrava and Horní Slezsko (Upper Silesia) as well as its geographical location - it is obvious that economic activities of the primary or secondary sector cannot be crucial stimuli to the development of the Beskydy region anymore as it used to be in the course of the last decades.

2. Specific features of the resort area

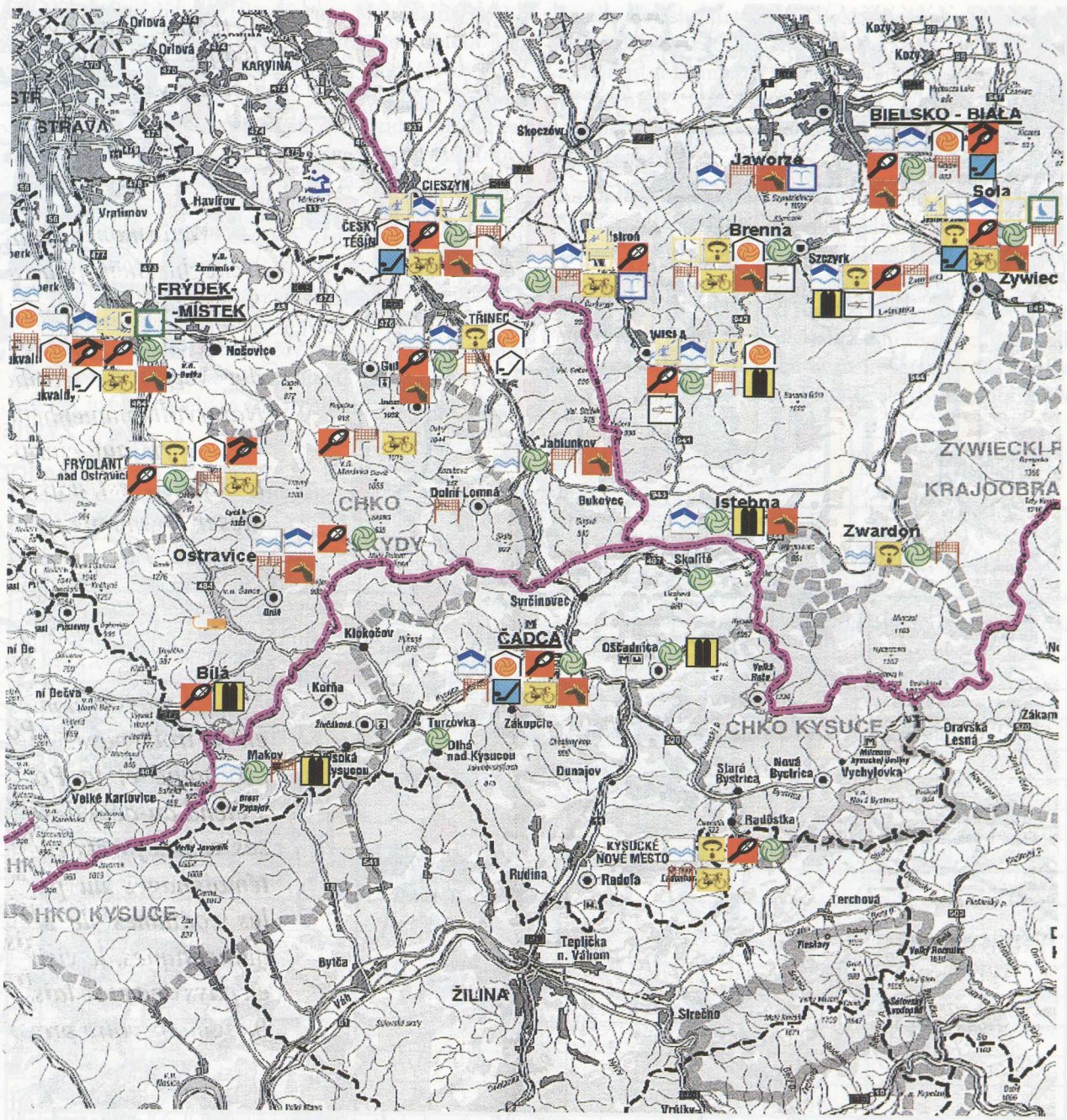
Recreational function of the region rests on possibilities that offer short-term, long-term, and off-season vacations, good conditions for ski sports and various forms of hiking (Fig. 2). To a lesser degree it also rests on cultural and educational events, health resorts, hunting, fishing and other activities.

The Euroregion has got a wide range of possibilities for more intensive development of tourism. Not only do the presuppositions ensue from the geographical location of the territory, from its natural conditions, from the range of landscape, from cultural and other attractions, but they also ensue from an absolutely specific development of some types of holiday activities that are tied mainly to tourism in some resort areas (Fig. 3).

In spite of the fact that the whole border region is very attractive and utilizable throughout the whole year, its off-season utilization is on rather a low level. Full utilization of the resort potential is restricted by a number of objective and subjective factors, such as for example the partial degradation of natural landscape phenomena and the existence of protected areas in which the possibility to develop leisure and hiking activities is nowadays limited only to some. In addition, services of the tertiary sector linked to travel industry having been not sufficiently represented, especially in the case of the Czecho-Slovak part of the Euroregion and are thus of no contribution to the development of this region.

Forms of domestic individual recreation in private chalets and resort cottages prevailed in the Czech part of the region – less in the Slovak part – during the period from 1960s to 1990s. More than 11,000 objects for individual recreation have been utilized in the Frýdek-Místek district (in the Czech territory) in the course of past years. They enable stays for approximately 55 thousand people coming mainly from the Ostrava urban and industrial agglomeration. The highest concentration of chalets and cottages is to be found in submontane villages such as Ostravice -1225, Morávka - 940, Krásna - 645, Komorní Lhotka, Řeka, Horní a Dolní Lomná, Nýdek and the area around the town of Třinec.

Fig. 2: The recreational territory of St. Hamry - Ostravice with pre-requisites for ski sports, hiking and cyclotourism (Photo: J. Havrlant)

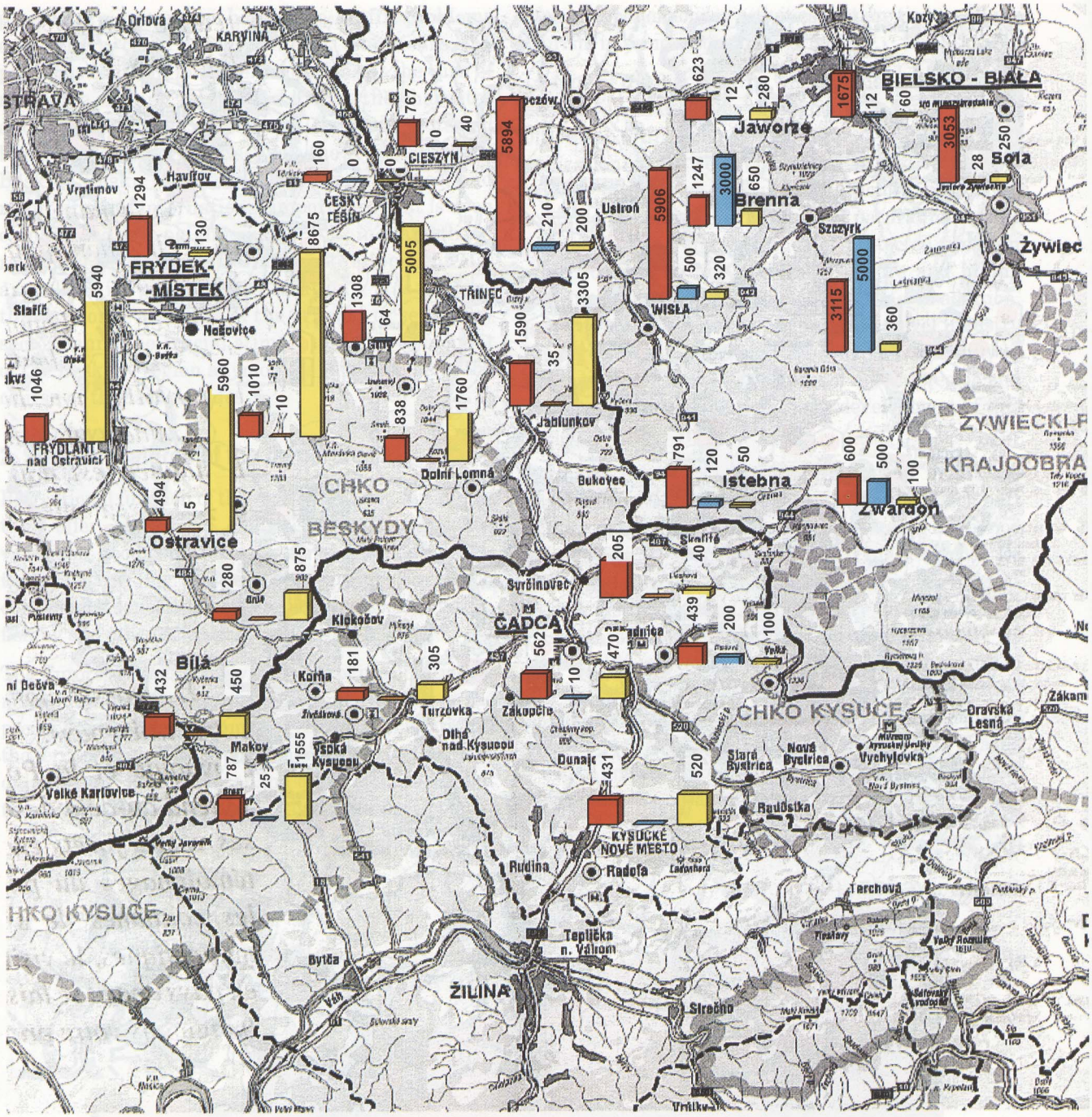


swimming pool and tidy beaches at water surfaces
indoor swimming pool
boathouses, boat rentals
yachting, surfing
paragliding
multi-purpose sports hall
tennis hall, squash hall
outdoor tennis courts
football pitch
state border

grounds for ball games
indoor skating rink
outdoor skating rink
bobsleigh tracks
water skiing
rental service, bike and ski rental
grounds for horseback riding
ski jump
spa

0 5 10 km scale

Fig. 3: Selected sports-recreational attractions in the Beskydy Euroregion



Total sleeping capacity

1000 Number of beds

1 hotels,motels, lodging houses, recreation obj.,tourist dormitories,chalets
2 private lodgings
3 family chalets and cottages (not commercially exploitable)

Number of beds

8000
6000
4000
2000
1000
500
0

Fig. 4: Structure and capacity of accomodation facilities in the Beskydy Euroregion (1999)

In the Čadca district (the Kysuce Mountains in the Slovak territory) a number of private chalets and cottages has been on increase much more slowly than in the Czech Republic during last 30 years. Today´s nearly 500 recreational objects provide individual recreation for approximately 2 thousand inhabitants who arrive there mainly from the neighbouring Žilina district. A considerably lower number of people is coming from the Ostrava region. The highest concentration of chalets is therefore in the area around the city of Čadca - 95, Kysucké Nové Město - 105(lower concentration is then in the montane villages of Oščadnice, Klokočov and Makov. Apart from few exceptions, these recreational objects, however, are not used actively in the free tourist industry.

In the Polish part of the Beskydy Euroregion over 2,500 private recreational objects are registered. The majority of them are situated in the holiday resorts of Brenna - 650, Szczyrk - 360, Wisla - 320, and Jaworze in the surroundings of the town of Bielsko-Biala (Fig. 4).

As for the forms of the free tourist trade, it is the Polish centres of winter and summer holidays such as Wisla, Ustroń, Szczyrk and the valley of the Sola near Żywiec that have the best presuppositions. In comparison with the Czech side, in Poland there is a considerably higher offer concerning accommodation, catering facilities and other amenities provided even in the private family houses. The Polish part of the Beskydy Mountains is

	Resort territory	Number of ski lifts	Total length of ski lifts (m)	Height difference of the most difficult or longest pistes	Locality	Note
1	Frýdlant-Lysá h.-Malenovice	14	5940	350	Lysá hora	
2	Dolní Lomná - Horní Lomná	8	4070	280	V. Polom	
3	Bílá	11	3700	220	Zbojnická	Artificial snow
4	Staré Hamry - Gruň	7	3420	180	Gruń	
5	Třinec-Oldřichovice-Řeka	6	3960	480	Javorový	Chair lift
6	Morávka - Krásná	10	3500	140	Kozlanka	
7	Mosty u Jablunkova-Bystřice	4	1600	150	Bystřice	
8	Ostravice	6	1180	120	Ostrá hora	
9	Frýdek-Místek - Palkovice	2	630	100	Palkovice	Artificial snow
	Total in Czech resort areas	68	28000			
1	Oščadnica - Velká Rača	12	7355	425	Lalíky	Chair lift
2	Čadca - Zborov n. B.	12	4220	250	Husárik	
3	Makov	7	2760	170	Kasárna	
4	Kysucké N. Město	7	2775	180	Šerkov	
5	Skalité - Čierné	6	2560	140	Serafínov	
6	Turzovka	3	1380	120	Bukovina	
	Total in Slovak resort areas	47	21050			
1	Szczyrk	34	26950	702	Skrzyczne	Art.snow, chair lift
2	Zwardoń-Rajcza-Ujsoly	20	9910	220	Rachowiec	
3	Wisla	15	7975	275	Soszów	
4	Sola-Korbielów - Pilsko	18	7250	450	Pilsko	
5	Istebna - Koniaków	10	5310	170	Jaworzynka	Artificial snow
6	Ustroń	8	5165	462	Czantorija	Art.snow, chair lift
7	Brenna	10	4740	180	Kotarz	
8	Bielsko-Jaworze-Szyndzielnia	8	3285	445	Szyndzielnia	Chair lift
	Total in Polish resort areas	123	70585			
	TOTAL IN THE EUROREGION	238	119635			

Tab. 1: Ski centres in the Beskydy Euroregion (situation in 2000)

generally better equipped with the necessary tourist service.

Tourist industry is - especially in the Polish-Czech border area - of an utterly specific character. An activity that strongly prevails is the so called „shopping tourism", which is concentrated into supermarkets, specialized shops and outdoor fairs along the both sides of the state border. Besides these, petrol stations in Poland are also a frequent destination. However, in connection with the stormy development of supermarket network along with the consequent levelling of prices, the shopping tourism was apparently on decrease at the end of 1990s. These short-term stays taking several hours or minutes increased in the first half of 1990s more than four times not only at the biggest border-crossings in the centre of Těšín and Chotěbuz-Cieszyn, but also at newly opened crossings at Horní Lištná - Leszne Gorne and at Bukovec- Istebné. After the year 1995, over 6.5 million vehicles and over 35 million people crossed the Czech-Polish border in the Silesian part every year. The majority of them crossed the border at any of the crossings mentioned above in the Beskydy region /over 3.7 million of cars and over 26 million people (according to the estimates of frontier police)/. It is Těšín crossings that are extremely overstrained, causing thus traffic problems.

Another quite recent and not quite a traditional short-term form of tourism in the Beskydy Euroregion is cyclotourism that makes use of newly marked cyclopaths. Nowadays there are 4 new border crossings specially designed for tourists and cyclists. However, longer-term forms of tourism are still in all the parts of the region on rather a low level and a number of foreign visitors staying for longer periods of time does not exceed 10% in any of the parts.

Long-term stays are typical only of the two warmest holiday months, especially at water reservoirs, such as Żywiec (in the Polish territory), Olešná and Baška (in the Czech territory), in the resort areas of the Sola valley and near the city of Frýdek-Místek. Long-term stays are also frequent at Christmas time, Easter and during one-week winter school holidays. The most visited ski resorts on the Polish side are Szczyryk, Wisla, Ustroń, on the Slovak side there belongs Oščadnica - Velká Rača, and on the Czech side these are Staré Hamry -Bílá and Lomná. Basic data of the ski centres are to be found in Tab.1.

