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## OBSAH – CONTENTS

### HLAVNÍ ČLÁNKY – ARTICLES

Dear friends,

after some discussions of the Editorial Board of Geography – Journal of Czech Geographic Society you are opening the second issue volume No. 107 prepared on occasion of the Regional Conference of IGU in Durban in South Africa. This issue is based on the appeal to geographical institutes and departments in Czechia to send contributions that could address broader international community of geographers. Selective opponent procedure has resulted in publishing of six contributions. These represent as individual geographical disciplines as a couple of university departments of geography in Czechia. We suppose these contributions will bring some response from geographers abroad, too. The abstracts of contributions to this journal from years 2000 and 2001 (mostly in Czech language) and the overview of university departments of geography and Institutes of the Academy of Sciences of the Czech Republic in the half of 2002 are included besides.

Both the authors and Editorial Board of this journal look forward to your response and opinions.

I do believe that this issue will enable closer acquaintance with the working results of Czech geographers during the last years. Simultaneously I express my hope for further continuation of entering upon the way of our scientific society heading at significant interconnection with international scientific geographical networks.

*Ivan Bičík, President, Czech Geographic Society*

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BOHUMÍR JANSKÝ

# CHANGING WATER QUALITY IN THE CZECH PART OF THE ELBE CATCHMENT AREA IN THE 1990s (Twelve years of cooperation of Czechs and Germans on the river Elbe)

B. Janský: *Changing Water Quality in the Czech Part of the Elbe Catchment Area in the 1990s.* – Geografie – Sborník ČGS, 107, 2, pp. 98 – 110 (2002). The Elbe is the largest river of the Czech Republic. On the state boundary it has an average long-term flow rate of 315 m³/s and it drains 2/3 of Czech territory into the North Sea. The alluvial plain of the Elbe was from the very beginning of our history an important migration corridor and later it gained a substantial economic significance. The impulse for the cooperation of Czechs and Germans on the Elbe was the unification of Germany. In 1990 an "Agreement about the International Commission for the Protection of the Elbe" was signed, and in 1992 regular Czech-German expert seminars started to take place. Geographers from the Faculty of Sciences of Charles University in Prague participated in the cooperation with German academic institutions. They introduced some new methodical approaches into the research of surface water quality and they achieved a number of valuable results. In twelve years of intensive scientific activities and substantial financial investments into the sanitation of sewage water from the largest pollution sources, water quality in the Elbe has improved markedly.
KEY WORDS: water quality – Elbe catchment area – Magdeburg Seminars – Czech-German cooperation –. regional approach to water quality – negative influence of agriculture – development of surface water pollution.

## 1. The Elbe – Hydrographical overview

Due to its position in the middle of Europe, the Czech Republic is a headwater region for European rivers. Around 66.2 % of the state area is drained into the North Sea through the Elbe, 24 % into the Black Sea through the Danube, and 9.8 % into the Baltic Sea through the Odra.

From the total Elbe catchment area of 148 268 km², 50 176 km² (33.8 %) are in the Czech Republic, and 96 932 km² (65.4 %) are in Germany. The remaining 1 160 km² (0.8 %) are in Poland and Austria.

The Elbe springs in the Krkonoše Mountains at an altitude of 1383.6 m above sea level. After 364.5 km it crosses the Czech-German state boundary and after 1 091.47 km it falls into the North Sea near the city of Cuxhaven. Its largest tributary is the river Vltava (Moldau in German); the Vltava, however, is superior to the Elbe in all hydrographical parameters including the rate of flow. Its catchment area is twice as large as that of the Elbe (28 090 km² compared to 13 714 km² of the upper Elbe), it is substantially longer (433.2 km compared to 258.7 km of the Elbe up to the confluence) and is also larger than the Elbe as regards average long-term flow rate (150 m³/s compared to the Elbe's 102 m³/s). Therefore, according to all hydrological rules, the Vltava should be the main flow of the hydrological system.

The average long-term annual flow rate at the estuary to the North Sea is 877 $m^3/s$, on the boundary profile Czechia – Germany it is 315 $m^3/s$ which represent 36 % of the total flow rate. The average long-term annual precipitation total in the Czech part of the Elbe catchment area reaches 659 mm and the average specific runoff is 6.2 $l.s^{-1}.km^{-2}$. The average long-term annual runoff in the boundary profile Hřensko is 10.06 mld. $m^3$. This value corresponds with the runoff coefficient of 29.7 % ($c = Ho/H_S$), Ho – average annual runoff depth, HS – average annual precipitation depth).

In the Czech part of the Elbe catchment area, agricultural land takes up 55.8 % (plough land 40.7 %, grassland 14.9 %, other agricultural land 0.2 %) forest land 32.6 %, water area 2 % and other areas 9.6 % (Nesměrák 1995).

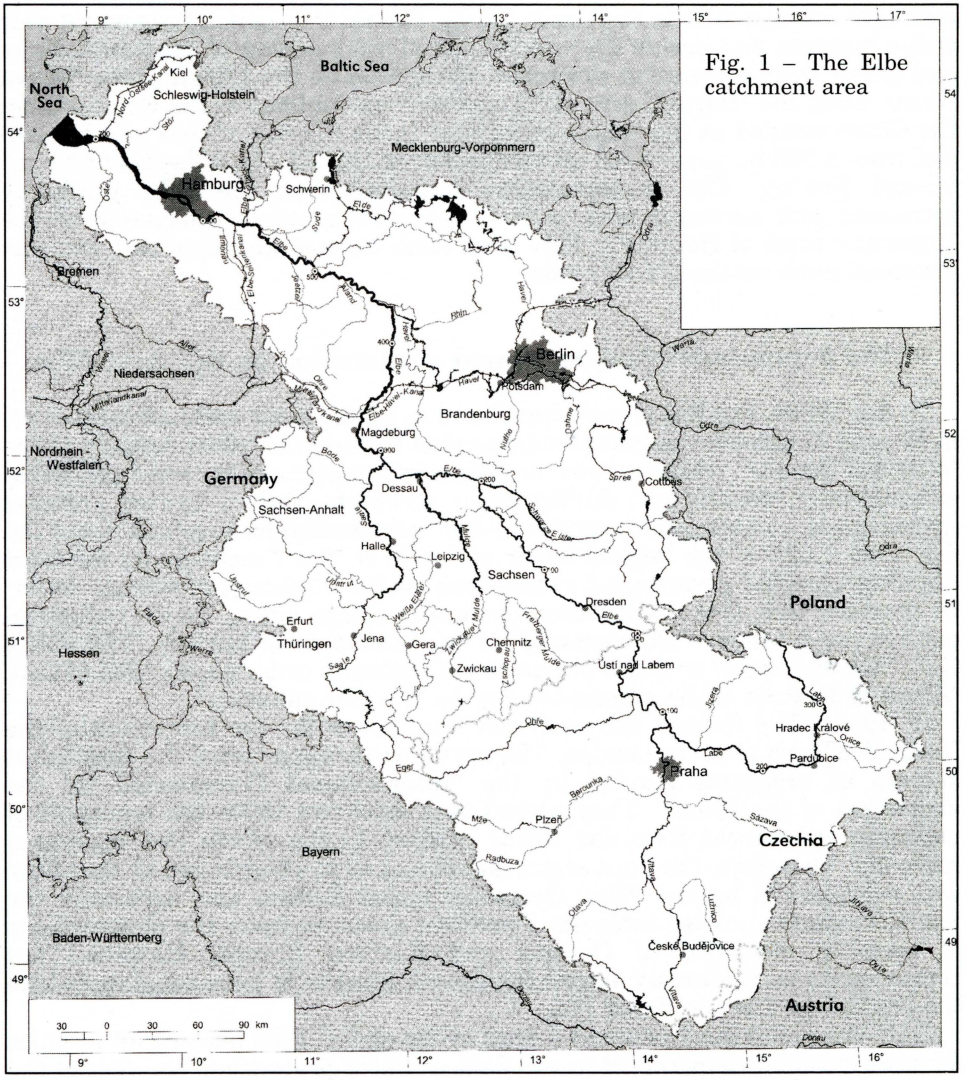


Fig. 1 – The Elbe catchment area

## 2. The Elbe – A connection of historical territories of Czechs and Germans

Already in the Middle Ages, an interconnected settlement and economic system originated along the main stream. The alluvial plain of the Elbe became an important migration corridor soon after the Czech Basin was settled by the first Slavonic tribes. Even today, we can find traces of Polabian Slavonic tribes along the whole length of the main stream and on the banks of its tributaries. In spite of many conflicts in the thousands of years of Czech and German neighbouring, on the Elbe the two nations on its upper and on its lower course were rather brought together by the river.