3. Difficulties of euroregion´s resort centres

The analysis of 23 Beskydy resort areas has shown that the majority of problems that restrict a more intensive development of medium-term and long-term tourism is what Czech, Slovak and Polish sides of the region share. The barriers are as follows:

- Incomplete and to a large extent outdated infrastructure (financially-technical base) of tourist industry.
- Incomplete or total absence of necessary supplementary services, such as social, cultural and entertaining, sporting and leisure, relaxation and rehabilitation type of services and other including entertaiment and sport facilities for children.
- Insufficient support of small and medium enterprising in the area of services and the problem of low effectivity of enterprice in this area (in the Czech Republic a considerable tax burden VAT reaches 22% for certain gastronomic and accomodation services).
- And consequence of that is the lack of financial sources, investments and subsidies even for example from the funds of active balance of international tourist industry in all three countries that does not allow for financing development and modernization of the already existing resort centres or new ones.
- Problematic relations of the coexistence of travel industry, environmental planning and protection that are difficult to solve. A clash of interests between districts´ needs, desirable transformations of peripheral areas, inevitable development and opening of the area to tourism and recreation on the one hand, and very strict environmental protection on the other.
- Degradation of natural landscape phenomena, especially of vast forest areas in peak parts of the Moravian-Silesian Beskydy and Silesian Beskydy Mountains due to immissions and heavy pollution of the Olše River, the Kysuce River, the Wisla River and their tributaries caused by waste waters as a consequence of insufficent treatment of municipal waters coming from industrial and agricultural firms.
- Human factors - entrepreneurial activities and professionalism and ethics of subjects that result in honesty and efforts of entrepreneurs who aim at offering visitors a wide range of services. Services in all resort areas are still not complex and very often not of high quality, often immediate profits rather than at the prospective functioning.
- Low professional level, especially low level of speaking foreign languages in people employed in the tourist industry.
- Low level of marketing and management in tourist industry establishments and insufficient utilization of modern informational and booking systems, internet, media and other programmes.
- In the Czech and Slovak parts of the Euroregion permanent residents show a lack of interest in

entrepreneurial activities in the area of travel industry - they are interested neither in basic services nor in providing various supplementary services including gastronomic services, rental services etc. The questionnaire research has shown that those inhabitants who are personally interested in the development of tourist industry in their village and wish to provide services, are willing to provide mainly accommodation services. As far as other services are concerned, only few would be interested. This fact is the weakest point of this part of the Beskydy Euroregion together with a considerable risk that it represents for the further development of tourist industry.

- These barriers are encouraged by insufficent advertising of resort centres abroad. Except for the largest Polish centres mentioned above and Frýdek-Místek, Třinec (CZ) and Oščadnice (SK), a majority of resort centres still provide insufficent tourist information service concerning the range of their sporting and recreational activities and services offered in individual localities and their hinterland. Tourist information centres and travel agencies usually work only during the week and only in 12 larger resort centres. They are far from providing all necessary services to customers such as immediate accommodation booking.
- Findings revealed that even ten years of social transformation did not significantly change the attitude of authorities, more specifically of entrepreneurs towards visitors and also the fact that staff and other subjects do not usually show more interest in active and intensive work in tourist industry. As for the interest in visitors the findings showed that a majority of entrepreneurs are indifferent towards the fact whether a customer will use their services again or not. Thus, such a reluctant attitude towards the development of tourist industry has a bad impact not only on visitors, but also on inhabitants and villages in the region.

The human factors mentioned above depend to a large extent on the mentality of particularly Czech and Slovak inhabitants, on their worries about their property as well as on the specific historical and political, economic and demographic development of this territory. Suppressed motivation for private enterprise in wartime continued with next generations, considerable migration of the young generation in the productive age to large cities of the Ostrava industrial agglomeration and relative and absolute growth in population in the post-productive age in the investigated submontane villages logically led to the barriers mentioned above, and to the weak points of these resort areas. The only exception today represent typical resort areas such as Ostravice and city centres as for example Frýdek-Místek, Frýdlant nad Ostravicí and in Slovakia Oščadnica and Čadca.

In the Czech and Slovak parts of the Euroregion other factors seem to exist. Firstly, it is the process of privatization of tourist industry establishments that has not been completed. Secondly, it is the fact that they are in a considerably neglected state and moreover they are only exceptionally involved in full commercial utilization within the free tourist trade.

- Almost no offer concerning the potential utilization of private recreational chalets and cottages by free tourist industry.
- In the sports resorts apart from exceptions (Oščadnica - Velká Rača) there is an on-going lack of both takeaways and qualitative catering facilities.
- Generally very poor transport infrastructure in the Polish-Czech-Slovak frontier region. Domestic communication links with the resort centres are considerably limited especially during weekends and bank holidays and international public transport connections are practically not existing. Villages have no funds for more extensive financing of transport. The only high-speed communication connects merely the resort area of Frýdlant nad Ostravicí - Frýdek-Místek with Ostrava.
- In Poland, road network of poor quality appears to be a serious problem.
- The roads are rather narrow make the time in which quite close resorts would be normally reachable considerably long.
- The above issues are, beside others, the reason why the resort centres in the Beskydy Mountains are utilized mainly in the course of the season and they also explain the generally low capacity utilization of resort establishments, especially in autumn and spring.

The seasonal character in visiting a place is connected not only with the location pre-requisites that are necessary for various forms of tourist industry, but they are equally connected with the fact that in the Euroregion there are only isolated centres - usually more luxurious hotels- which offer sport and leisure attractions and services during the off-season as well. Apart from the resort centres in Frýdlant - Malenovice (CZ) and Ustroň-Wisla (PL), all the other centres rest on either only summer (the Sola valley) or only winter season (Szczyrk, Bílá- Staré Hamry, Oščadnica). It is only exceptionally both the winter and summer season (Morávka -Visalaje), however, these centres are rather specific because of weekend visits of inhabitants from near urban areas.

Fig. 5: The recreation territory of Makov - Kasárna situated on the Czech-Slovak border with pre-requisites for development of all forms of tourism (Photo: J. Havrlant)

4. Conclusion

Despite all the weak points mentioned above, the Beskydy Euroregion has both good potential and pre-requisites also for the development of the off-season sporting and leisure activities such as mountain cycling, paragliding, riding, family holidays and agritourism in montane farmsteads. A cruical presupposition for this is expansion of gastronomic services, including local specialities, specific supplementary services connected with keeping livestock, horses etc. and modernization of interiers with an emphasis on preserving the traditions of mountain wooden folk architecture.

A crucial condition for the development of the whole Beskydy region is enlivening of contacts on all levels between the countries involved, all-level cooperation in the field of modernization and coordinated development of non-existing service infrastructure including specialized shops, services, rental services providing sports equipment of all kinds. Together with the conditions mentioned above it is also a very close cooperation in the process of the

development of a transboundary information system and marketing. As a result, transformation of residential and residential-production functions of village communities into residential-service, agency and recreational functions are viewed as vitally important. This is posible only with a far broader involvement of permanent residents into the tertiary sector.

Considerable potential for the development of tourist industry in all parts of the region have objects belonging to former company tourist establishments, in Poland also establishments of convalescent homes and sanatoria, in the Czech and Slovak parts these are mainly private cottages and chalets that are very little utilized.

What would be very beneficial for the Beskydy region is establishing of genuine international tourist and ski resorts without boundaries, centres with a lively foreign tourist industry, with a free access to utilization of borderland mountain ridges along both their sides and with the interconnection through cable cars without the need of getting through customs and other barriers. The entry of all three countries into the European Union is already planned; it is therefore desirable to look for solutions of this issue. The montane resort areas, such as Oščadnica - Velká Rača - Zwardoň-Rajcza, Ustroń-Wisla - Velká Čantoryje-Nýdek and Makov-Bílá (Fig. 5) have good pre-requisites for such a development.

After the social and economic transformation in the course of 1990´s, it is obvious that the tourist industry in the Beskydy Mountains is one of the phenomena that can - under certain conditions - provide socioeconomic development of this rather

neglected borderland area. Some of the most important conditions are for example a broader involvement of local residents into small and medium scale enterprises and a good level of marketing and management activities. In addition, a considerable improvement of the accessibility of the resort from all sides, intensification of transboundary contacts and cooperation, development of mutual relations (tourist industry including) will bring significant assets, financial means and a decrease of high unemployment rate that was reaching 15 - 20 % in the course of the last years. Creating new economic activities and expansion of service infrastructure should be a stimulus and perspective for the local population, and it should consequently serve as a basis for the rise of the living standard, global economic transformation, and development of this borderland region.

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GEOMORPHIC RESULTS OF FLOOD IN JULY 1997 IN THE BIAŁA LĄDECKA VALLEY (EASTERN SUDETEN, POLAND).

Janusz LACH

Abstract

Catastrophic floods, which affected the Sudeten, SW Poland, in July 1997 , have caused substantial changes in the relief of river valleys. In particular, valley-bottoms were altered as a result of erosion, transportation and accumulation processes. Such changes were shown in the Biała Lądecka valley. Researches analysed the erosion and accumulation forms built as a result of the rising torrents of 1997. The documented and described the resulting sedimentary forms arising from the flood deposits, both within the river bed, and along the riverbank flood-plains. The researches also measured the area covered by gravel sedimentation from the flood, together with gravel particle size.

Shrnutí

Geomorfologické hodnocení důsledků povodně z července roku 1997 v údolí Biała Lądecka (východní Sudety, Polsko)

Katastrofální povodně, které postihly v červenci 1997 Sudety v jihozápadním Polsku, způsobily zásadní změny v reliefu říčních údolí. V důsledku erozních, transportních a akumulačních procesů se změnila především údolní dna. Tyto změny jsou demonstrovány na údolí Biała Lądecka. Provedené výzkumné práce se týkaly analýz erozních a akumulačních forem vytvořených v důsledku zvýšené hladiny bystřin v roce 1997. Dokumentovány a popsány jsou výsledné sedimentární formy vzniklé z povodňových naplavenin jak v říčním korytu, tak podél říčních niv. V rámci těchto výzkumných prací bylo rovněž provedeno měření ploch pokrytých štěrkovými nánosy po povodni a měření velikosti štěrkových částic.

Key words: *flooding, erosion, transport, accumulation, Sudeten Mts, Poland*

1. Introduction

The Biała Lądecka valley is located in the eastern part of the Sudeten between the Złote Mountains in the east and north and the Śnieżnik Massif with the Bialskie Mountains in the west and south (Fig.1).

This valley, with the neighbouring upper part of the Nysa Kłodzka river basin, which drains the Śnieżnik Massif, was under the influence of rainfall center. Long-lasting, intensive rainfalls followed by a rapid rise in the water level in the rivers turned out to be an extreme event. The flood that took place in July 1997 is regarded disastrous due to damages caused in the geographic environment and town and village infrastructure.

The flood was an effect of two rainfall episodes. The first episode began on 5 July and lasted uninterruptedly until 9 July; precipitation totalled 484.3 mm at the Kamienica weather station in the upper part of the basin and 336.0 mm at the Lądek Zdrój weather station. The maximal rainfall intensity happened on 7 July reaching 20 mm/hr and resulted in the daily precipitation of 179.5 mm in Kamienica and 159.0 mm in Lądek Zdrój. Such an intensity made water level to rise at the gauging station in Lądek Zdrój up to the height 3.65 m, exceeding the alarm marking by 2.3 m. Water flow reached a very big level at about 750 m^3/s (Dubicki 1997), compared for example with the average flows during high states which occasionally reached 245 m^3/s (Gierwielaniec 1971). The second rainfall episode lasted from 17 July to 22 July and was characterized with lower sums of precipitation, totalling 132.8 mm in Kamienica and 178.0 mm in Lądek Zdrój. During the second rainfall episode, water level in Lądek Zdrój exceeded the alarm state by 1m (Chlebicki 1997).

The presented paper is a report from author's own research focusing on geomorphic results of July 1997 flooding in the Śnieżnik Massif. The aim is to delimit the area affected by erosional transport and accumulation

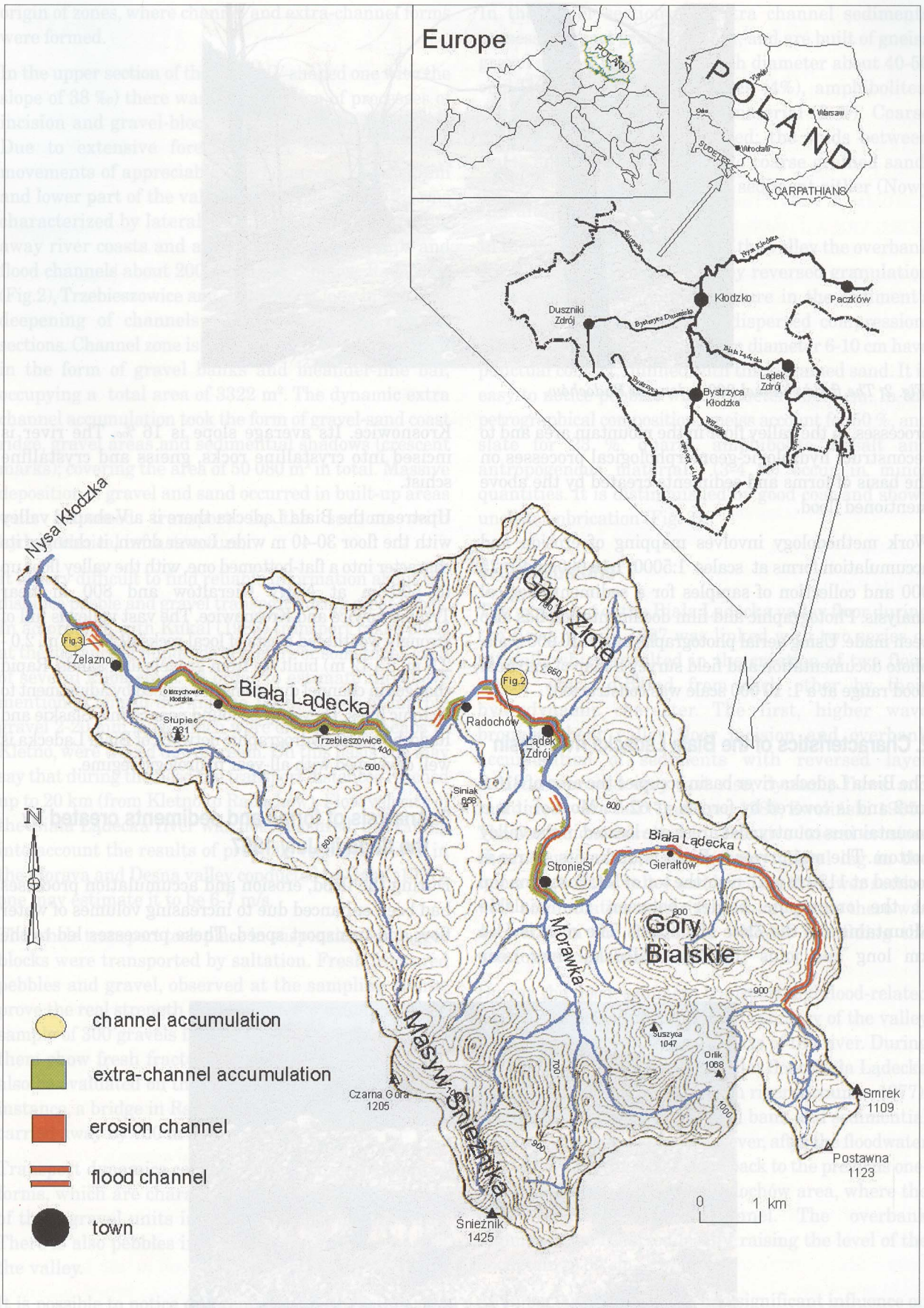

Fig. 1: The location of the Biała Lądecka river basin on the territory of Poland and the Eastern Sudeten.

Fig. 2: The flood channel 200 m long in Radochów.

processes, in the valley floor in the mountain area and to reconstruct hydrologic-geomorphological processes on the basis of forms and sediments created by the above mentioned flood.

Work methodology involves mapping of erosion and accumulation forms at scales 1:5000, 1:10 000 and 1: 25 000 and collection of samples for a sedimenthological analysis. Photographic and film documentation has also been made. Using aerial photographs at a 1: 10 000 scale, photo documentation and field survey a map of maximal flood range at a 1: 10 000 scale was constructed.

2. Characteristics of the Biała Lądecka river-basin

The Biała Lądecka river basin occupies the area of 310.8 km2 and is covered by forests at 62 %. Most of it is a mountainous country; flat areas are located in the valley bottom. The main river is Biała Lądecka; its source is located at 1120 m a.s.l. near the top of Mt. Postawna top at the orographic border between the Bialskie Mountains and the Złote Mountains. The river is 51.4 km long and joins the Nysa Kłodzka river near Krosnowice. Its average slope is 16 ‰. The river is incised into crystalline rocks, gneiss and crystalline schist.

Upstream the Biała Lądecka there is a V-shaped valley with the floor 30-40 m wide. Lower down, it changes its character into a flat-bottomed one, with the valley floor up to 500 m at Nowy Gierałtów and 800 m near Trzebieszowice and Krosnowice. The vast valley is full of strongly weathered clasts of local rocks (0.5 - 1.5 m, 2.0 - 2.5 m, 8 - 12 m) built up from gravels and sands. Rapid changes in channel directions are caused by adjustment to tectonic lines. They may be found near Stonie Śląskie and Radochów. The hydrographic network of Biała Lądecka is well developed with all-year hydrologic regime.

3. Analysis of forms and sediments created by the flood in July 1997

During the flood, erosion and accumulation processes had been enhanced due to increasing volumes of water flow and transport speed. These processes led to the

Fig. 3: The extra-channel accumulation form in the Żelazno.

origin of zones, where channel and extra-channel forms were formed.

In the upper section of the valley (V-shaped one with the slope of 38 ‰) there was a domination of processes of incision and gravel-block bottom material transport. Due to extensive forestation of slopes, no mass movements of appreciable size occurred. The medium and lower part of the valley with the slope of 8 ‰, was characterized by lateral erosion resulting in washing away river coasts and a great number of slumps and flood channels about 200 m long in Stojków, Radochów (Fig.2), Trzebieszowice and up to 500 m long in Żelazno; deepening of channels was recognized in ravined sections. Channel zone is characterized by accumulation in the form of gravel banks and meander-line bar, occupying a total area of 3322 m^2. The dynamic extra channel accumulation took the form of gravel-sand coast ridge, gravel areas and sedimential shadows (crescent marks); covering the area of 50 080 m^2 in total. Massive deposition of gravel and sand occurred in built-up areas with increased transport in the sections with hydrotechnical infrastructure.

It is very difficult to find reliable information about the distance pebble and gravel transport during great floods. In accordance with Kukal (1983) transport takes place at the distance of hundreds of meters or sometimes even of several kilometers. In order to estimate the above mentioned length during the flood, pieces of marble gravel 2-20 mm long, which were eroded from heaps in Kletno, were traced downstream. On this basis one may say that during the flood the transport distances reached up to 20 km (from Kletno to Radochów). Flow velocity of the Biała Lądecka river was not measured, but taking into account the results of previous research works in the Morava and Desna valley conducted by Gába (1997), one may estimate it to be 6-7 m/s.

The whole transport took place in suspension and bigger blocks were transported by saltation. Fresh fractured pebbles and gravel, observed at the sampling points, prove the real strength of transport. For example, in the sample of 300 gravels in the fraction > 20 mm, 15 % of them show fresh fracturing. Transport strength may also be evaluated on the basis of displaced bridges; for instance, a bridge in Radochów several tons heavy was carried away by 700 m downstream.

Transport dynamics caused sedimentation of channel forms, which are characterized by massive structure of thick gravel units in the upper part of the valley. There is also pebbles imbrication in the lower part of the valley.

It is possible to notice differences in the structure and texture of extra channel sediment forms, which are related to changes in channel geometry and channel slope along the valley.

In the upper section the extra channel sediments possess compact grain skeleton, and are built of gneiss gravel at 86 % and pebbles with diameter about 40-50 cm. The rest consists of slates (4%), amphibolites, quartz and anthropogenous material (3 %). Coarse grained sediment is dovetailed; the voids between clasts are filled with middle to coarse grained sand. There is no imbrication in the sediment either (Nowy Gierałtów).

In the middle and lower part of the valley the overbank sediments are characterized by reversed granulation with apparent sediment structure in the sediment's floor. There are featured by dispersed compression, gravels and pebbles with average diameter 6-10 cm have punctual contact, fulfilled with thick-grained sand. It is easy to notice pebbles with diameter 30-40 cm. In the petrographical composition, gneiss account for 50 %, and slate for 23 %, quartz, amphibolite, basalt and antropogenous material (3-4 %) occur in minor quantities. It is distinguished by good coat and shows unclear imbrication (Fig. 3).

4. Conclusions

The modelling of the Biała Lądecka valley floor during the flood in July 1997 was linked with two series of rainfall, which resulted in the creation of two flood waves which differed from each other by their hydrodynamic character. The first, higher wave brought about valley floor incision and overbank accumulation of sediments with reversed layer structure proved very fast rise, dynamic flows and rapid rise-wave fall (Teisseyre 1988, Zwoliński 1985). The second one resulted in intensive lateral erosion, channel widening, washing away gravel lag in the upper part of the valley and levelling the lower section with accumulation material. In many places there was no water in the floodbasin without rebuilding the previous sediments structure.

During the flood, sediment transport and flood-related sedimentation influenced the morphology of the valley floor by incision in the upper parts of the river. During the flood at the area with vast, flat floor Biała Lądecka valley acquired character of glen river (Schumm 1977). The proofs are as follows; gravel bank and sedimential shadows (crescent marks). However, after the floodwater had fallen down the river came back to the previous one-channel system, except for Radochów area, where the river created a new channel. The overbank sedimentation occurred locally, raising the level of the floodplain to 80 cm.

An important feature, that had significant influence on overbank accumulation was channel concrete lining in Stronie Ślaskie, Lądek Zdrój, Radochów, Trzebieszowice, Ołdrzychowice and Żelazno.

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SUMMER FLOODS IN CENTRAL EUROPE IN 1813 - AN ANALOGY TO FLOODS OF 1997

Jan MUNZAR

Abstract

It was found out after disastrous floods in central Europe occurring in July 1997 that there are no comprehensive data available from the watershed of the Morava River and from the Czech part of the Odra (Oder) River that would facilitate a comparison with historical floods before the year 1900. The subsequent investigations revealed that one of possible analogies could be the August floods of 1813, which impacted the territories of today's northern Slovakia, northern Moravia, Czech part of Silesia and southern Poland. An experimental reconstruction of this historical flood is made in supraregional context, which among other meant the beginning of systematic observation of water levels in the Polish part of the Odra R. watershed.

Shrnutí

Letní povodně ve střední Evropě v roce 1813 - analogie povodní v roce 1997

Po katastrofálních povodních ve střední Evropě v červenci 1997 se ukázalo, že pro povodí Moravy a české části povodí Odry nejsou k dispozici soubornější podklady, které by umožnily srovnání tohoto hydrometeorologického extrému s historickými povodněmi před rokem 1900. V rámci provedeného výzkumu se ukázalo, že jednou z možných analogií byly povodně v srpnu 1813, které postihly území dnešního severního Slovenska, severní Moravy, české části Slezska a jižního Polska. Je provedena rekonstrukce příčin a dopadů této historické povodně v nadregionálním kontextu se zaměřením na povodí Moravy. Srovnání kulminačních stavů je možné pro roky 1813 a 1997 jen pro polskou, popř. německou část Odry, protože vodočetná pozorování na Moravě začala až koncem 70. let 19. století.

Key words: *historical floods, Morava River watershed, Odra River watershed, 19th century, Central Europe*

1. Introduction

The floods of July 1997 were an extreme event, unprecedented in the Czech Lands in the 20th century (Munzar, Ondráček 2000). The worst situation was experienced by inhabitants from the immediate vicinity of Czech part of the Odra (Oder) River, Morava R. and their tributaries. It appeared later that there are no data from this part of the country available for the comparison with historical flood events before the year 1900.

S. Militzer, M. Börngen and G. Tetzlaff (1999) presented the summer flood on the Odra River in 1736 as an analogy to the flood of the century in 1997. It has not been found out so far, however, how or if at all this situation manifested in the territory of the Czech Republic. It appears therefore a better solution for the territory of Moravia and the Czech part of Silesia to make a comparison with the summer flood on the Odra R. and on other watercourses in central Europe, which occurred in the year 1813 in spite of the fact that it is not included in the list of great floods in Germany from the period 1342-1850 published by M. Schmidt (2000). The fact that there was no flood in Germany (except that in the Odra River watershed) in summer 1813 is logical since unlike the winter and spring floods rising due to thaw, the floods from continual precipitations lasting for several days in the summer half-a-year do not usually impact large territories in Europe at one time.

The choice of the flood occurring in August 1813 is for example supported by the circumstance that K. Fischer (1907) ranks the flood among four greatest high-waters on the Odra R. in the 19th and at the beginning of the 20th century (August 1813, September 1831, August 1853 and July 1903). Furthermore, the flood in question is an extreme which can be compared with the above mentioned summer flood of 1736. According to Jungnitz

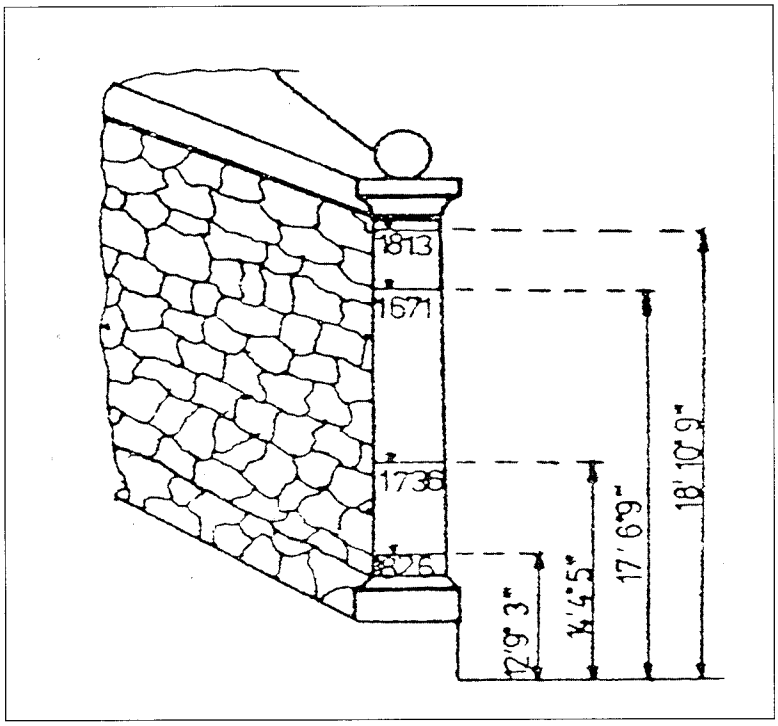

Fig. 1: High-water marks of culminations on the Vistula River on a small stone pillar in the wall corner at the Church of St. Agnes in Cracow near Wawel. The extremes were figured as height culminations above the minimum water table (according to Bielański-Fiszer 1997).

(1813), the culmination water level of the Odra River in Wroclaw was in the year 1736 by 2 inches [about 5cm] lower than in 1813 (measured by the then town water gauge). The Vistula (Wisła) River in Cracow surmounted the culmination of 1736 by more than 4 1/2 inches [approx. 12 cm] in 1813 (Fig.1).

2. Summer floods in watersheds of the Odra and Váh rivers in the year 1813

The reasons and course of summer floods in the Odra R. watershed in the year 1813 were studied in detail by H. Mann (1905). According to his reconstruction, the precipitations affected the watershed of the Odra R., Lusatian Neisse R., Vistula R. together with a part of Bohemia towards the end of August and at the beginning of September. The greatest rainfall totals were most probably recorded in the watershed of the Váh R. in Slovakia where they resulted in a disastrous flood.

If the records from the upper catchment of the Odra R. in the Polish territory speak of wind direction changing from western to north-western on 24 August 1813 and rains lasting without any interruption from 26-30 August, the heavy rains in the Váh R. watershed appear to have been lasting already from 23-26 August. In the Liptov region, the Váh R. culminated on 25 August in morning hours. In Púchov it was at night from 25/26 August. The flood claimed a toll of 287 lives in the region.

In Slovakia, the above mentioned flood on the Váh River in 1813 is called the „Palacký flood" because František Palacký, at that time the 15-year old student and later the historician and prominent

Place	Date	Water level
Racibórz – Ratibor	26. 8. or 27. 8.	more than 700 cm
Wroclaw – Breslau*	31. 8.	549 cm
Glogów – Glogau	3. 9.	502 cm
Krosno – Krossen	8. 9.	446 cm
Frankfurt / O.	10. 9.	430 cm
Schwedt	15. 9.	818 cm

* downstream water gauge

Tab. 1: Flood culminations on the Odra River in summer 1813 according to M. Deutsch (2001).

representative of the Czech National Revival, was its eye witness. The German literature speaks of the floods from this year as of the „ally from Katzbach" (today the Kaczawa River) because the flooded river contributed to the defeat of the Napoleon's army on 26 November 1813 in the encounter between the detachments of General Blücher, leader of the Silesian allied army and those of General MacDonald, chief commander of the French. And it was the flood once again which rescued the town of Jelenia Góra (Hirschberg) from pillage on 27 August 1813 when it hit the bridge of access and twenty Napoleon's soldiers who wanted to cross the stream got drowned.

According to H. Mann (1905), the Váh R. water level raised in the upper stream in Liptovský Svatý Mikuláš by „15 feet" (4.74m) above the normal, which was over 2 meters above the maximum water table known to those who remember. Culmination discharges from profiles in the vicinity of flood marks were estimated by V. Heisig (1933) as follows:

Place	Discharge (m^3/sec)
Žilina	3,300
Velká Bytča	3,800
Púchov	3,900
Trenčín	4,000
Piešťany	3,900

Anyhow, let's go back to the Odra River watershed. The course of culmination wave on this river in the period from 26 August - 15 September 1813 is presented in Table 1.

A comparison of the observed maximum water tables for individual sections of the Odra River in the years 1813 and 1997 are then presented in Table 2.