The economic importance of the Elbe river system was recognized already by the Czech king and Roman emperor Charles IV. In 1340 he set up a "Commission of Sworn Provincial Millers" which was the highest water-management institute in the Czech Lands. Beside the right of judgement over water trespass and beside the supervision of the building of fishponds, weirs and gates, the Commission controlled navigation on the Elbe and the Vltava rivers. Even the "Royal Count of Navigation" was subject to the Commission; the Count resided at the Castle of Střekov (near the city of Ústí nad Labem) and from 1 348 he supervised all navigation on the Elbe in Bohemia and even toward Saxony. The transportation importance of the Elbe gradually increased and corresponding with it was the growing prosperity of the Hanseatic town of Hamburg. This town later became an important gateway overseas, even for the Czech lands.

## 3. The beginnings of international cooperation on the river Elbe

In the 1960s, the Rhine was considered to be the most polluted large river in Europe. Czechoslovak mass media at that time described its estuary as the "cloaca of Europe", while our own problems with water quality were presented exceptionally, usually just during major accidents. Only a limited group of hydrologists – water quality experts – had information for example about the fact that 2 037 of the largest water polluters in the Czechoslovak Socialist Republic received government exemptions for the discharge of sewage water. In practice this meant that these polluters (large cities, major industrial plants) could behave "alternatively" to the provisions of law no. 138/1973 of Coll. "About waters" or to the provisions of statutory order no. 25/1975 of Coll. "About indicators of the admissible degree of water pollution".

In 1988, "The Second International Conference for the protection of the North Sea" took place in London. The participants appreciated the significant success of programs started by the "International Commission for the Protection of the Rhine". They agreed that since the 1970s the transport of polluting substances from the Rhine estuary to the North Sea decreased radically. Therefore, the most important threat to the North Sea at that time was represented by the Elbe. Germany, Great Britain and especially the Scandinavian countries intensified political pressure upon the governments of socialist countries of Central and Eastern Europe. However, out representatives vigorously denied the growing inflow of toxic substances into the North Sea and the Baltic Sea.

Only the precipitous political events at the end of 1989 became an impulse for international cooperation in the field of water protection. The text of the

"Agreement about the International Commission for the Protection of the Elbe" was prepared already before the unification of Germany. On 8 October 1990 it was signed in Magdeburg by Ministers of Environment of the Czechoslovak Federative Republic and of the Federal Republic of Germany, with the participation of a representative from the European Commission. It was the very first mutual agreement for the new Czechoslovakia, Germany and the European Union. After 45 years of political separation the important European stream Elbe became a connection of the two countries, of towns and cities lying along it, as well as of the people living on the upper stream and the lower stream.

## 4. Czech-German seminars about the protection of water

The tradition of expert seminars of water-managers and research workers was established in 1988 in Magdeburg, on the territory of the former socialist German Democratic Republic. In the same city, two other seminars took place, with German participation only, and always with one single guest from Czechoslovakia. In 1992, two leading research laboratories on the two sides of the state boundary entered into professional relations – the "T.G.M. Water-Management Research Institute" (Výzkumný ústav vodohospodářský) in Prague and the institute "GKSS-Forschungszentrum" in Geesthacht; these two institutes agreed on organizing joint conferences, so-called "Magdeburg Seminars", in two-year intervals. One topical key theme is selected for each seminar and it results in the formulation of specific measures to be taken in the field of water protection. The both parties thus fulfil the basic ideals of the European Water Charter which was adopted in Strasbourg 30 years ago: "Water knows no boundaries; being a shared resource, it requires international cooperation" (see Tab. 1).

The development of the key themes of the seminars suggests that while at the beginning the research teams focused on recording pollution sources and on improving water quality, in the following years they rather focused on a more complex ecosystemic approach. The scientific conferences last one week; the participants speak both Czech and German, and they use simultaneous interpretation. At the last seminar in Berlin, there were 30 lectures, and more than 100 posters were presented. Over 200 participants signed up for this year's seminar in Špindlerův Mlýn (near the spring of the Elbe in the Krkonoše Mountains); there will be 48 lectures and about 120 posters will be

Tab. 1 – An overview of Czech-German „Magdeburg seminars about water protection" organized so far:

| Year | Theme | Place |
|---|---|---|
| 1992 | Situation on the Elbe | Špindlerův Mlýn |
| 1994 | The Elbe - Ecology versus Economy? | Cuxhaven |
| 1996 | Ecosystem of the Elbe – Condition, Development and Use České Budějovice | České Budějovice |
| 1998 | Protection and Use of Water in the Elbe Catchment Area | Karlovy Vary |
| 2000 | Management in the Catchment Area | Berlin |
| 2002 | Elbe - New Horizont of the Catchment Area Management | Špindlerův Mlýn *) |

*) The seminar will take place from 22 to 25 October 2002

presented. The ratio of Czech and German participants corresponds approximately to the share of the Elbe catchment area: 1/3 are Czechs and 2/3 are Germans.

## 5. The national project of the Elbe and its aims

The national project was ordered in 1990 by the Czechoslovak Ministry of Environment. One year later, a technical-economic study (Nesměrák 1991) was adopted which defined the main goals of the project. These goals were supposed to take into account accepted international commitments. If they were fulfilled, it would help us to reach the standards of EU member states:

- Gain knowledge about the current condition of water quality in streams and of discharged pollution for the selected water quality indicators.
- Propose such conceptual measures (including legal and economic tools) which would lead to securing the following aims:
  - Substantial improvement of water quality in the Elbe and in its tributaries in such a way as to achieve the possibility of processing water at water treatment plants into drinking water. The same applies to infiltrated water in quaternary sediments and the possibility of using water for irrigation.
  - Improving the condition of biocenoses with the aim of attaining natural stream ecosystems and of their alluvial plains.
  - Substantially decrease the amount of polluting substances flowing into the North Sea.
  - Provide qualified data for the state administration and for cooperation of the Czech Republic within the framework of the International Commission for the Protection of the Elbe (Czech abbrev. MKOL, German abbrev. IKSE).

## 6. Participation of geographers in the solution of the Elbe Project

Research of surface water quality has a 25-year tradition at the Department of Geography and Geoecology of the Faculty of Science of Charles University in Prague. In 1976, the author engaged in the solution of a large public project called "The influence of natural elements, terrain washing and waste substances upon water quality in streams and ponds", where he solved the main stage – "Atlas of maps of specific substance denudation in the catchment area of the Berounka river" (Janský 1980).

During the following years, methodology of the research work improved, and the area of the researched territory grew. Research started in the catchment area of the Úhlava (a water supply river in western Bohemia), then it was extended to the catchment area of the Berounka (a left-hand tributary of the Vltava in Prague) and in the next stage it continued to the whole Czech catchment area of the Elbe.

At the beginning of the 1990s, a close professional relationship developed with Universität Hamburg and some research institutes in Germany (the International Commission for the Protection of the Elbe in Magdeburg, the Commission ARGE Elbe, and the Centre of Water Quality Control "Wassergütestelle Elbe" in Hamburg). Cooperation during research enabled us to gain access to data and to new software which we used to model water

quality in the longitudinal profile of streams (e.g. Langhammer, Janský 1996; Langhammer 1997, 1999, 2002). Active contact with hydrologists and water-managers in Hamburg takes the form of lecture stays of pedagogues, practice stays of graduates and students. Special hydrological excursions have been organized, of German students in the Czech Republic (Karbe, Nellen, Janský 1993), and of Czech students in Hamburg and in lower Sacia. Also, a joint publication of a monographic type was produced (Karbe, Mädler, Janský 1992).