Water Gauge	1813	1997
Chalupki - Ruderswald	–	705
Racibórz – Ratibor	700	–
Koźle – Cosel	715	947
Krapkowice – Krappitz	811	1032
Opole – Oppeln	604	777
Brzeg - Brieg	554	730
Wroclaw – Breslau (lower)	549	–
Wroclaw – Breslau (upper)	727	–
Trestno – Treschen	549	724
Glogów – Glogau	502	712
Kros Krossen	446	583
Frankfurt / O.	530	657
Schwedt	318	886

Tab. 2: Maximum water tables Hmax (cm) of the Odra River during summer floods, in 1813 and 1997 according to A. Dubicki et al. (1999)

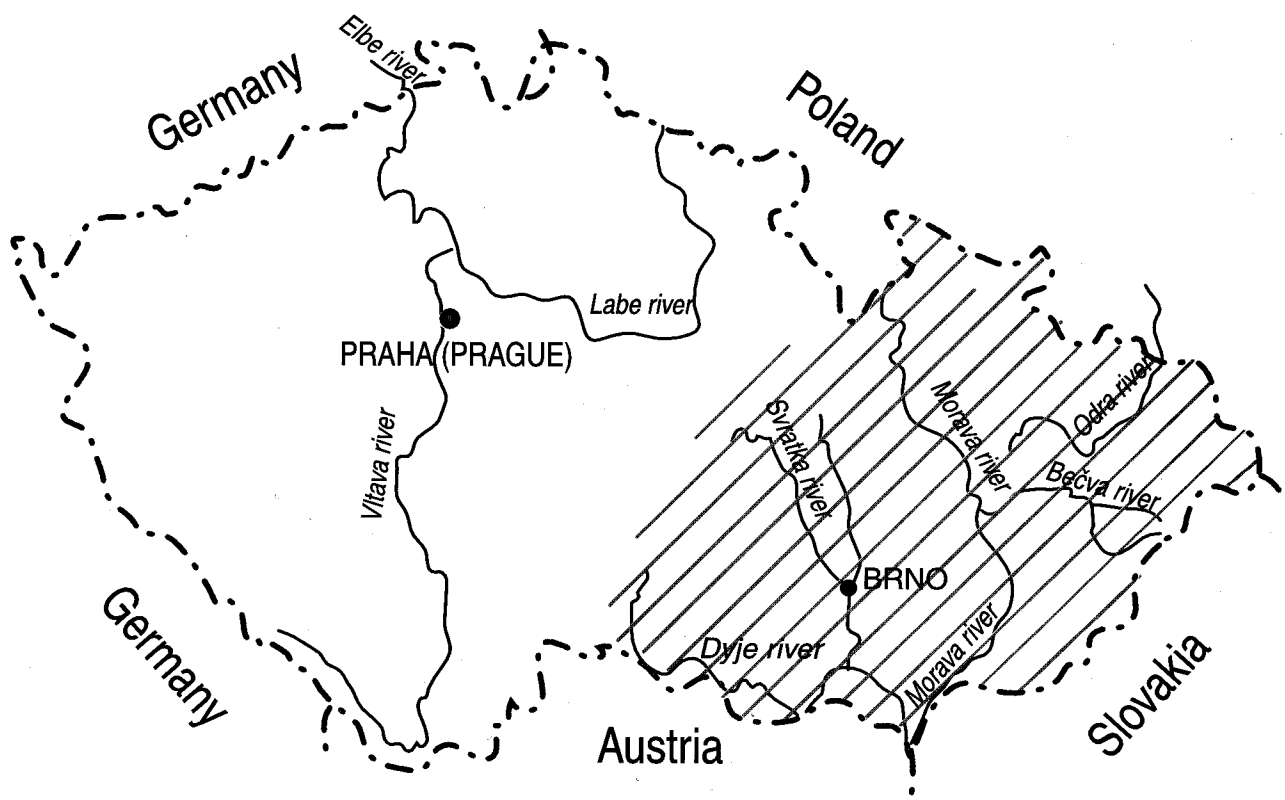

Fig. 2: Area under study

Fig. 3: Prof. Dr. Cassian Hallaschka (1780-1847) according to contemporary engraving.

3. WEATHER AND FLOODS IN THE MORAVA RIVER WATERSHED IN SUMMER 1813

In his admirable monograph H. Mann (1905) used all available data from the territory of the today's Czech Republic for the reconstruction of synoptic situation during the entire hydrometeorological extreme of 1813, namely the results of meteorological measurements made in Prague, Žitenice and Teplá near Mariánské lázně (Marienbad), i.e. from the territory of Bohemia where the extreme rainfalls and floods did not show, however. Regarding the fact that the author of this paper participates in the grant project „Floods, landscape and people in the watershed of the Morava River", an attempt was made to complete the hitherto information from the Odra R. watershed according to Mann with preliminary pieces of knowledge about weather and floods occurring in the Morava R. watershed and in the Czech part of the Odra R. watershed towards the end of August 1813 (Fig. 2).

Ones of the most interesting discoveries are results of meteorological measurements and observations from Brno made by the prominent Moravian meteorologist of the 1st half of the 19th century and professor of physics and mathematics Cassian Hallaschka (1780-1847), member of the Piarist order, who later worked at universities in Prague and Vienna (Fig. 3). Hallaschka summed up his knowledge about the course of summer 1813 as follows (a partly shortened free translation):

May 1813

The month was on average cold, rainy and mostly cloudy with winds arriving at turns from SE, NNE, NW and WNW directions ...

June 1813

Also this month - with the exception of its beginning and end - was cold, rainy and cloudy with changeable weather and wind prevailing from the WNW...

July 1813 is characterized as very humid and with mean temperatures and prevailing WNW wind .....

August 1813 was mainly humid and colder than July. Prevailing wind was of WNW direction once again. The pleasant weather on 1 August raised hopes for other fine days but the sky became overcast as early as on 2 August and rains were taking turns with storms and unpleasant windy days. There was a widespread rain (Landregen in German) which arrived with the WNW wind after nearly everyday's showers, which was stopped on the following day by a gale of WNW direction. However, the gale was followed by continuous raining for 48 hours and all plains (lowlands) suddenly appeared under water. The weather got very cold until 31 August when finally Sun emerged and brought to an end the sad view. We could count only three clear days in the whole month. The highest pressure of 28 inches, 5 lines and 9/10 fell on 31 August whilst the lowest pressure of 27 inches, 10 lines and 7/10 on 24 August. The highest air temperature was 22 1/2°Réaumure (28.1°C) on 13 August, and the lowest air temperature was 9° Réaumure (11.2°C) on 30 August.

September 1813 was characterized by humid, cold weather and heavy winds which usually arrived from the SE directions, i.e. from the different directions than in August. There were floods due to the continuous rains not only in Moravia but also in the neighbouring countries. Most pleasant were the first four days. A strong but still warm NW wind arrived on 5 September, which changed into an extraordinarily severe gale of SE directions lasting until the next day. It was followed by rain showers and a three-day widespread rain (Landregen in German) which arrived on 9 September with the NE wind. Eventually, the wind turned to the NW on 12 September, bringing here changeable weather... (Hallaschka 1814).

Unfortunately, Hallaschka's observations made in Brno were not preserved in extenso; this means that a detailed analysis of weather course is hardly possible (Fig. 4). Nevertheless, it is at least possible to make a comparison of calendar data of the occurring air-pressure extremes recorded by stations in central Europe towards the end of August 1813 (Tab. 3).

It appears that the measurements made in Brno fit very well in the weather situation in central Europe, in other words that the occurrence of the absolute air-pressure minimum in the third August decade on the individual gauging stations had its logical explanation because the lowest measured values were recorded in Budapest and Brno on 24 August, in Cracow on 26 August, in Warsaw on 27 August, and finally in Gdansk on 28 August 1813, the Váh River in the NW direction could have been considerable.

To concretize the occurrence of floods in the Morava R. watershed there are data available e.g. about an extremely big flood after a rainstorm upstream the valley of the Desná R. - the right-bank tributary of the Morava R. in the upper part of the stream. Although the flood is not precisely dated, there is no doubt it was the same disaster which affected the town of Jeseník (distant some 10km) and its surroundings with a subsequent flood on the Bělá R. (the Odra R. watershed) in the period from 26-28 August. Entries in the Jeseník parish chronicle indicate that the disaster was coming near already on 24 August when the northern wind got the strength of hurricane and the barometer was advising arriving storm. The downpour fell down at night from 25/26 August, which changed into hailstorm in the mountains. All streams and brooks overflew their banks before the morning (Polách, Gába 1998).

Station	Minimum	Date	Maximum	Date
Budapest	747.4	24. VIII.	768.0	31. VIII.
Brno x	734.4	24. VIII.	750.5	31. VIII.
Cracow	751.6	26. VIII.	766.7	31. VIII.
Warsaw	751.5	27. VIII.	767.2	31. VIII.
Gdańsk	752.0	28. VIII.	767.1	31. VIII.

x/ without reduction of pressure to the sea level

Tab. 3: Extremes of air pressure during the period 21-31 August 1813 (mm Hg) according to Mann (1905) and Hallaschka (1814).

which acknowledges the cyclone trajectory from the south to the north.

And there are more data from Brno! Atmospheric precipitations were measured by Zacharias Melzer and it is therefore useful to include the values into the central European context too (Tab. 4).

Monthly total rainfalls in Brno document an extraordinarily wet period from May to July 1813 as well as a considerably rainy August (whose total precipitations were by about 25% higher than the month average in the period 1901-1950). As to the year 1813 as a whole, it is possible to say that with its 762 mm of precipitations it was the wettest month in the period of measurements made by Melzer (1803-1836). A somewhat surprising is the low August precipitation total in Wroclaw; however, the measured value might relate to a non-standard installation of the rain gauge on the gallery of a planetarium at a height of 102 Parisian feet [about 33m] above the ground surface. Another factor could have been the fact that territories impacted by heavy rains are sometimes very sharply demarcated, which leaves space enough for an assumption that the „precipitation gradient" from the upper watershed of

The floods at the end of August 1813 and their causes were evidenced also on another left-bank tributary of the Morava River - on the Bečva River - from so far unknown archives of the Hranice manor (Fig. 5). A free translation of a report preserved in German language reads as follows: „Due to torrential rains in the period from 21 - 29 August 1813, the Bečva River and its tributaries overflew their banks and caused a severe damage in the Hranice estate. It was the greatest water in the last 34 years. Fields of retainers residing on river banks were at a greater part destroyed, spring cereals washed away and the crop turned to nothing. Only the

Station	J	F	M	A	M	J	J	A	S	O	A	D	Year
Prague[1]	3.5	5.7	32.5	27.2	56.8	35.0	54.2	87.0	48.1	53.5	29.8	23.8	457.1
Brno[2]	11	5	21	36	134	131	114	78	78	83	36	35	762
Wroclaw[3]	2.8	7.5	9.3	9.3	27.3	24.5	22.5	50.8	37.5	27.3	22.5	11.3	-

1- according to Meteorologická pozorování (1976);
2- according to Hydrographischer Dienst (1913);
3- according to Mann (1905).

Tab. 4: Precipitation totals in Central Europe measured on three stations in 1813 (mm)

Fig. 4: Mean air-pressure values in Brno in the year 1813 according to C. Hallaschka (1814).

1813.	Mittlerer Barometerstand für den Brüner Horizont.								
	8 Uhr früh			3 Uhr Nachmittag			10 Uhr Abends.		
Jäner	28 Zoll	5 Lin.	6 S.	28 Zoll	5 Lin.	7 S.	28 Zoll	5 Lin.	3 S.
Februar	28.	3.	5.	28.	3.	3.	28.	4.	1.
März	28.	4.	0.	28.	2.	9.	28.	3.	3.
April	28.	2.	5.	28.	2.	3.	28.	2.	4.
Mai	28.	2.	6.	28.	2.	4.	28.	2.	2.
Juny	28.	2.	1.	28.	2.	1.	28.	1.	7.
July	28.	0.	1.	28.	0.	7.	28.	0.	9.
August	28.	2.	1.	28.	2.	3.	28.	2.	6.
September	28.	2.	9.	28.	2.	9.	28.	3.	8.
Oktober	28.	1.	7.	28.	0.	0.	28.	0.	0.
November	28.	1.	7.	28.	1.	5.	28.	1.	5.
Dezember	28.	4.	1.	28.	3.	6.	28.	3.	7.
Summa	338.	7.	7.	338.	4.	9.	338.	7.	5.
12:	28.	2.	6.	28.	2.	4.	28.	2.	6.
	28.	2.	4.						
	28.	2.	6.						
3:	84.	7.	6.						
	28.	2.	53/99.	Mittlerer Barometerstand für den Brünner Horizont.					

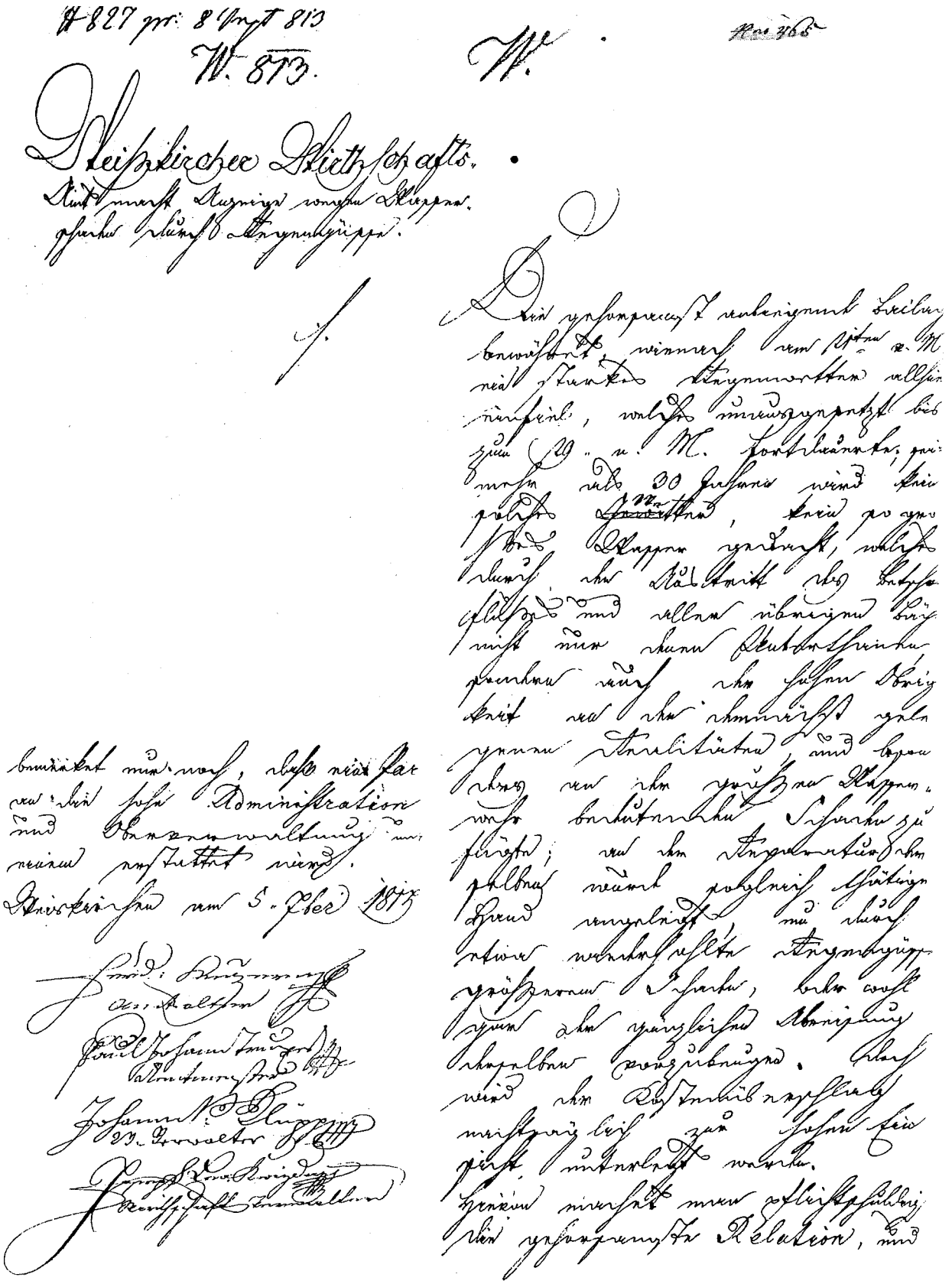

Fig. 5: Original report dated 9 September 1813 about damage due to high-waters in August 1813 on the Hranice estate (regional Archives Opava, subsidiary in Olomouc; Fund Hranice Manor)

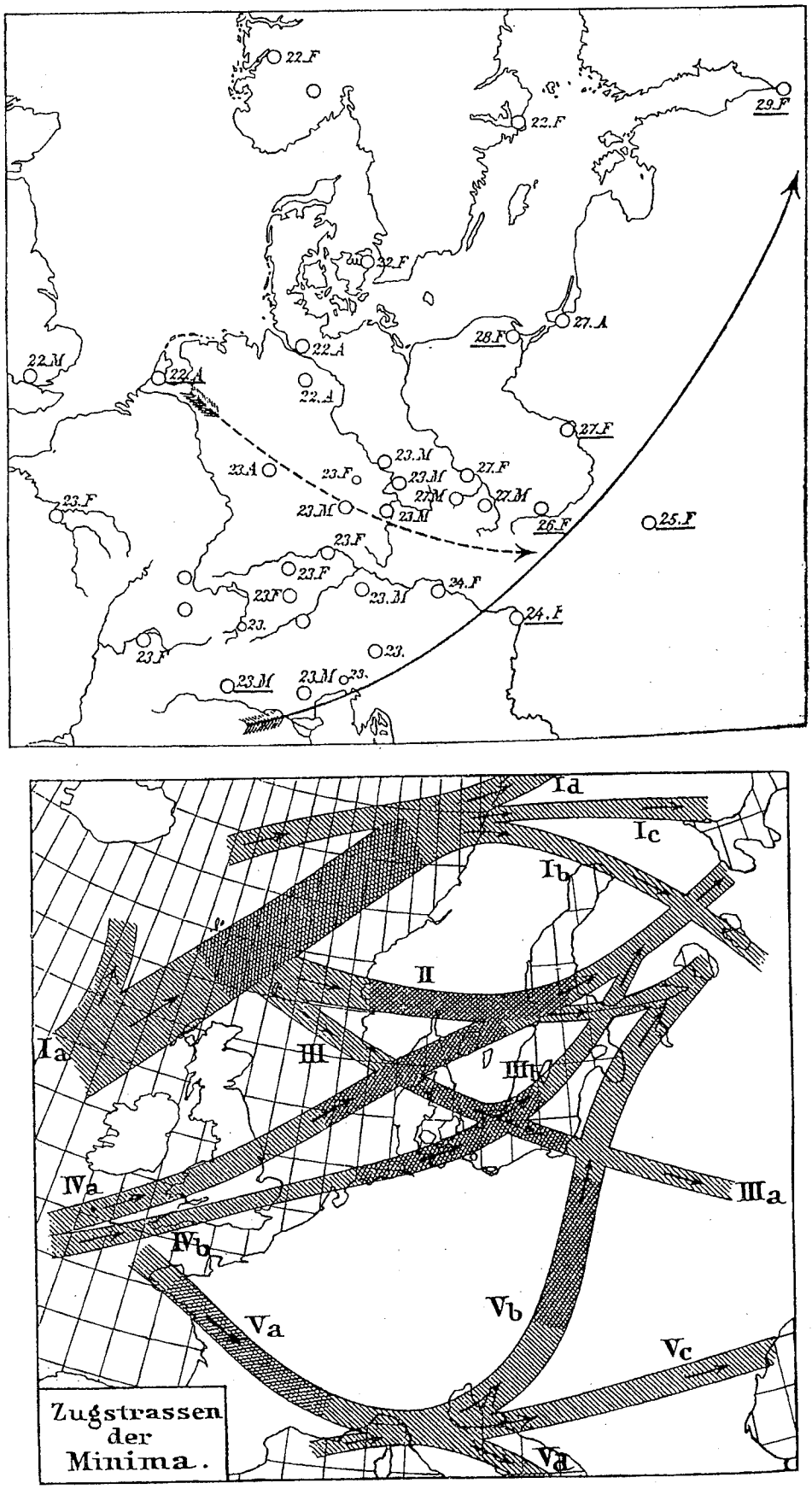

Fig. 6: Above: Assumed cyclone trajectory in 23 - 29 August 1813 according to Mann (1905). Figures represent occurrence dates of the lowest air-pressure on individual stations in Europe (Dates of places at which the lowest air-pressure lasted the whole day are underlined; F = morning, M = noon, A = evening).
Below: Cyclone trajectories in Europe according to the classification by W.J. van Bebber (according to Hann-Süring 1926).

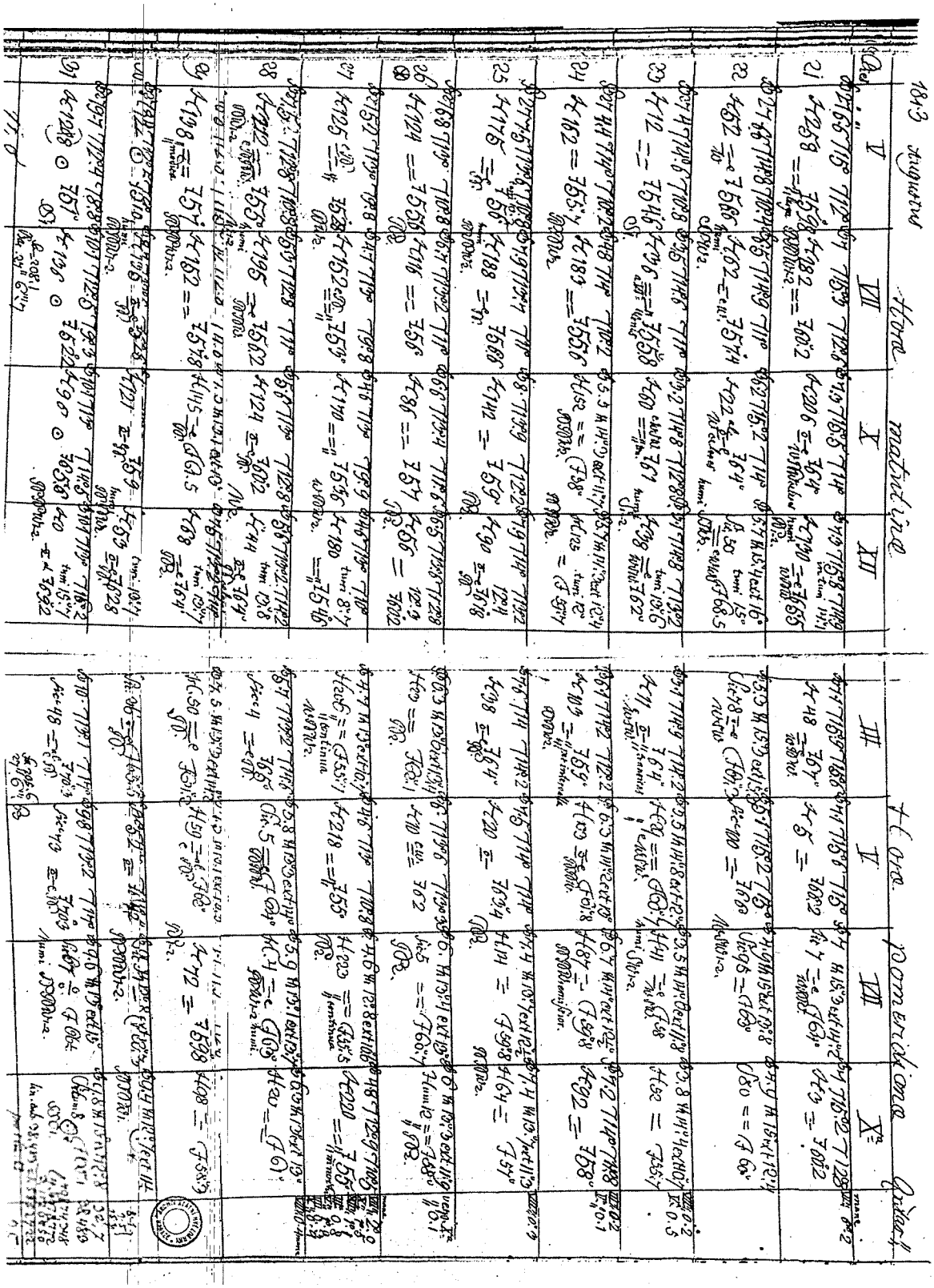

Fig. 7: The original meteorological diary of Prague - Klementinum observatory from August 1813 with 8 observations

barley near the Slavičín fish pond was flooded but not washed away. The greatest damage was seen at the big dike where repairs were started immediately in order to prevent other losses due to repeated floods. A blueprint of costs for the repair will be submitted ..." The historical document mentions a somewhat controversial beginning of the rainy period, i.e. 21 August.

The extremely wet year, heavy torrential rains and awful floods are also mentioned in memoirs from the village Písečné (altitude 614m) in western Moravia. The humid weather did not allow rye harvest which could be started as late as on 31 August 1813.

A record exists from the central section of the Morava River (Třebětice near Kroměříž - ca. 8km east of the river) that the rain began on 24 August and continued day and night until 31 August 1813. The entry also mentions that people heard of great floods occurring in Hungary (the Váh R.), Poland and Prussia - surprisingly without mentioning the flood on the nearest watercourse, the Morava River. Nevetheless, a flood (due to cloud-burst) on the Haná River, a near right-bank tributary of the Morava R. in the Vyškov district was recorded on 30 August 1813.

Quantification of culmination high-water levels on the Morava River is difficult because the hydrological measurements on this watercourse were started - unlike on the Polish part of the Odra River - relatively late, towards the end of the 1870s. A single interesting fact is the statement that the Bečva R. valley was flooded particularly severely with high-waters in 1809 and 1813. The Bečva River water table reached the height of important bridge in Vsetín and the whole outskirts of the town Vsetín appeared under water (Ergänzungs-Tabelle).

4. Conclusion

Floods in central Europe in August 1813 were most probably caused by a cyclone proceeding along the Vb trajectory (Fig. 6) according to the classification by van Bebber (Hann-Süring 1926), in a similar way as those occurring in July 1897 and in July 1997 but with the effect of its retrograde movement. It was exactly the effect of retrograde depressions that resulted in extreme floods on the Odra River not only in 1997, but also for example in the year 1903 (Kakos-Štekl 1997, Koblihová 1989).

The description of weather in Moravia from May to August 1813 is analogical to the extreme summer of 1890 in Bohemia with corresponding extra high soil saturation which at a great deal contributed to the rise of the greatest historical summer flood on the Vltava River in Prague at the beginning of September 1890 (Kakos 1997b, Kakos-Kulasová 1990).

The occurrence of gale in the last decade of August 1813 meant an extraordinarily intensified horizontal pressure gradient between air-pressure values in the area of cyclone and anticyclone where normally orographic windward effects can apply which results in the incidence of sometimes even extremely heavy precipitations in mountain areas. It is these synoptic situations that affect more extensive territories (Kakos 1997a).

A great drop in temperature which lasted in Brno until 31 August (Hallaschka 1814) clearly corresponds with the case when the territory finds itself in a cold part of the cyclone with temperatures considerably below normal (Kakos 1983, 1984). The situation is documented also by the meteorological observations from Prague-Klementinum (Meteorologická pozorování 1976, Observationes 1813) where we can read that the last day with the southern flow and minimum air-pressure was 23 August 1813 (Fig. 7). Then there were winds of northern directions and low temperatures prevailing until 31 August (27 August recorded even some more pronounced precipitations of 19.4mm at the western flow). This indicates that Prague was also included in the zone of cold air.

We can conclude that the above mentioned documentation on the hydrological situation in the Morava River watershed further extends the hitherto knowledge of floods occurring in August 1813 in watersheds of the Odra and Váh Rivers. It follows from the documentation that these historical floods in central Europe can be considered an analogy to extreme from July 1997. However, the floods in the territory of the Czech Republic at the beginning of the 19th century affected first of all the Bohemian part of the Odra R. watershed and the upper and/or middle part of the Morava R. watershed (particularly its left-bank tributary - Bečva River - where a considerable damage was recorded).

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PARADOXIES OF NATURAL DISASTERS (WITH EXAMPLES FROM THE CZECH REPUBLIC)

Jan MUNZAR, Stanislav ONDRÁČEK

Abstract

Natural disasters use to be cruel to concrete impacted persons and regions. However, they can become a source of initiatives for subsequent restoration, an impuls for modernization of towns, etc. The fact that disasters have become an inseparable part of society's everyday life led to efforts aimed at their prevention or post-prevention (insurance) already in the past. The situation occurring in connexion with the most severe natural disaster of the 20th century in the territory of the Czech Republic, i.e. floods in July 1997, was unvaried.

Shrnutí

Paradoxy přírodních katastrof (s příklady z České republiky)

Přírodní katastrofy jsou kruté k postiženým lidem i regionům. Mohou se však stát i zdrojem iniciativy pro následnou obnovu, impulzem pro modernizaci měst apod. Fakt, že se katastrofy staly neodmyslitelnou součástí života společnosti vedl již v minulosti ke snahám o jejich prevenci, popř. postprevenci (pojišťovnictví). Nejinak tomu bylo i v souvislosti s největší přírodní katastrofou 20. století na území České republiky - povodněmi v červenci 1997.

Key words: *fires, summer floods, snow calamities, society versus natural disasters, 16th - 20th century,Czech Republic*

1. Introduction

The paper deals with some aspects of society's attitude to natural disasters in the territory of the Czech Republic (CR) in the past and nowadays.

The natural disasters in conditions of the Czech Republic are usually discussed in connexion with dangerous hydrometeorological phenomena which are in these natural conditions mainly represented by intensive storms and torrential rains and by them induced flash floods or long-lasting rainfalls and resulting floods. Floods can also result from sudden and rapid snow thaw, usually combined with rain or even with ice passage. In winter, it is nearly any more abundant or longer-lasting snowing that can cause a disaster. The dangerous hydrometeorological phenomena also include hailstone, windstorms and sporadically occurring tornadoes. Natural disaster is also a longer-lasting drought, particularly if it arrives at the beginning of the growing season as was the case of the year 2000. Nevertheless, there are some geomorphological processes such as land slides and water erosion, which are spoken of as natural disasters, too.