During the last 20 years, students and graduates are regularly engaged in the research of water surface quality. A number of diploma theses have been defended in our department which contributed to our knowledge of regional water quality structure in sectional catchment areas, and some of them even represented a valuable methodical contribution (see the list of master theses beyond the list of works cited).

### 6. 1. Contribution of the geographers to solution methodology

- Beside traditional water-management processes, we introduced the so-called dependency *evaluation of water quality*. It consisted in statistical dependency of polluting-substance concentration not only on water flow rate, but also on the season of the year. In all examined profiles we therefore obtained schematic three-dimensional models of water quality, enabling recognition of water quality during any flow rate or during any season of the year (Janský, 1983, Janský 1991, Pivokonský, Benešová, Janský 2001).
- Using the software Mike 11, Mike 21 and QUAL 2E enabled us to model water quality in a longitudinal profile of the stream, with regard to the quantity of discharged sewage water in point sources and hydraulic conditions of streams (Langhammer 1997). This methodology also enables us to prognosticate the development of water quality in the future.
- *Regional approach* to water quality analysis grew to be accentuated more and more during the solution. As opposed to water-management engineers, we did not evaluate water quality merely in river channels, but we focused on the landscape. In most of our works we focused on evaluating the balance of substance denudation from catchment areas by means of an indicator of *specific substance denudation* (Janský 1983, Janský 1991). Our priority was to research scattered substance sources, especially on agricultural land. *Agriculture* had a negative influence upon water quality and it markedly changed the face of Czech countryside. During the socialist farming epoch, production grew rapidly, but the quantities of artificial industrial fertilizers that were used were appalling. The originally scattered livestock production was concentrated in gigantic modern farms which produced enormous amounts of sewage. The sewage was usually transported to insufficient areas of plough land, commonly very near to the stables (Janský et al. 2000). A number of our researches proved for certain, that in many regions the negative influence of agriculture is much more pronounced than that of municipal and industrial waste (Janský 2000).
- In order to evaluate substance denudation from and area, we developed a grid-oriented GIS model called TYCOM, which is based on a combination of information from available distance data about the Earth (Langhammer 2002).

– The solution of the Elbe Project became an impulse for the development of a new research direction within the framework of geography at the Faculty of Science – *revitalization of river ecosystems* (Matoušková 2002).

## 7. Development of water quality in the Czech part of the Elbe catchment area during the 1990s

At the end of the 1980s, the Elbe belonged among the most polluted rivers in Europe. From the beginning of the 1990s we have been registering a continuous improvement of water quality in the Elbe and in its main tributaries. The first changes occurred in the Czech Republic in the period from 1990 to 1992 especially due to the marked decrease of volume of industrial production. A direct consequence of this industrial crisis was the decrease of volume of sewage water discharged into water streams. Further improvement of water quality was achieved in the following years due to the sanitation of the largest pollution sources in industry and in large settlements. Within the framework of the so-called "Immediate program", 30 sewage water treatment plants were built and reconstructed in the Czech part of the Elbe catchment area during the period from 1991 to 1995. In the period from 1996 to 1999, within the framework of the so-called "Action program", another 12 new or reconstructed sewage water treatment plants were commissioned (see Tab. 2).

The German government participated in the building of new sewage water treatment plants and the reconstruction of obsolete sewage water treatment plants in the Czech part of the Elbe catchment area with a total sum of 10.072 mil. USD, that is about 29 % of the total expenses.

### 7. 1. Development of surface water pollution from municipal and industrial sources

In 1990, 72.4 % of the 6 million inhabitants in the Czech part of the Elbe catchment area were connected to the public sewerage system and 51.6 % to the sewage water treatment plants. However, the elimination of total phosphorus and nitrogen itself reached only 4.2 % of inhabitants of the Czech

Tab. 2 – New and reconstructed sewage water treatment plants in the period from 1991 to 1999 with a capacity over 20.000 equivalent citizens

| | Number of sewage water treatment plants *) | Number of inhabitants supplied (millions of equivalent citizens) | Investments (mill. USD) | Pollution decrease (tons per year) BOD TP TN |
|---|---|---|---|---|
| Czechia | 42 | 8.47 | 306.4 | 40970 730 3870 |
| Germany | 139 | 12.87 | 2 688.4 | 42800 2590 10380 |
| Total | 181 | 21.34 | 2 994.8 | 83770 3320 14250 |

*) new and reconstructed sewage water treatment plants
BOD – biochemical oxygen demand
TP – total phosphorus
TN – total nitrogen

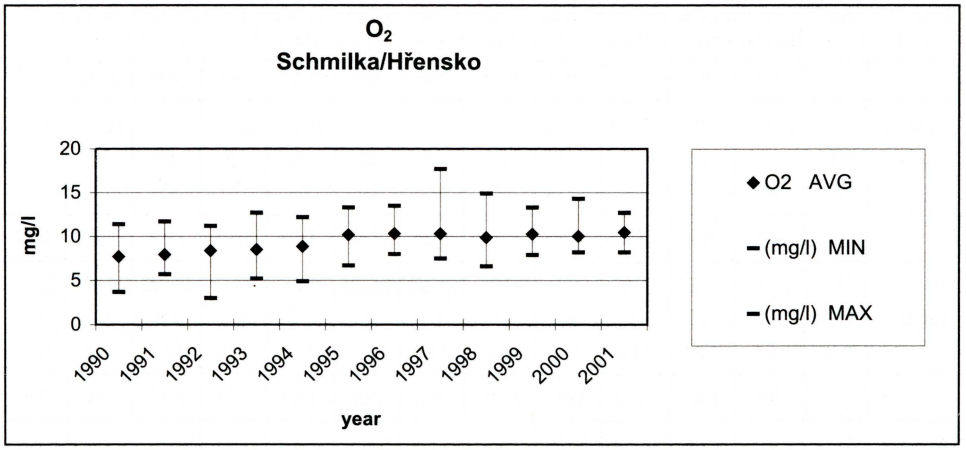


Fig. 2 – Development of oxygen concentrations in the boundary profile of Schmilka/Hřensko in the period from 1990 to 2001

part of the Elbe catchment area. The average efficiency of the sewage water treatment plants was only 46 % in 1990, while 65 % of all sewage water was brought to the sewage water treatment plants.

In 1999, more people were connected to the public sewerage system (74.7 %) and to the sewage water treatment plants (63.8 %) A more pronounced progress could be observed as regarded elimination of total phosphorus and oxygen, which now was provided for sewage water from 17.6 % of the inhabitants.

## 7. 2. Selected examples of water quality improvement in the Elbe during the 1990s

*Oxygen conditions.* Since 1993, no critical concentrations of oxygen under 3 mg/l have been registered on the profile Schmilka / Hřensko (Czech-German

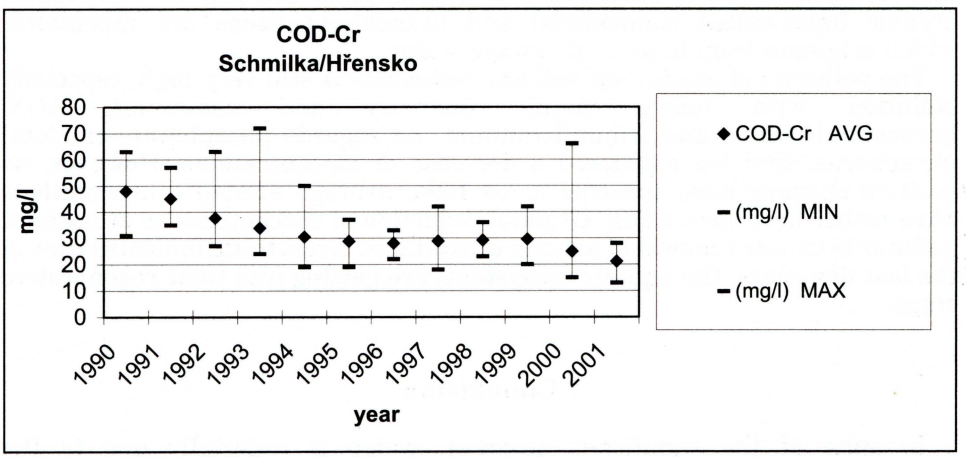


Fig. 3 – Development of concentrations of COD-Cr in the boundary profile of Schmilka/Hřensko in the period from 1990 to 2001