2. A look back into the history

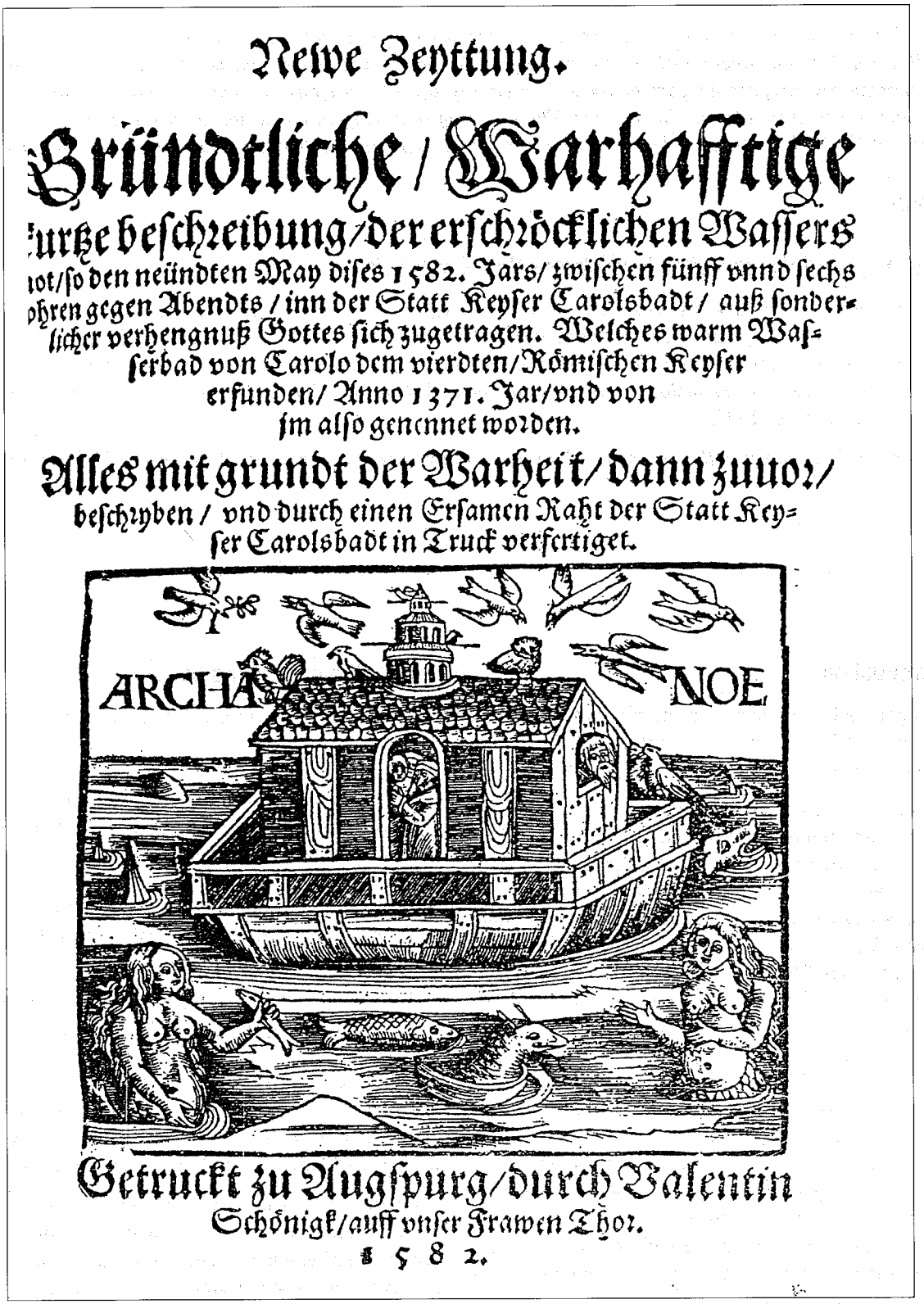
Natural disaster is an accident conditioned by natural forces and phenomena - „elements" in idea of ancient ages, i.e. earth, water, air and fire - which by an essential way impacts, destroys or at least puts into great danger a certain region and the man in it. However, disasters are in fact potentially productive not only for nature itself but for the whole human society. Although the disastrous situations reveal some hitherto hidden problems, they usually also reveal sources of initiatives for restoration unthought before.

The history of the Czech Republic gives an account of fires affecting towns and villages, which were of immediately natural origin (lightning) or caused by human carelessness or even intention at which accompanying weather played an important role. Other often mentioned disasters were epidemics, famines and incidence of dangerous hydrometeorological phenomena.

Big fires can have immediate tragical impacts in terms of losses on human lives and material, and can even result in extinction or decline of towns. In many a case, however, they often became a starting impuls for new developments and modern reconstruction of towns. Here

we can mention examples of two big fires occurring in Prague in the 16th and 17th centuries:

The „Big Prague Fire" of June 1541 took the toll of more than 50 human lives and 197 houses. It attacked a larger part of Lesser Town and Hradčany; the Prague Castle was burnt down with the exception of cathedral vaults and Vladislav Hall in spite of the fact that roofs above them burned down, too. The hopeless scenes of fire gradually became flourishing towns (todays city districts), much more architecturally rich than before the disaster, because of their pronounced transformation from Gothic style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Gründtliche / Warhafftige

urtze beſchreibung/der erſchröcklichen Waſſers

ıot/ſo den neündten May diſes 1582. Jars/ zwiſchen fünff vnnd ſechs

ohren gegen Abendts / inn der Statt Keyſer Carolsbadt / auß ſonder-

licher verhengnuß Gottes ſich zugetragen. Welches warm Waſ-

ſerbad von Carolo dem vierdten/Römiſchen Keyſer

erfunden/ Anno 1371. Jar/vnd von

jm alſo genennet worden.

Alles mit grundt der Warheit/ dann zuuor/

beſchryben / vnd durch einen Erſamen Raht der Statt Key-

ſer Carolsbadt in Truck verfertiget.

ARCHA NOE

Getruckt zu Augſpurg/durch Valentin

Schönigk/auff vnſer Frawen Thor.

1582.

Fig. 1: Front page of special printed release on the flood in Carlsbad 9 May 1582, issued in Augspurg.

to Renaissance. At the same time, demolition scree from destroyed houses deposited near embankments of the Vltava River helped to reinforce the surface and stabilized the groundplan of originally swampy eyot of Kampa, separated from the bank of Lesser Town by a river arm. And extensive construction works started in the northern part of the isle.

The fire of the Old Town, Jewish Ghetto and a part of the New Town of Prague in June 1689 was incomparably bigger. It took a toll of 749 houses not including 5 cathedrals, several monasteries and parsonages. The restoration helped to convert the Prague towns from Renaissance to Baroque.

Floods represented another natural impact on inhabitants of towns and villages situated near watercourses since they have always been normal and practically annually occurring phenomenon on natural (unregulated) watercourses. They usually took down wooden footbridges and bridges while the new ones were of more stable and modern construction and design.

The first stone bridge across the Vltava River in Prague was built in the second half of the 12th century and was named after Queen Judith. It was paid deserved attention and admiration although it was only pillars and several vaults near both river banks that were made of stone. The bridge performed its function a number of years and had to give in to a big ice flood of 3rd February 1342. A temporary wooden bridge was erected in its place right after the disaster.

The idea of rebuilding the stone bridge became true as late as under the rule of Emperor Charles IV who raised Prague up to the position of the first city in central Europe by having had founded a university here in the year 1348. A metropolis of this kind could not do without a good bridge. This was why a foundation stone of a new connecting line between the two Vltava River banks was laid 3rd July 1357. The precise date of accomplishment of works on the new bridge is not known because frequent floods were permanently disturbing the construction works and caused a permanent overlapping of repairs with the proper construction work. A flood in March 1367 for example broke through several points in the temporary wooden bridge and took down a pillar in the newly constructed bridge. The last breakage through the Charles Bridge occurred during a flood at the beginning of September 1890. There is a well justified assumption that if the Bridge of Queen Judith were functional during the reign of Charles IV, there might have been no famous Charles Bridge of grand design decorating the capital of Prague today.

An interesting source of information about natural disasters became occasional printed matters in the 2nd half of the 16th century. The first printed description of a flood in Czech lands was a response to losses incurred by a storm with torrential rain and the flooded river of Teplá (Fig. 1) in Karlovy Vary (Carlsbad) in May 1582. Occasional printed news concerning the accident became to a certain extent a bestseller which was gradually published in Augspurg, Nurnberg and Regensburg with the news about the flood in Carlsbad not missing in chronicles of other central European towns. We can assume that the natural disaster and at the same time sensational event de facto brought fame to the already popular spa town which bears the name after its founder, Emperor Charles IV.

The fact that disasters have become a part of the everyday life of people and society brought about prevention efforts since the oldest times - starting from the construction of dikes and dams, adoption of fire regulations and flood instructions up to the system of civil defense. Modern times have come with the idea of post-prevention, i.e. insurance.

The first printed regulations and instructions issued by state administration for the territory of the Czech Republic and concerning natural disasters originate from the mid-18th century. In 1780 for example, an instruction was published in Prague according to which the councillors, representatives of tax offices and authorized persons were to make records on impacts by fire, weather and water in the Kingdom of Bohemia, and liquidate the incurred losses in terms of „accounts". This means that there were still no instructions in these times how to behave and what to do in the case of proper fire or flood occurrences.

The oldest preserved flood instruction for Prague was published on 28 January 1799 in two languages - German and Czech and was most probably instigated by sad experience with the impact of irregular ice flood on the Vltava River after the bitter winter of 1793/94. The instruction is very extensive and splits into three groups of issues: what to do before the ice passage beginning, after the beginning of the ice passage and after the ice passage is over. Abstracting from incomparable technical possibilities in the span of two centuries, we can surprisingly find a great similarity with organizational flood instructions issued for Prague in 2000, which confirms a rather modern character of the old instruction.

3. Summer floods: Most dangerous natural disasters in the Czech Republic

The most dangerous natural disasters in Czech conditions are summer floods. The issue of summer floods and floods in general appeared in the centre of attention for both experts and general public after disastrous floods in watersheds of the rivers Morava, Odra and Upper Elbe in July 1997, which represented the most severe natural disaster in the territory of the Czech Republic, occurring in the 20th century (Munzar, Ondráček, 2000). Impacted areas immediately exhibited

enlivened social awareness of the risk of this natural phenomenon. People literally feared any coming rain and looked up to the sky with worries. So far unexperienced was also the conspicuous concern of mass media in the issue of floods.

Summer floods on watercourses in natural conditions of the Czech Republic can be classified in about two general types: Relatively frequent are so called flash floods which can be recorded even several times in a year. The flash floods are destructive floods with only short duration since they are evoked by intensive rainstorms which usually last several tens of minutes or hours. The rains usually affect a relatively small territory and this is why the flash floods usually occur only on small watercourses with watershed areas up to several tens of square kilometers (Hrádek, Ondráček 1995).

The flash floods will always surprise the affected area with their destructive character. Floods of particularly destructive nature occur in the territory of the south-eastern Bohemian Highland, i.e. in the territory which also includes the town of Tišnov, the venue of our Conference Congeo 2001. This is given by the fact that the main watercourses of the region such as Dyje, Jihlava, Svratka and other rivers flow in deep valleys and their short tributaries which experience flash floods have a great gradient and their articulated catchments are heavily sloping. Should there be a seat in the vicinity of the mouth of such an affluent, a great danger exists that the seat will be impacted during a possible flash flood. An example of seat affected in this way can be the village of Luka nad Jihlavou where two persons lost their lives during a flash flood towards the end of April in 1988. Flash floods occurred in the south-eastern Bohemian Highland also in this year 2001 with two floods occurring in Vranov nad Dyjí in the Znojmo district and in the Třebíč district.

Less frequent are floods induced by long-lasting rains affecting as a rule a more extensive territory; this was the case of the floods in July 1997.

4. Floods as an instigation and impuls for the society. Beneficial aspect of flood consequences.

The disastrous floods in Czechia in the year 1997 discovered a whole range of suspected and unsuspected facts corroborating that the general trend recorded a considerably decreased perception of flood risks, neglectance of the need of systematic flood prevention, underestimation of the significance of flood measures. It is rather striking that something of such a basic importance as the demarcation of inundation areas has not been made to full extent in the Czech Republic. The inundation areas have been so far demarcated along just a third of important watercourses, not speaking of other streams, which is ever more striking if we take into account the fact that they are densely inhabited with large seats, industrial complexes and important communications. The flood of 1997 showed that it is not even the large cities such as Ostrava, Olomouc, Opava, Krnov, Kroměříž, Přerov, Uherské Hradiště and other towns that are provided a sufficient protection against floods.

A less known fact is that it is also the capital of Prague which is exposed to a relatively high risk of floods. The cascade of waterworks and reservoirs on the Vltava River, used primarily for power generation, does not provide sufficient protection against big floods. Furthermore, right above Prague the Vltava River receives waters of its largest tributary - the Berounka River which has no water reservoirs at all. Some reservoirs are situated upstream in the upper parts of the Berounka R. watershed on some of its source streams. After years of considerations, research, theoretical studies and partial provisions, the capital of Prague decided to start implementation of a flood protection system as late as in the year 1997. Making use of foreign experience the city authorities adopted a system of mobile barraging elements which prevent big flood losses and at the same time do not markedly intervene into the existing appearance of the town, especially in its historical quarters (Cabrnoch 2000). Construction of the whole flood protection system is divided into seven stages until the year 2004. Preparation and the so far implementation of particular stages together with the experience from the disastrous floods occurring in the eastern part of the Czech Republic in 1997, which are at the same time an important memento and warning, represent a promising view that the systematic protection of Prague against floods will actually be successfully accomplished and the protection of Prague inhabitants and their properties, including historical and cultural sights ensured for the long future.

The floods of 1997 took a toll of 50 human lives and losses were enormous. Should we look for something positive when summing up the flood consequences, we would find a change in the general perception of flood protection importance in the Czech Republic. The disaster instigated implementation of a number of projects to assess and analyze reasons, course and consequences of the floods, and to propose measures for flood protection improvement. A Strategy of Flood Protection for the Territory of the Czech Republic was elaborated and passed by the Czech government in April 2000. Linking up with the document, the competent state departments drafted concrete programs focused on the development of individual elements of flood protection and flood prevention. A program for the construction and renovation of polders, reservoirs and dams is for example implemented under direction and

coordination of the CR Ministry of Agriculture as well as the program for increasing capacity of water stream beds, program for demarcation of inundation areas, program of changes in landscape functions and methods of use of land property in active zones of inundation areas. Programs directed and coordinated by the CR Ministry of Environment are for example the program for construction and renovation of watch systems, program for documentation of inundation areas, and there are other programs under the direction and coordination of the CR Ministry of Transport and Communications and CR Ministry for Local Developments (Details see URL www.mze.cz).

Unfortunately, the society would up to now realize some flood measures usually only after the attack of floods, under the burden of flood losses and under the burden of financial means spent to remove the losses - all this instead a continual and systematic flood prevention which would not only reduce flood losses but which would also facilitate development and use of the protected area. One of reasons to the existing situation seems to be a fact that the return of investments into the continual and systematic flood prevention is slow, making the investments a „mere" deposit into the future.

Hydrological forecast service plays an important role in the flood protection and prevention. Similarly as the majority of other flood protection elements, the service was not developed continually and systematically but rather by steps made in consequence of individual floods. The development of hydrological forecast service was in this sense very well described by Hladný (2001). It was the unpropitious flood events in May 1872 which represented an impuls for the foundation of Hydrographic Commission for the Kingdom of Bohemia in the year 1875. And the very beginnings of flood water level forecasting in the catchment of the Elbe River relate to the activities of this Commission. Efforts aimed at the official introduction of water level prognoses date back to the year 1886. Yet, there had to be another disastrous flood before the permission was issued towards the end of the year 1890, i.e. after the disastrous flood in September 1890, which destroyed several vaults of the Charles Bridge on the Vltava River in Prague. And it was flood once again - this time in 1954 - which made the responsible institutions agree with the constitution of an independent groups of prognostic experts at the Hydrometeorological Institute. However, the hydrological forecast service was officially founded as late as in 1960 with the decision having been accelerated once again by relatively extensive flood losses. Another important step forward in the development of the hydrological forecast service was made in the year 1997 with the development of automation of watch stations and extended applications of hydrological forecast models.

5. Society and flood risk

River floodplains, i.e. areas immediately adjacent to watercourses, were inhabited to a relatively low degree in the past. Man was in a tighter coupling with nature, and should people live in the vicinity of watercourses and streams, they were most probably much more aware of the risk of floods than people today. Floods used to be a part of life for the population living along the watercourses.

The historical memory of flood risk was lost during the 20th century which had a relatively low incidence of big floods. And it was exactly the 20th century when man invaded river floodplains, building extensive industrial and housing complexes and important communications. This is how the society became much more vulnerable than ever before.

Only a few people of those living in the river floodplains at the end of the 20th century were aware of the risk of floods which constantly threaten these regions. Hardly anybody considered the fact that their homes are in fact situated in the inundation areas. This is why the society was caught entirely unawares by the extraordinary floods which occurred in the Czech Republic towards the end of the 20th century. The floods surprised both by their destructive character and by the fact of their incidence itself. Opinions of experts that floods are an absolutely natural phenomenon and that river floodplains represent naturally flooded areas are not always accepted with agreement. On the other hand, there are also opinions that it is the human society itself who induces floods by for example landscape devastation.