Tab. 3 – Development of concentrations of chemical oxygen demand (COD-Cr), oxygen ($O_2$) and mercury (Hg) in the profile of Schmilka/Hřensko in the period from 1990 to 2001

| | | 1990 | 1991 | 1992 | 1993 | 1994 | 1995 | 1996 | 1997 | 1998 | 1999 | 2000 | 2001 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| COD-Cr | AVG | 47.917 | 45 | 37.667 | 33.846 | 30.462 | 28.769 | 28 | 28.846 | 29.154 | 29.538 | 24.923 | 21.077 |
| (mg/l) | MIN | 31 | 35 | 27 | 24 | 19 | 19 | 22 | 18 | 23 | 20 | 15 | 13 |
| | MAX | 63 | 57 | 63 | 72 | 50 | 37 | 33 | 42 | 36 | 42 | 66 | 28 |
| | | 1990 | 1991 | 1992 | 1993 | 1994 | 1995 | 1996 | 1997 | 1998 | 1999 | 2000 | 2001 |
| $O_2$ | AVG | 7.717 | 7.925 | 8.367 | 8.5 | 8.862 | 10.185 | 10.323 | 10.308 | 9.877 | 10.262 | 10.015 | 10.462 |
| (mg/l) | MIN | 3.7 | 5.7 | 3 | 5.2 | 4.9 | 6.7 | 8 | 7.5 | 6.6 | 7.9 | 8.2 | 8.2 |
| | MAX | 11.4 | 11.7 | 11.2 | 12.7 | 12.2 | 13.3 | 13.5 | 17.7 | 14.9 | 13.3 | 14.3 | 12.7 |
| | | 1990 | 1991 | 1992 | 1993 | 1994 | 1995 | 1996 | 1997 | 1998 | 1999 | 2000 | 2001 |
| Mercury | AVG | 0.178 | 0.173 | 0.108 | 0.156 | 0.595 | 0.173 | 0.069 | 0.077 | 0.054 | 0.062 | 0.058 | 0.062 |
| (µg/l) | MIN | 0.02 | 0.03 | 0.01 | 0.03 | 0.01 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 |
| | MAX | 0.5 | 0.33 | 0.23 | 0.27 | 3.2 | 0.7 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 |

state boundary). Meanwhile, medium concentrations of $O_2$ are growing continually (see Fig. 2). Between the years 1990 and 2001, they increased from 7.7 to 10.5 mg/l, and minimum yearly values have not decreased below 6.6 mg/l since 1995.

*Heavy metals.* Medium yearly mercury (Hg) concentrations decreased on the boundary profile Schmilka/Hřensko from 0.178 µg/l to 0.062 µg/l between 1990 and 2001. In the mentioned period, the variation range between maximum and minimum yearly values also decreased substantially.

*Nitrate nitrogen ($N\text{-}NO_3$).* At the state boundary, medium annual values decreased from 5.2 mg/l in 1990 to 4.3 mg/l in 1999.

*Chemical oxygen demand.* Medium annual values on the boundary profile Schmilka/Hřensko have decreased to less than a half of the original values. In 1990, maximum measured concentration was 63 mg/l, but it 2001 the maximum was only 28 mg/l (see Fig. 3 and Tab. 3).

We also registered a decrease of medium annual concentration values as regards some *organic substances*. However, AOX compounds (absorbable organic halogenated compounds) and hexachlorobenzene are exceptions, which originate from industrial sewage water.

The pollution of *washed-off soil* and *sediments* is still very high, especially pollution with heavy metals (mercury and cadmium), AOX, hexachlorobenzene and tributylstannum. As regards phosphates and total phosphorus, first we registered a decrease of concentrations. However, no positive changes have occurred since 1994; average annual concentrations have rather been increasing. Gradual reduction of concentrations of harmful pollutants causes renewal of aquatic ecosystems. Everything indicates that in the last few years, the aquatic ecosystems are getting into their regenerative stage.

## Conclusion

In spite of the significant progress, which is especially due to the continuous sanitation of sewage water in the Czech part of the Elbe

catchment area since 1990, it is necessary to adopt more measures in order to improve water quality even further:

- The inflow of harmful pollutants into water streams must be reduced further.
- It is necessary to continue building sewage water treatment plants at smaller industrial plants and especially in settlements with a population below 5,000. These diffusion sources excessively pollute surface water in the Elbe catchment area with nutrients (especially compounds of phosphorus and nitrogen).
- It is necessary to further reduce the thermal water pollution.
- Another important task is to reduce dangerous toxic substances originating from industry, such as mercury, chlorinated hydrocarbons, especially hexachlorobenzene and trichloromethane, as well as absorbable organic halogenated compounds (AOX) and EDTA.
- A substantial problem still is the influence of planar sources of substances on the quality of surface and underground waters. In many rural regions of the Czech part of the Elbe catchment area, the situation is not only getting better, it is getting worse. This concerns especially regions with a dominant influence of agriculture upon water quality.

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## Summary

### ZMĚNY KVALITY VODY V ČESKÉ ČÁSTI POVODÍ LABE V 90. LETECH (dvanáct let spolupráce Čechů a Němců na Labi)

Labe je největší řekou České republiky. Pramení v Krkonoších v nadmořské výšce 1 383,6 m nad mořem, po 364,5 km překračuje česko – německou státní hranici a po 1 091,47 km se u města Cuxhaven vlévá do Severního moře. Odvodňuje 66,2 % území ČR a na státní hranici má průměrný dlouhodobý průtok 315 $m^3/s$, což představuje 36 % vzhledem k průtoku v ústí (877 $m^3/s$). Z celkové plochy povodí Labe 148 268 $km^2$ připadá na Českou republiku 50 176 $km^2$ (33,8 %) a Spolkovou republiku Německo 96 932 $km^2$ (65,4 %). Zbylých 1 160 $km^2$ (0,8 %) leží na území Polska a Rakouska.

Průměrný dlouhodobý roční úhrn srážek dosahuje v české části povodí Labe 659 mm a průměrný specifický odtok činí 6,2 $l.s^{-1}.km^{-2}$. Dlouhodobý průměrný roční odtok v hraničním profilu Hřensko je 10,06 mld. $m^3$. Tomu odpovídá odtokový součinitel 29,7 %.

Údolní niva Labe byla na počátku našich dějin důležitým migračním koridorem a později získala značný hospodářský význam. Český král a římský císař Karel IV. zřídil v roce 1340 „Komisi přísežných mlynářů zemských", která byla nejvyšší institucí pro vodohospodářské záležitosti v Čechách. Jí byl podřízen i „Královský hrabě plavební", který sídlil na hradě Střekově a od roku 1348 měl dohled nad veškerou plavbou na Labi v Čechách i směrem do Saska. Dopravní význam Labe postupně vzrůstal. Tomu odpovídal rozkvět hanzovního města Hamburk, které se i pro území Čech stalo důležitou branou do zámoří.

Impulsem pro spolupráci Čechů a Němců na Labi v oblasti ochrany vod se stalo sjednocení Německa. Dne 8. října 1990 podepsali v Magdeburku ministři životního prostředí tehdejší ČSFR a SRN spolu se zástupcem Evropské komise „Dohodu o Mezinárodní komisi pro ochranu Labe". Pro všechny zúčastněné strany to byla vůbec první vzájemná mezinárodní smlouva. V roce 1992 byly navázány odborné kontakty mezi předními výzkumnými pracovišti na obou stranách hranic, které se dohodly na pořádání společných konferencí, tzv. Magdeburských seminářů, a to ve dvouletých intervalech. Obě strany tak naplňují základní ideje Evropské vodní charty, která byla přijata před třiceti lety ve Štrasburku: „Voda nezná hranic, jako společný zdroj vyžaduje mezinárodní spolupráci".

Výzkum jakosti povrchových vod má na katedře fyzické geografie a geoekologie Přírodovědecké fakulty UK v Praze již pětadvacetiletou tradici. V roce 1976 ji založil autor této stati jako spoluředitel rozsáhlého státního projektu s názvem „Vliv přírodních činitelů, terénního smyvu a odpadních látek na jakost vody v tocích a nádržích".

Již na počátku 90. let byly navázány úzké odborné kontakty s Universitou Hamburk a některými výzkumnými institucemi v SRN. Spolupráce ve výzkumu nám umožnila získat přístup k datům i novému software, který jsme využili k modelování jakosti vod v podélném profilu toků. Čilé kontakty se projevily ve výměně pedagogů, při odborných praxích studentů i doktorandů, při organizování společných hydrologických exkurzí a vyústily přípravou společných publikací.

Dlouhodobé zapojení geografů do analýzy jakosti vod znamenalo výrazný přínos k metodice řešení:

Kromě tradičních vodohospodářských postupů bylo zavedeno tzv. závislostní hodnocení jakosti vod. Spočívalo v hodnocení statistické závislosti koncentrace znečišťujících látek nejen na průtoku vody, ale současně i na ročním období. Za využití software Mike 11 a QUAL 2E se provádí modelování jakosti vody v podélném profilu toků se zřetelem na množství vypouštěných odpadních vod v bodových zdrojích a hydraulické poměry. Během řešení je stále více akcentován regionální přístup k analýze jakosti vod. Ve většině našich prací jsme se věnovali hodnocení bilance látkového odnosu z ploch povodí, přičemž těžištěm našeho zájmu se staly rozptýlené zdroje látek, především v zemědělsky využívané krajině. Pro hodnocení látkového odnosu z území byl vyvinut gridově orientovaný GIS model označený TYCOM, který je založen na kombinaci údajů z dostupných distančních dat o Zemi. Řešení projektu Labe se stalo impulsem pro rozvoj nového výzkumného směru v rámci geografie na Přírodovědecké fakultě revitalizace říčních ekosystémů.

Na konci 80. let patřilo Labe k nevíce znečištěným řekám Evropy. Od počátku 90. let můžeme pozorovat stálé zlepšování kvality vody v Labi i jeho hlavních přítocích. Pozitivní změny nastaly v ČR nejprve v období let 1990 až 1992 především v důsledku markantního poklesu objemu průmyslové výroby a tím i poklesu objemu vypouštěných odpadních vod do toků. Dalšího zlepšení jakosti vod bylo poté dosaženo díky sanaci největších zdrojů znečištění v průmyslu a velkých sídlech. V české části povodí Labe bylo postaveno či intenzifikováno 42 čistíren odpadních vod. Na konci 90. let bylo na veřejné kanalizace připojeno 74,7 % a na čistírny odpadních vod 63,8 % obyvatel.

Na závěr článku jsou uvedeny konkrétní příklady zlepšení jakosti vody v hraničním profilu Schmilka/Hřensko, a to pro ukazatele koncentrace kyslíku, rtuti, dusičnanového dusíku a organické znečištění vyjádřené parametrem CHSK (chemická spotřeba kyslíku). Kromě trendů zlepšování jakosti vody upozorňuje článek rovněž na přetrvávající problémy a přináší návrh opatření pro další zlepšování kvality povrchových vod v českém povodí Labe.

Za seznamem literatury je připojen přehled témat diplomových prací a doktorských disertací, které se na katedře fyzické geografie a geoekologie PřF UK Praha po roce 1980 zabývaly analýzou jakosti vod.

Obr. 1 – Povodí Labe
Obr. 2 – Vývoj koncentrací kyslíku v hraničním profilu Schmilka/Hřensko v období 1990 až 2001
Obr. 3 – Vývoj koncentrací CHSK-Cr (chemické spotřeby kyslíku) v hraničním profilu Schmilka/Hřensko v období 1990 až 2001

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VÍT VOŽENÍLEK

# TERRAIN SENSITIVITY IN ENVIRONMENTAL MODELS

V. Voženíl ek: *Terrain Sensitivity in environmental models.* – Geografie – Sborník ČGS, 107, 2, pp. 111 – 120 (2002). – Environmental models involved many spatial components. A terrain (Earth's surface) is often included as crucial factor of modelled processes. Terrain is a continuous phenomenon that is represented by various discrete or networked means. This dimensional variability in representation process impacts in both inherent terrain parameters (incl. surface forms) and modelled outcomes. The paper treats various aspects and shows them in examples.
KEY WORDS: Environmental models – terrain sensitivity – GIS – digital terrain models.

## Introduction

Environmental processes often have a signsificant horizontal component in a landscape that is neglected in current environmental models, i.e. lateral stream erosion, which by widening a valley can significantly alter the depositional geometry within a floodplain over geologic time. A terrain (Earth's surface) is mostly involved in the models.

There is a dynamic relationship between the surface forms and the processes that build, modify or remove the surface forms. The processes include some form of displacement of the Earth's surface material, which varies in relation to velocity, direction, amount of material removed and the frequency or return period of the process. This gradually changes topography. The terrain changes can be quantified by comparing altitude and different terrain parameters, which have a geomorphic significance with respect to terrain changes.

Terrain sensitivity is an ability of terrain to impact all supplemental and derived topics in terrain processing. Terrain sensitivity is caused by influences of Earth's surface representation in digital data models.

## Digital terrain models

Digital terrain models (DTMs) are digital representations of the terrain properties at discrete points in that landscape (Moore, Nieber 1989). These models have been designed recently to calculate the distributed topographical attributes of the landscape for use in environmental sciences, geography, cartography, mining, land-use planning, engineering, defence etc.

Terrain is a „continuous" phenomenon and potentially has an infinite number of points, which can be measured. Obviously it is impossible to record every point. Consequently, a sampling method must be used to extract representative points to build a surface model that approximates the actual surface. Many

environmental phenomena are related to terrain (runoff, agriculture etc.). The environmental models including DEM should (Voženílek 1996):
- accurately represent the surface,
- be suitable for efficient data collection,
- minimise data storage requirements,
- maximise data handling efficiency,
- be suitable for surface analysis.

A digital terrain model may be defined as a regular gridded matrix of elevation values that represents surface form called a grid. There is less certainty in the way in which the DTM should be interpreted as a model of continuous surface form. The process of interpolating parts of surfaces from point values in a DTM is fundamental to much DTM processing and analysis, yet the implications of the form of interpolation are not always fully appreciated.

The TIN model is a vector topological structure similar in concept to the fully topologically defined structures for representing polygon networks. The TIN model regards the nodes of the network as primary entities in the database. The topological relations are built into the database by constructing pointers from each node to each of its neighbouring nodes. The neighbour list is store clockwise around each node starting at north.

TIN data structure offers the best approximation of a real terrain surface. There are two reasons for this. Firstly, every measured data point is being used honoured directly, since they form the vertices of the triangles used to model the surface, to determinate the heights of additional points by interpolation and to carry out the construction of contours. Secondly, the use of triangles offers a relatively easy way of incorporating breaklines, faultlines and other natural linear hypsographical objects.

Digital terrain models based on TINs allow for variable spatial resolution, lend themselves naturally to interpolation procedures and make dynamic rediscretization a real possibility. However, use of TIN-based dynamic models has not been widespread, in part because of the increased complexity of data structures and algorithm development in a TIN framework (see Fig. 1).

In recent years, spatially distributed models of land surface processes, such as runoff and erosion, have come into widespread use in the Earth and environmental sciences. As these models grow in sophistication, the software engineering effort required to implement them also expands. Therein lies the need for portable, modular codes that can implement many of the basic requirements of a distributed model in a flexible, efficient, and application-independent manner.