After year 1948 an opinion spread about floods and their destructive character being markedly contributed to by mistakes of the former capitalist regime. The fact is that the man has been affecting the landscape since the Neolithic and there were often be heavy interventions into the landscape until the mid-20th century. However, nothing can be compared with land devastation in socialism during the 2nd half of the 20th century.

Landscape devastation in the times of socialism related primarily to the socialistic intensification of agricultural production largely associated with improper land use, large-scale drainage of agricultural land and liquidation of permanent grass stands. The drainage was hypocritically called amelioration, i.e. soil improvement. Apart from the devastation of agricultural land, disastrous forest decline occurred due to air pollution on a scale unseen in the history of Czech landscape before. There were huge projects for improper regulation of watercourses. It follows that the principal and large-scale interventions into the landscape, which were furthermore made in a historically very short time

impaired the retention and retardation potentials of the landscape and accelerated runoff from the fallen atmospheric precipitations. This resulted in a changed regime of watercourses in such a way that culmination flows have got higher than normal at the time of floods and low flows on the other hand even lower at the time of drought than would be their normal natural condition.

There is certainly no doubt that the human society itself worsened the course and consequences of floods by extensive landscape devastation thus affecting the risk of floods. Nevertheless, this will change nothing on the fact that floods are a natural phenomenon which cannot be prevented and that the man can only modify the floods to a certain extent in either positive or negative sense.

6. Conclusion

The opinion that society is capable of suppressing or even eliminating natural disasters and their impacts is a very dangerous illusion. On the other hand, however, we have to realize that a relatively current event can become disaster should it catch the society unprepared. In this way, a flood which is announced in time and expected may not be a disaster but rather a historical event (Fig. 2).

An example of how the current natural phenomenon can result in collapse or disastrous situations because of man and his unpreparedness, neglectance, poor discipline or unscrupulousness can be events from the speedway from Prague to Brno on 22 and 23 February 2001. The speedway D1 which has been connecting the capital of Prague and Brno since 1980 became a trap from late afternoon 22 February to morning hours 23 February 2001. First time in its 20-year history the speedway got totally blocked and closed in both directions for twelve hours. It took up to twenty hours to overcome the distance of 190 km between the two towns by cars.

Why? It got suddenly dark at about 16.00 o'clock 22 February 2001 in the region of the Bohemian-Moravian Uplands with the range of sight being markedly impaired. A strong wind started to blow with snow fall which was abundant at some places. It did not take long and a queue of cars on the speedway spread across several tens of kilometers. Although the event was finally presented in the mass media as a snow calamity,

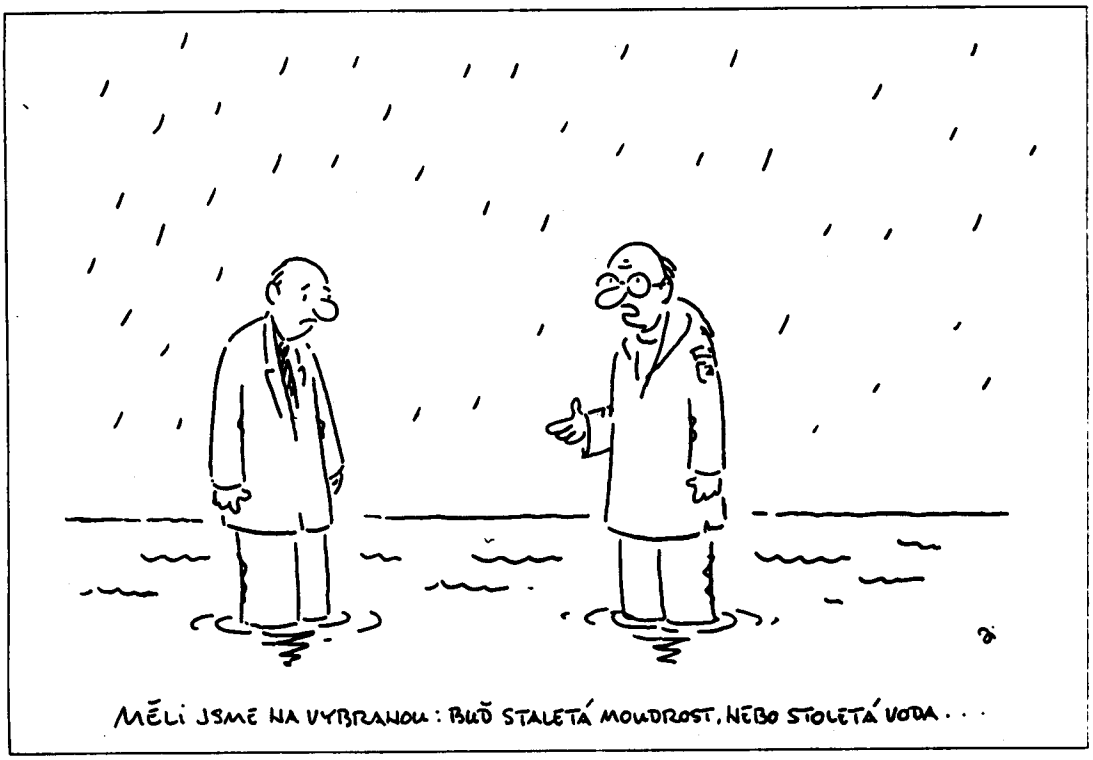

Fig. 2: „We had a choice of either centenary wisdom or centenary water..." (The flood in July 1997 in daily press as seen by cartoonist Vladimír Jiránek, Magazín MF Dnes, 24. July 1997).

it had to do with only 10-20cm of new snow; what was decisive was the human factor. The fact is that road workers failed to efficiently remove the snow but dominant appeared to be the poor discipline of drivers. Truck drivers began to „race" in all speedway lanes. Loaded trucks with summer tyres got into problem with long elevations and began to lose stability a number of them ending in ditches or across the road. Other undisciplined drivers choked the third, out-side lane, which prevented the motion of police, ambulance, towing service cars and road workers. This is why hundreds of drivers had to wait in their cars for about seven hours in the queue with gradually getting out of petrol, heating, frozen, hungry and without any possibility for help coming near.

In contrast, let us remind the behaviour of people during the floods in Moravia in summer 1997. Some time later a school boy from the Kroměříž district made a following statement about the floods: „Disaster? Yes, but let us not forget how close we were to each other!"

Acknowledgement

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RNDr. Vilibald KAKOS

THE PRESENT DEMOGRAPHIC SITUATION IN CZECHIA AND ITS TRENDS

Antonín VAISHAR

There was a paper published in one of the recent numbers of Moravian Geographical Reports, which dealt with the socio-economic situation as a factor of changes in the demographic development (Michálek and Podolák 2001). Since the issue is topical also for the Czech Republic (Vaishar 1997), we would like to present several following comments to it.

A core of the problem is the alarming alteration in the population's demographic behaviour which among other consists in a dramatic fall of women's fertility. The number of deceased has been exceeding the number of newly born children since 1995 (see Fig. 1). Furthermore, the probability of survival at birth has been at the same time slightly increasing. All these trends result in ageing of the population. Should the trends continue at this pace, there is a danger that the very existence of the Czech nation would be put into question in just several hundreds of years.

Authors of the Slovak contribution referred to above try to explain the change in the demographic behaviour primarily by the worsening financial situation of young people consisting in a considerably decreasing material standard of living with each newly born child, in a heavily restricted possibility of creating proper family environment by getting flat, etc. It is to be pointed out that there was a very intensive discussion to the issue led by the Czech scientific public on pages of the periodical DEMOGRAFIE several years ago (Rychtaříková 1996, Rabušic 1996, Rabušic 1997, Rychtaříková 1997, Kučera 1997, Srb 1997).

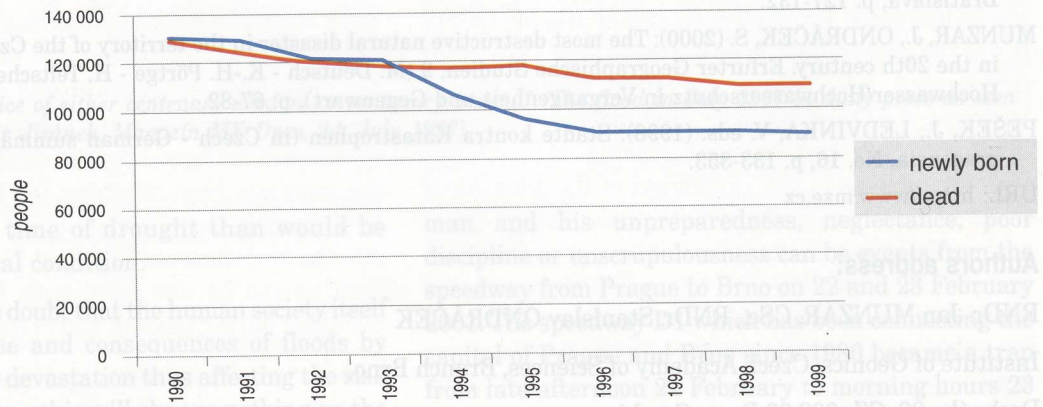

Figure 1: Development of natality and mortality in Czechia in the 1990s

Advocate of a similar standpoint as the author of this paper is demographer Rychtaříková from the Charles University. However, a different opinion is defended by sociologist Rabušic from the Masaryk University, who assumes the change in the demographic behaviour being given mainly by the extension of alternative possibilities of young people for self-realization such as education, travelling, enterprising, etc. Factors mattering in this sense are the decreasing amount of leisure time and permanent ties to children and to the partner rather than the impaired economic standard of the household. Rabušic claims that it is not a rejection of children but just a postponement of their conception until later. A question stands at hand nevertheless whether the original postponement

will not be later changed -for various reasons- into permanent childlessness or into having just a single offspring, which would not be enough to ensure natural reproduction of the population.

Not wishing to unambiguously recognize either of the opinions of the two camps we assume the problem to be considerably more complex than just a mere relation between poverty and decreased number of children. Anyhow, statistics made on a world's scale and even Czech statistics indicate that the poorest social groups of population have the largest numbers of children. Decisive will apparently be rather the relation between the implementation of the demographic function which is given not only by social terms but also biologically, and all that people give up because of this implementation. The relations seems to be different in the different social groups. While the young people from the socially strong groups would give up freedom and leisure time, the middle social groups would give up economic prosperity and independence, and the socially weakest groups could even make profit on social allowances paid for their many children. Seen from this point of view, the pro-natality policy of the government would apparently result in the further increasing number of children in the socially weakest families and hence a further future load on social expenses from the state budget.

The government should rather express their concern in families with children and create an atmosphere of assurrance that their future policy in the sphere of taxes, dwelling, education etc. will not put the families with children into a greater disadvantage. Rather than onto the support of reproduction, the government should concentrate onto the support of improved care, education and realization of children and their parents.

Another question is however what is the measure at which social behaviour models are working. The past regime unambiguously promoted the working man and normal family; the present models admire individualism and freedom of individual and a so called mobility while the permanent partnerships, family and industrial relations are not promoted. Although the population with the Catholic background (which is much more abundant in Slovakia than in the Czech Republic) usually prefers the family as a normal formula of behaviour in public inquiries, it is to be doubted that individual persons put the general opinion into any relation with themselves. Also, a question is to what extent the decreased fertility can be considered a permanent phenomenon. It is clear, however, that the demographic reproduction will never be able to restore the values of the 1970s. The age pyramid (Fig. 2) is characteristic by its narrowing base.

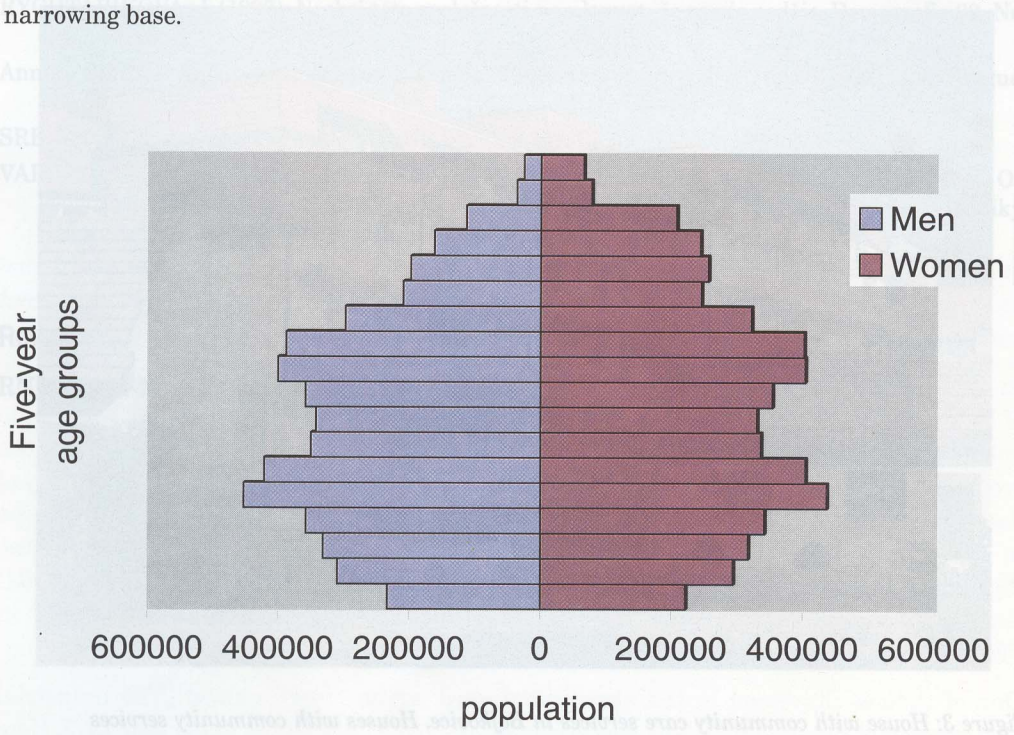

Figure 2: Age pyramid of Czech population as at 31 December 1999

The problem does not seem alarming from the global point of view as the world is facing over-population. Should the European nations be ageing and gradually dying out, their genetic code will be readily extended by nationals from eastern and particularly southern countries. The process has been already launched. The field inquiry indicates that our people are not motivated to perform some kinds of less paid jobs. A consequence to this situation is the fact that the jobs are gradually taken up by foreign nationals - either legally or illegally. After all, it is to be expected that as soon as the country enters the European Union, the balance of migration for work between the Czech Republic and EU other countries is going to be passive in the first years. The deficit will have to be compensated for by immigrants from the east and south. And if the trend of Czech young women marrying western men is going to be confirmed, there will most probably also be a trend later of brides being imported from the east.

The immigrations of peoples from the east and south is recently often being put into connection with the manifestations of xenophobia. Here we have to say that the inflow of foreigners will be impossible to prevent in the future. And in fact, we would have no serious reason for it since the foreign nationals are going to enrich the local population both from the genetic and cultural point of view. The only thing that will be necessary is to give the process a fix order.

The major fear from the inflow of foreigners is that from the increased criminality. A fact is, however, that the criminality of foreigners is not only the question of their nationality but rather the question of criminality level in the target country in general. Criminal and mafia elements concentrate in countries with the best conditions for their criminal activities. The criminality of foreigners is going to be a problem provided that they are not going to have jobs or any other legal form of realization, that they will not be integrated into the society and will have to gather in ghettoes of people with similar problems. Illegal immigration which is controlled by gangs of criminals is a nutrient-rich soil for criminality. Illegal immigrants are not fully-qualified persons in terms of their rights and they have no possibility of being integrated into legal structures, thus becoming potential participants of organized criminality.

Figure 3: House with community care services in Bojkovice. Houses with community services represent examples of modern architecture and modern care of senior people in many small towns. However, they are at the same time symbols of the ageing Czech population (Photo A. Vaishar).