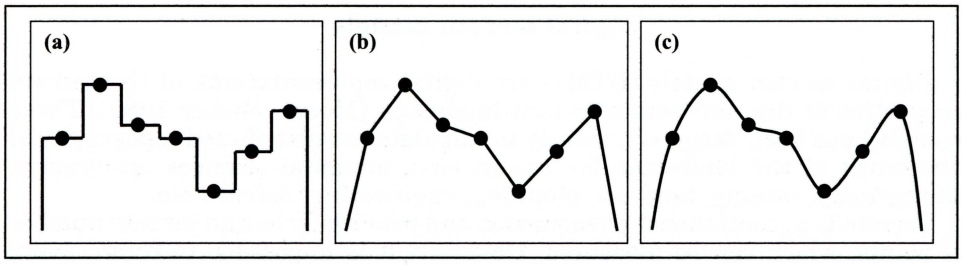


Fig. 1 – Three forms of interpolation used to transform discrete DEM cell values into continuous surface models. (a) Proximal interpolation; (b) linear interpolation; (c) cubic spline interpolation. (Wood 1999)

## Terrain data

An analysis of scaling effects in DTMs evaluates whether data aggregation is a useful spatial tool or whether it leads to an unacceptable loss of information. Some issues concern the appropriate resolution of DTMs used to derive surface input parameters for environmental models. Investigations involving commercially available terrain data sets with different horizontal and vertical resolutions and systematically aggregated DTMs were presented in many papers, for example, deriving a stream network and the contributing subareas from a DTM with a distinct critical support area. By varying this threshold area various watershed configurations were obtained. Terrain data with different resolutions diverge in landscape representation and in the derived parameters such as slopes, flow directions and channel networks. Coarse DTMs show a smoother terrain and shorter flow paths than highly resolved data. The contributing threshold area controls the extent of the watershed configuration and therefore determines the drainage density. These topographic and geomorphological features help to explain differences in the runoff simulation results. Watershed configurations with a varying extent of the channel network can be derived from a distinct DTM. These can then be used to simulate surface runoff and the drainage densities of the configurations correlated with the simulated runoff volume. A distinct drainage density, however, does not necessarily lead to similar simulation results when different DTMs are used. For example, since the hydrological model permits reinfiltration, the runoff volume depends directly on the lengths of the overland flow. Therefore, the mean length of the overland flow paths might to a certain degree be considered as a scaling factor.

Catchment boundary interpretation using topographical maps depends upon the representation of both altitude and water features. The level of details of the topographic map is dependent upon the scale of mapping and the compilation guidelines used by the mapping organisation. Thus, the source map accuracy is known as it is a reliable guide to overall accuracy (Miller et al. 1996).

Remote sensing data of the Earth's surface is readily available in digital format. These data are used for identifying certain features of interest in the image with the assistance of computers. To identify a feature of interest we not only have to classify individual pixels as belonging to a specific class, but also identify a set of such pixels as a part of the feature.

Developments in digital photogrammetry have provided the ability to automatically generate DTMs. Using overlapping imagery, dense grids of co-ordinates can be collected at high speeds (150 points per second) with a high level of accuracy. The trend towards using PC-based hardware, the widespread use of GIS, and the forthcoming availability of high-resolution satellite imagery over the Internet at ever-lower costs means that the use of automated digital photogrammetry in terrain modelling is likely to become more widespread.

## Distributed models

Distributed models of surface processes such as runoff, vegetation growth, soil erosion, forest fires, landscape evolution, and other processes typically share a number of important features in common. All involve (Voženílek 1996):

- spatial division of terrain into discrete elements,
- storage of mass and/or energy within landscape elements,
- routing of flows of mass (e.g., water) and/or energy among landscape elements,
- dynamic updating of boundary conditions (e.g., rainfall input), and
- dynamic updating of state variables (e.g., soil moisture and surface elevation) through time.

Often, the programming effort required to implement these features is non-trivial and quite labour intensive, especially when the underlying spatial representation is irregular. For example, the case of models based on triangulated irregular networks. Although current GIS systems provide sophisticated capabilities for spatial representation of data, performance and other limitations make them unsuitable for computationally intensive dynamic (i.e., time evolving) simulations. Thus, to reduce software development times and minimise duplication of effort, it would be advantageous to develop application-independent modelling routines that would provide the underlying space and time structure for distributed models without dictating the processes or state variables.

## 3D spatial data models

3D spatial data models (i.e. based on the National Imagery and Mapping Agency's (NIMA) Vector Product Format (VPF)), are capable of supporting high-resolution 3D representations of natural and man-made environments with full 3D topology. The assumption that terrain has a single value at a specified 2D location does not necessarily hold true. Structures such as bridges, overpasses, tunnels, and the interiors of buildings cannot be adequately represented using 2D topology. Therefore, a spatial data model that supports 3D topology is needed.

Some previous work in the development of data models that support 3D topology, from both the GIS and computer graphics communities have been processed.

## Surface forms

Many environmental models have been developed over the past decades. However, relatively little is known about handling the effects of changing spatial and temporal resolutions (Wood 1999). Therefore, resolution effects remain a factor of uncertainty in many environmental modelling approaches. In multi-scale studies of landscape process modelling an emphasis lays on quantifying the effect of changing the spatial resolution upon modelling the spatial processes (Schoorl, Sonneveld, Veldkamp 2000). Theoretical digital terrain models eliminate effects of landscape representation. The only variable factors can be DTM resolution and the method of flow routing, both steepest descent and multiple flow directions. The general trend was an increase of erosion predictions with coarser resolutions. An artificial mathematical overestimation of erosion and a realistic natural modelling effect of underestimating resedimentation is the cause of this. Increasing the spatial extent eliminates the artificial effect while at the same time the realistic effect is enhanced. Both effects can be quantified. They increase

within natural landscapes. The modelling of landscape processes benefits from integrating all types of results at different resolutions.

Wolock and McCabe (2000) compared terrain characteristics computed from 100- and 1 000-m resolution DEM data for 50 locations representing varied terrain in USA. The topographic characteristics were three parameters used extensively in hydrological research and modelling - slope, specific catchment area and a wetness index computed as the logarithm of the specific catchment area divided by slope. Slope values computed from 1 000-m DEMs were smaller than those computed from 100-m DEMs. Specific catchment area and the wetness index were larger for the 1 000-m DEMs compared with the 100-m DEMs. Most of the differences between the 100- and 1 000-m resolution DEMs were attributed to terrain-discretization effects in the computation of the topographic characteristics and were not the result of smoothing or loss of terrain detail in the coarse data. The differences in the average values of the topographic characteristics computed from 100- and 1000-m resolution DEMs were predictable; that is, biases in the mean values for the characteristics computed from a 1 000-m DEM can be corrected with simple linear equations.

Drainage density defined as the total length of channels per unit area, is a fundamental property of natural terrain that reflects local climate, relief, geology, and other factors. Accurate measurement of drainage density is important for numerous environmental applications, yet it is a difficult quantity to measure, particularly over large areas. Tucker, Catani, Rinaldo and Bras (2001) developed a method for generating maps of drainage density using digital elevation data. The method relies on measuring hillslope flow path distance at every unchanneled site within a basin and its analysing as a random space function. As a consequence, they measured not only its mean (which is half the inverse of the traditional definition of drainage density) but also its variance, higher moments, and spatial correlation structure. This yields a theoretically sound tool for estimating spatial variability of drainage density. Averaging length-to-channel over an appropriate spatial scale also makes it possible to derive continuous maps of drainage density and its spatial variations. The study showed that the autocorrelation of length scale provides a natural and objective choice for spatial averaging. This mapping technique was applied to a region of highly variable drainage density in the Northern Italy. The method is capable of revealing large-scale patterns of variation in drainage density that are correlated with lithology and relief. The method provides a more general way to quantitatively define and measure drainage density to test geomorphic models, and to incorporate drainage density variations into regional-scale hydrologic models.

## Environmental models with DTM

Digital terrain models make it possible to quantify a topographic surface. When new DEMs are generated from the same topographic surfaces with certain increment in time it is possible to achieve measures of horizontal and vertical surface displacement. The quantification of horizontal displacements involves large computational efforts if the aim is the analysis of spatially distributed velocity vectors (Etzelmuller 2000). The analysis of vertical surface changes results in measures of the magnitude of vertical surface changes and how vertical changes are distributed spatially over the topographic surface studied.

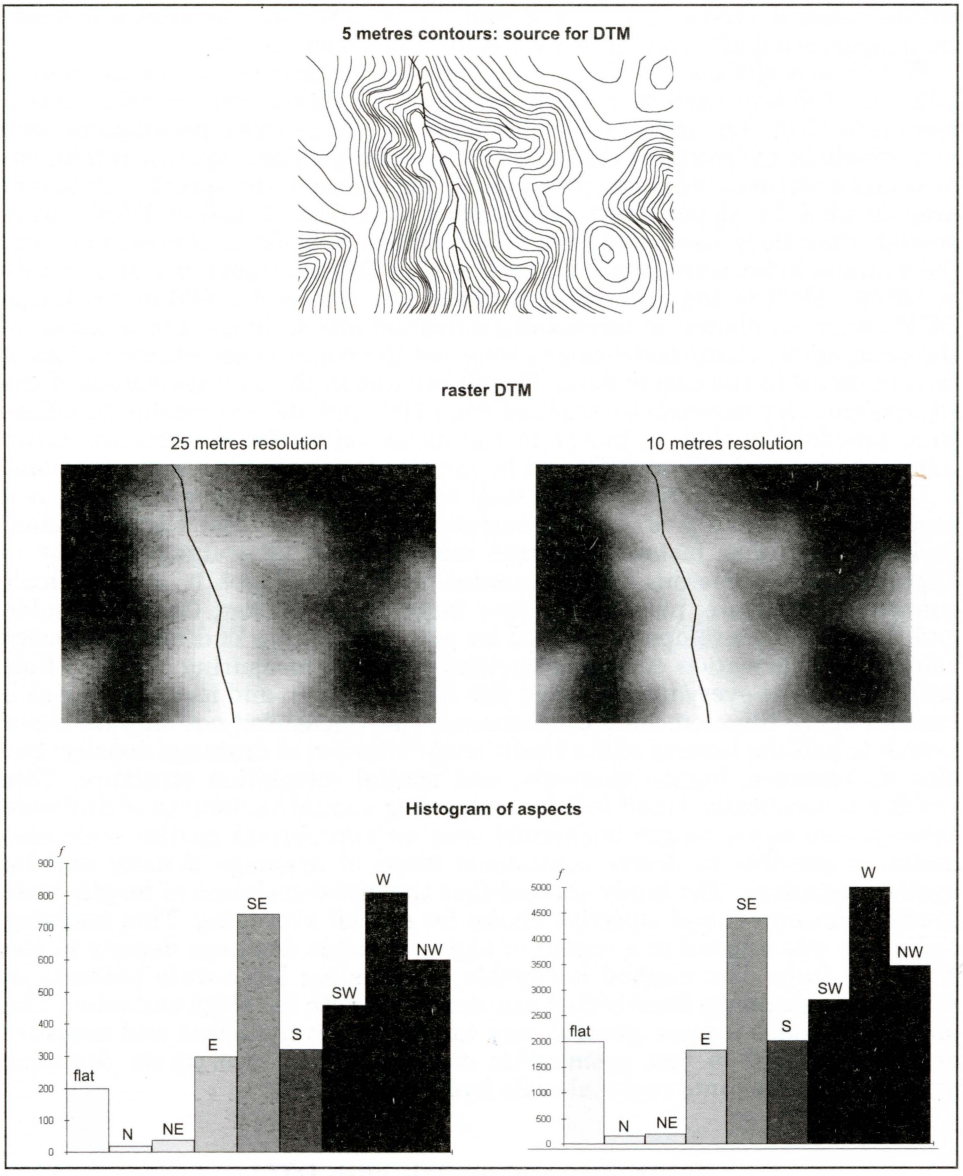


Fig. 2 - Terrain sensitivity through aspects derived from two different DTMs generated over one data source

Terrain sensitivity depends upon many phases in process of DTM generating – grid resolution, interpolation methods, parameters of interpolation etc. (Wood 1999). Figure two shows terrain sensitivity through aspects derived from two different DTMs generated over one data source. The impact is distinct form histograms (see Fig. 2).

Various quantitative environmental methods have been developed for characterising the morphology of surface (surface forms) (Evans 1972, Mark 1975, Elghazali and Hassan 1986, Fels 1995, Wood 1999, Voženílek 1996) and

for extracting hydrologic characteristics from DEMs (Jenson and Domingue 1988). However, since classifications of surface forms are not based on morphology alone but also on the position of the land surface in relation to its surroundings.

A method for land classification yields a quantitative index of landscape position by evaluating elevation differences between a given point and other model points within a specified search radius. The value calculated is the mean of the distance-weighted elevation differences between a given point and all other model points within a specified search radius. Greater positive values indicate lower topographic positions (proximal to streams) and greater negative values indicate higher landscape positions (ridges, summits) while values approaching zero indicate mid-slope positions. Where relief is minimal within the search radius, values will also tend to approach zero. The extent of the search area is an important consideration, since the evaluation of position is most meaningful when confined to a single landform. In principle, the radius of search should be one-half of the fractal dimension of the landscape, that is, one half of the ridge-to-stream distance in that landscape. Under such circumstances, a point located at mid-slope position is evaluated with respect to points extending from the stream at the bottom of the slope to the ridge at the top of the slope. Average ridge-to-stream distance varies considerably among different landscapes but is consistent within a particular region. Estimates of ridge-to-stream distance are obtained for the various regions by visualising digital terrain models within each region, measuring ridge-to-stream distance for a number of typical surface forms, and taking the mean of these measurements to obtain a representative value.

## Impacting of terrain sensitivity to modelled results

An important component of the modelling approach are the digital terrain models that form the basis of the Earth´s surface and stream networks that are used to derive many spatial parameters. It is also important to estimate the influence the importance of these parameters and to calibrate the model accordingly (Wheeler, 1993). The sensitivity of surface runoff simulations to watershed configurations can be studied with synthetic storms and by means of an infiltration excess runoff model.

The main source for catchment-wide terrain models in the Czech Republic are contours digitised from 1:10 000 paper maps at contour intervals of 1 – 5 metres. There are a number of options for the production of a DTM from digitised contours, including triangulated irregular networks, inverse distance weighting or kriging. Each of the methods themselves have a number of options available, such as a choice of algorithms, the value of controlling parameters and the selection of spatial lags and resolutions. There are questions how faithfully these methods represent the environment (Maidment 1996) and how they influence modelling results. This has resulted in a requirement for systematic studies into the most suitable terrain representation to use in conjunction with other spatial datasets (Maidment 1993). In general, a sensitivity analysis establishes the effect of the different available techniques on any model outputs. The analysis takes into account a representative range of the current terrain modelling techniques available and their interaction with different surface forms. The results of the analysis can be used to make an appropriate selection of techniques for DEM

production for many regions, and to give an indication of the sensitivity of the environmental hazard models to errors and generalisations due to the DEM. It is envisaged that the information gained from sensitivity analysis provides a useful set of guidelines for future projects that wish to use these techniques.

Most studies on the use of physically based hydrological models have identified saturated hydraulic conductivity as one of the most sensitive input parameters. However, it is also one of the most difficult landscape properties to measure accurately, casting doubt on the ability of modellers to estimate this parameter for catchment simulations. Several studies have shown that conductivity estimates are greatly influenced by the measurement method used, primarily because of scale effects (Beven ed. 1997). The effect of conductivity measurement method can be evaluated on catchment simulations aimed at predicting water yield from forested catchments. Method highlights the need for caution when applying soil hydraulic measurements to catchment-scale models (Davis, Vertessy, Silberstein 1999).