The above facts clearly suggest that the government should make all efforts to control immigration into the Czech Republic in such a way that the exclusively legal immigrants are accepted at amounts that can cover the need of labour force not only from the viewpoint of occasional and up-to-date job opportunities but also from the viewpoint of population ageing and from the viewpoint of requirements arising for the coverage of increasing expenses for seniors. If the immigrants can work in identical conditions as the Czech nationals, they would stop creating unfair competition on the labour market, which is based on low wages and absent insurance; in this way they would not become an easy prey of mafia gangs. We can hardly object to the fact that they may become a serious competition to the Czech nationals in terms of their work motivation or qualifications.

As to the concerns of the Czech population, the government should invest as much as possible into culture in its broadest sense of the word, which means including the support of education, science, development of associations and building of all structures of the democratic society. This would improve the competitiveness of Czech nationals on the labour market of Czechia and European Union.

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Reviewer

RNDr. Peter MARIOT, CSc.

IN MEMORIAM PROFESSOR FRANCIS W. CARTER (1938 – 2001)

We were deeply grieved to learn of the death of important English geographer, Professor Francis Carter, expert in the issues of Czech Republic and other Slavonic countries from the School of Slavonic and East European Studies at the University College London, our colleague in the editorial board of the Moravian Geographical Reports on 4 May 2001.

Knowledge of Slavonic languages made it easy for him to study in Czech archives and libraries and to comprehend the life and institutions of Czech lands much deeper than many other foreigners. Professor Carter learned Czechoslovakia very well during his frequent study stays and attachments. Here he could for example gain also the harsh experience of living in a Communist country including smuggling out photographs of the Soviet-led invasion of Prague

in August 1968 for western newspapers and Tv channels. It is not much known what „problems" he caused to the Ministry of Environment in Prague when a majority of data on environment quality asked by him were of secret or at least confidential character at that time.

In 1974 he submitted at the Charles University a written work for the academic title Doctor of Natural Sciences but he was declined at the time of Communist „normalization" due to political reasons. Surprisingly enough, his work dealing with „Some contributions to the economical and historical geography of Prague" was preserved in the geographical library of the Faculty of Natural Sciences at the Charles University until today. After the political changes in 1989, Professor Carter was conceded the Doctor's degree additionally in 1993 with the diploma being handed over to him in a ceremonial on the occasion of the Regional IGU Conference „Environment and quality of life in Central Europe: Problems of transition." in Prague in August 1994, i.e. after twenty years.

One of themes discussed in the above mentioned written work named „The industrial development of Prague 1800-1850" was published in London as early as in the year 1973. Here Prof. Carter documented the first problems of inhabitants with industrial air-pollution and

smoke creeping into Prague's suburbs. At a conference held in Garmisch-Partenkirchen in 1980 he then informed in details on the „Pollution problems in Czechoslovakia with special reference to the Prague region.".

Experts from the Brno Centre for Environmental Geography at the Institute of Geonics, Academy of Sciences of the Czech Republic, had a chance to personally meet Professor Carter as late as at the 3rd Moravian Geographical Conference (CONGEO) in September 1999 in Slavkov near Brno (Austerlitz) where he presented a knowledgeable contribution concerning „The role of foreign direct investment (FDI) in the regional development of Central and South-East Europe". It was at that time when he accepted with gratitude an offer to become a member in the Editorial Board of the Moravian Geographical Reports. Right after having been nominated he published in this periodical (No. 1/2000) an article on „The role of FDI in the Czech Republic during the 1990s."

The MGR Editorial Board commemorated Professor Francis W. Carter at its meeting of 21 June 2001. Frank will be long remembered in Brno as one of distinguished scientists and the one who devoted his life to geographic problems and people of Czechoslovakia and Czech Republic. We shall always regard it an honour and privilege to have known him in person.

Editorial Board

THE 4th MORAVIAN GEOGRAPHICAL CONFERENCE CONGEO '01: NATURE AND SOCIETY IN REGIONAL CONTEXT. TIŠNOV, SEPTEMBER 10-14, 2001

Antonín VAISHAR

The Brno branch of the Institute of Geonics of the Academy of Sciences of the Czech Republic held the 4th Moravian Geographical Conference, this time in the town of Tišnov situated 25 km to the north-west of Brno. The Conference topic was nature and society in the regional context. Apart from experts from the organizing institution the Conference was attended by geographers from Czechia, Ireland, Canada, Hungary, Germany, Poland, Portugal, Slovakia, Slovenia, Spain and Sweden, who presented a total of 25 papers. The conference proceedings were issued before the opening of the Conference and are also offered by means of the Editorial Office of this periodical.

Photo: A. Vaishar

The Conference included two excursions of which the first one was to make the Conference participants acquainted with the organizing town, its history, natural conditions and rarities, and present problems, and the second one was made into the upper part of the Svratka River watershed in order to point out a close coherence between the regional natural conditions and the social development.

The Conference was aimed at the establishment, reinforcement and restoration of contacts between geographers from various countries, who are engaged in regional issues. Also, it was to inform the participants of ideas, programmes and approaches of scientific research and to introduce the foreign geographers the interesting Moravian region. The Conference was a challenge for young experts from the Institute of Geonics to attend an international event in the domestic environs. The town of Tišnov and the hotel Květnice together with other facilities created a very friendly and pleasant atmosphere for the Conference participants.

Photo: O. Mikulík

The technical programme of the Conference consisted of four sections which were moderated by A. Vaishar (Brno, Czech Republic), B. Greer-Wooten (York, Canada), M. Werner (Göteborg, Sweden) and D. A. Gillmor (Dublin, Ireland). The opening paper by M. Hrádek, J. Lacina and Š. Střítežská (all from Brno) introduced the Conference participants into the issue of the Tišnov region. S Kurek (Kraków, Poland) discussed demographic aspects of the transformation period after the year 1990. A. Podpierová (Brno) informed of the hitherto experience with the affiliation of municipalities for purposes of reaching common goals such as at building technical infrastructure or supporting tourism in southern Moravia. Differentiation of the Slovenian landscape and its present development were introduced by M. Ravbar (Ljubljana, Slovenia). Contributions by A. Vaishar and E. Kallabová (both from Brno) dealt with problems of small Moravian towns and specific features of their contemporary development. The issue of natural disasters, floods in particular, was discussed in papers presented by J. Munzar, P. Hlavinková, K. Kirchner, M. Hrádek, Z. Máčka, S. Ondráček (all from Brno) and L. Steinbachová (Prague).

The philosophic essence of issues concerning the relations between nature and society was presented by B. Greer-Wooten. O. Mikulík and B. Kolibová (Brno) focused their attention on the course of transformation in the Ostrava industrial conurbation while J. Zapletalová (Brno) discussed the functions of the town of Brno in the conditions of globalization. D. Plut (Ljubljana, Slovenia) presented a paper on regional aspects of sustainable development in Ljubljana. F. Breton and A. Tulla (Barcelona, Spain) dealt with the issue of conflicts and measures for area planning at seeking an optimum integration of agrarian activities into metropolitan regions on an example of the Llobregat River delta. The issue of countryside from the viewpoint of afforestation, conflicts between landscape protection concerns and modern dispersal house-building and development of national parks was discussed by D.A. Gillmor (Dublin, Ireland). Very illustrative was the contribution of D. Haas (Leipzig, Germany) concerning the assessment of landscape functions in meso-scale watersheds with emphasized retention capacity of the territory.

G. Horváth (Budapest, Hungary) and N. Dévy-Vareta (Porto, Portugal) made a comparison of the landscape changes and environmental policies in their countries in the course of radical social transformation. S. Szabó (Debrecen, Hungary) presented a paper dealing with the issue of landscape bearing capacity as related to the contamination with foreign substances and

determination of landscape types most succeptible to contamination. Theoretical problems of landscape analysis as related to the principle of sustainability were discussed by J. Oťahel (Bratislava, slovakia). An area detail was used by G. Szabó (Debrecen, Hungary) to analyze the relation between the soil content of heavy metals and land use. Z. Lipský (Prague, Czechia) informed of present changes in using the territory of the Czech cultural landscape and their environmental consequences. Personalities dominating in the discussions were D. Haase, A. Tulla, F. Breton and B. Greer-Wooten.

Organizers plan to hold the 5th Moravian Geographical Conference on *Regional Geography and Its Applications* in a Moravian region in September 2003 with the proposed conference subtopics being Regional Environmental Issues, Regional Processes in the System of National Settlement, Geography and Regional Planning, Geography and Regional Politics, and/or Regional Identity, Ethnicity, Religiosity and Human Problems.

ANNUAL CONFERENCE OF CZECH GEOGRAPHICAL SOCIETY „CZECH GEOGRAPHY AT THE TIME OF DEVELOPMENT OF INFORMATION TECHNOLOGY" HELD IN OLOMOUC, 25-27 SEPTEMBER 2001

Miroslav VYSOUDIL

The Annual conference of Czech Geographical Society „Czech Geography at the Time of Development of Information Technology" was held in Olomouc, in end-September 2001. The venue was a main building of the Faculty of Science, Palacky University of Olomouc.

The opening ceremony of the Annual Conference of Czech Geographical Society 2001 (Ass. Prof. Dr. M. Vysoudil, CSc.)

On behalf of the executive committee of the Czech Geographical Society the Department of Geography of the Faculty of Science, Palacky University of Olomouc was charged with organizing the Conference. The carrier topic of the Conference was the meeting of all geographers, irrespective of approach to used methods as in geographical research as geographical education.

The Conference included a plenary session where invited speakers discussed the key problems of Czech geography, as dealing with thematic groups. Integral parts of the Conference were a poster session, two workshops and an excursion. Informal and active discussion and contacts were in progress during social evening at a hunting lodge in Horka nd Moravou, a village in the heart of the protected area Litovelské Pomoraví where the prominent Czech geographer of 20th century dr. František Machát (1876 - 1935) was born.

The themes of invited papers were as follows:

- Physical Geography (presented by J. Kalvoda)

- Global Spatial Data Projects in Contemporary Geography: Task of GIS and Cartography (presented by M. Konečný)
- Responsibility of Regional Geography in Present Geography (presented by A. Vaishar).

The individual thematic groups were as follows:

I Physical geography at the time of development of information technology, 11 papers (moderated by M. Vysoudil and M. Trizna)

II Human geography at the time of development of information technology, 21 papers (moderated by T. Siwek, I. Lepka, A. Vaishar)

III Geographical education and development of information technology, 6 papers (moderated by A. Wahla)

The participants presented 14 posters related to the above topics.

The subject of workshops were as follows:

I Creation of maps for geographical education (moderated by P. Sedlák)

II Navigation systems in geography (moderated by V. Voženílek)

The third day of the Conference was devoted to the excursion which led the participants either to the protected area of the Litovelské Pomoraví combined with a pleasure visit of brewery in Litovel or to visit the Deputy Mayor of Olomouc (Department of Planning and Area Development) combined with a visit of Regional Development Agency for Central Moravia.

The Annual Conference of Czech Geographical Society was attended by 107 official participants of whom 8 arrived from the Slovak Republic (Komenský University of Bratislava, Matej Béla University of Banská Bystrica). Excep for the Department of Geography, South-Bohemian University of České Budějovice the Conference was attended by all Czech university geographical workplaces and Brno branch of the Institute of Geonics, Ústí nad Labem branch of the Institute of Sociology, Deputy Mayors of Ostrava, Olomouc and Plzeň cities, Weather Central Office of Czech Army, Department of Information about Territory of Czech Army, Research water Institute TGM Brno, Zlínský kraj Region Office, Star 21 Networks, respectively.

The Conference attempted at finding answers mainly to these key questions:

- What eas the course of the process of adaptation of Czech geographers to possibilities in exploration of geoinformation technology?
- What eas the success of traditional geographers in the process of using the mentioned technology?
- What was the contribution of the new technology to their work and quality of research?
- Are these technologies used in the research of all geographical disciplines?
- Is the geographer to use traditional methods of research ahead of others?
- Must the present geographer be able to apply geoinformation technology? Where? At what level?
- Has the system of education of geography teachers been changed?

End of plenary meeting showed that the above questions were answered during the discussion only partly. It appears that answers on some question will have to be found during other similar events. Most important appears that geographers and geography teachers must be highly skilled in using geoinformation technology today. As highlighted by the president of the Czech

Geographical Society Ivan Bičík during a closed ceremony, the future of geography depends on the geographers themselves.

More detailed information about Conference talks can be found on internet address *http://www.upol.cz/resources/geography/*. Conference proceedings will be published in the end of 2001 on CD-ROM altogether with other related facts.

Publications available:

RURAL GEOGRAPHY AND ENVIRONMENT (167 pp.)

The Proceedings contain 25 papers of 38 authors from 24 countries presented on 2nd Moravian Geographical Conference CONGEO 97´, held in Valtice, Czech Republic, September 15-19, 1997.

The centre of attention was the country and problems of rural regions.

The Conference objectives was to turn the attention not only to the problem of agriculture but also to other aspects of the country as a space for the alternative settlement of certain social strata of the population, as a place for the recreation of town inhabitants, as an environment for more intensive ecological contacts of people with nature, as well as an integral part of settlement system which would make it possible to maintain the cultural landscape also outside urbanized territories. The economic, social, infrastructural, environmental and other problems of rural regions undoubtedly deserve more attention on the part of geographers.

The Conference topic was defined by the issue rather than by scentific disciplines, which facilitated participation of physical and human geographers as well as of specialists in various methods applied at regional analyses.

Price 380 CZK, ISBN 80-901844-2-1. In English

REGIONAL PROSPERITY AND SUSTAINABILITY (209 pp.)

The Proceedings contain 24 papers of 28 authors from 12 countries presented on 3rd Moravian Geographical Conference CONGEO 99´, held in Slavkov u Brna (Austerlitz), Czech Republic, September 6-10,1999.

The Conference theme was chosen in such a way that it facilitated the attendance of geographers from all possisble lines of specialization and other experts engaged in the regional problems. The relation between the regional prosperity and sustainability is a hot topic for the transforming countries of our region the the key issue being a question of how to harmonize the market-oriented economy at its immediately post-transformation stage with the requirement to preserve the natural and social potential of the regions for the coming generations. The western experience cannot be adopted entirely since the relation between the market economy and the requirements for sustainability developed step by step in these countres and over a relatively long time.

Price 300 CZK. ISBN 80-901844-7-2. In English

NATURE AND SOCIETY IN REGIONAL CONTEXT (174 pp.)

The Proceedings contain 24 papers of 36 authors from 12 countries presented on 4th Moravian Geographical Conference CONGEO 01´ held in Tišnov, Czech Republic, September 10-14, 2001.

The Conference topic was defined by the issue rather than by scientific disciplines, which facilitated participation of physical and human geographers as well as of specialists in various methods applied at regional analyses. To connect both physical and human geographers is a very topical problem of present geography. To explain interactions between nature and society by means of their regional connections is one of the main topics of geographical research.

Price 300 CZK. ISBN 80-86377-03-2. In English.

The Proceedings can be ordered:

by mail: Ústav geoniky AV ČR, Drobného 28, 602 00 Brno, Czech Republic

by e-mail: zapletalova@geonika.cz

CONGEO'01: The excursion in the Svratka river valley near Prudká

Photo: A. Vaishar

CONGEO'01: The mud settling pond in the area of the uranium mine near Rožná

Photo: A. Vaishar

Illustrations to the report of A. Vaishar.

Young cultural landscape of montane agriculture in the North Bohemia qith permanent grasslands and spruce forests

Photo: Z. Lipský

New wetland on the place of former hay meadows in alluvial floodplain of Jevanský brook in the higland of Central Bohemia

Photo: Z. Lipský

Illustrations to the paper of Z. Lipský.