Terrain sensitivity depends upon grid size of raster DTMs which influences the representation of drainage areas and local slopes derived from DTMs. Catchments tend to increase and local slope decreases with increasing grid size. For example different grid size DTMs created from the contours illustrate profound shifts in the spatial distribution of predicted landslide hazards (Montgomery, Dietrich, Sullivan 1998).

## Conclusion

With the increasing use of GIS and availability of DTMs, the quantification of surface changes is of high interest, not only in geomorphology. Surface changes are normally estimated by taking the differences of more DTMs, which is a complicated operation with respect to error propagation. Thus, high-resolution DTMs with high accuracy are necessary to derive statistically reliable differential surfaces that give a spatial picture of surface changes. In the case of low magnitude geomorphologic changes or poorer DTM quality, spatial averaging and statistical analysis are suitable to estimate surface changes, at least quantitatively. The principles of terrain parameterisation and landform classification are very useful in the analysis of surface changes.

DTM grid size fundamentally constrains the role of physically based models in real environments. However, minor misrepresentation of terrain common in DTMs can seriously impact the predictions of environmental process models. The headwaters, for example, can flow into different watershed. Reducing the elevation of a single pixel in the original raster DTM corrects misrepresentation. In general, the terrain-discretisation effects are greatest on flat terrain with long length-scale features, and the smoothing effects are greatest on steep terrain with short length-scale features.

Uncertainty in the compilation of altitude or hydrological details on the source map influences the quality of the interpretation of a catchment boundary. Thus, the principle is that reliability of the boundary delimitation ultimately depends upon the integrity of the map, either in graphical or digital form. Validity of the boundary interpretation can also vary according to the land cover and land use.

The level of generalisation of the contours has a significant impact on the reliability with which a boundary may be delimited. Aggregation methods, aggregation level and the geometry of source data cause considerable

differences in estimating of surface forms, environmental characteristics and ultimately affect the various model outputs.

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Summary

CITLIVOST RELIÉFU V MODELECH ENVIRONMENTÁLNÍCH JEVŮ

Citlivost reliéfu (terrain sensitivity) je schopnost reliéfu ovlivnit všechny prvky v procesu zpracování reliéfu. Citlivost reliéfu je způsobena generalizovaným vyjádřením zemského povrchu v digitálních datových modelech.

Většina environmentálních jevů je v krajině přímo nebo nepřímo vázána na zemský povrch. Při jejich simulaci v modelech různé abstrakce a různé podrobnosti dochází k ovlivnění výstupů vlastnostmi vyjádření reliéfu v modelu, tzn. jeho citlivostí. Tyto environmentální modely využívají digitální reprezentace reliéfu v digitálních modelech reliéfu (DMR). Běžně jsou využívány oba základní druhy DMR, to rastrový grid i vektorový TIN. Citlivost reliéfu v modelech environmentálních jevů závisí na všech fázích zpracování povrchu, počínaje výběrem zdrojových dat přes stanovení rozlišení, interpolačních metod a jejich parametrů atd.

Environmentální modely obsahují také nejrůznější odvozené parametry, například morfometrické charakteristiky a tvary reliéfu. Řada studií (např. Wolock, McCabe 2000, Tucket a kol. 2001) diskutuje o vhodnosti užití zdrojových dat pro vyjádření reliéfu. Jsou však uvažovány již generalizované zdroje výškových dat (vrstevnice), zatímco k přesnějšímu vyjádření reliéfu a ke snížení vlivu nepřesně vyjádřeného reliéfu je nutné používat hypsometrickou reprezentaci pokud možno co nejbližší k primárním zdrojům výškových dat.

Obr. 1 – Tři způsoby interpolace používané k transformaci hodnot diskrétních DMR do spojitých povrchových modelů: a) proximální interpolace, b) lineární interpolace, c) interpolace kubických splajnů

Obr. 2 – Citlivost reliéfu v orientaci svahů odvozených ze dvou odlišných DMR vygenerovaných nad stejným zdrojem dat

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PETR DOSTÁL

# EU ENLARGEMENT AND THE PUBLIC OPINION ON THE CZECH REPUBLIC: AN EXPLANATORY ANALYSIS

P. Dostál: *EU enlargement and the public opinion on the Czech Republic: an explanatory analysis.* – Geografie – Sborník ČGS, 107, 2, pp. 121 – 138 (2002). The article provides an analysis of the public opinion in EU countries on the anticipated Czech membership. Public opinion and mass interest articulations are central to studies on European integration. Macro-geographical structure of the EU and its enlarged periphery of associated countries is examined in order to derive basic explanatory assumptions. The differentiation in the support for the Czech membership is explained with the help of structural variables and public opinion variables. Statistical analysis (LISREL model) shows the importance of post-materialist value orientation of the EU populations for their support given to the enlargement with the Czech Republic. The public in rich and large countries and in French-speaking parts of the EU tends to give less support for the Czech accession indicating that a strong integrative sense of a larger European community still has to emerge.
KEY WORDS: European Union enlargement – public opinion – Czech Republic.

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## 1. Introduction

For Europeans and also for many people from other parts of the world the collapse of the geopolitical divide of the Iron Curtain at the end of the 1980s brought a fundamental change of historical importance. Perhaps the most important change since the end of the Second World War. As an inevitable consequence of this collapse, there started complex processes of redrawing the map of Europe thereby changing the basic geopolitical and geo-economic organisation of the continent structured in a historical core of the European Union, its old and new semi-peripheries and, importantly, its periphery that has included since the fall of the Iron Curtain a large number of old, new or restored post-communist countries. Many people were surprised by the rapidity and easiness with which this geopolitical and developmental redrawing of the map of Europe took place (see also Ash 1993; Dostál, Hampl 1996).

By the end of the 1990s, anticipated eastern enlargement of the European Union has become critical for the future of European integration (Preston 1997; Mayhew 1998). In the beginning of the 1990s the Maastricht Treaty on European Union (EU) was signed by the twelve member governments of the European Communities. The largely Liberal Institutionalist view of Maastricht was that the Treaty would be an important step towards an international society in Western Europe strengthening European integration. The post-war four decades long period of building an international society only

in the North-West and the South-West of Europe and in Greece seemingly ended. It appeared that also for the numerous countries in East-Central Europe and Eastern Europe, a new Article 49 of the EU Treaty (Amsterdam 1997) on enlargement stipulated that "Any European state may apply to become a Member of the Union. It shall address its application to the Council, which shall act unanimously after consulting the Commission and after receiving the assent of the European Parliament, which shall act by absolute majority of its component members". However, the Article 49 also demands that an applicant country must respect principles specified in Article 6 which stipulates that "the Union is founded on the principles of liberty, democracy, respect for human rights and fundamental freedoms, and the rule of law". Importantly, the EU Treaty does not include any geographical definition of Europe. In consequence, this and the basic stipulations of the Treaty make clear that the prospect of EU membership continues to offer the important incentive to the Central and Eastern Europeans to persevere with western-style political and economic transformation.

Obviously, the far-reaching fragmentation of the map of East Central and Eastern Europe has complicated the evolution of European unifying processes. However, with Emerson (1997), Preston (1997) and many other observers of current European integration, one has to recognize that only the EU is a key institutional vehicle able to make the dynamics of European integration persistent and strong. It seems that the basic geopolitical and geo-economic organisation of the continent in the historical core of the EU, its old and new semi-peripheries and its periphery is undergoing significant changes. Most of the post-communist countries officially aspire since mid-1990s EU membership (EC 2000). Such membership requires qualitative regime adaptations and the establishment of the Western-styled institutional arrangements and compatibility with Western political and economic standards of democracy and market economy (cf. Dostál 1998). The Copenhagen European Council meeting of June 1993 established three general criteria of the EU for evaluation of accession candidates (i) stability of institutions guaranteeing democracy, the rule of law, human rights and respect for protection of minorities, (ii) existence of a functioning market economy as well as the capacity to cope with competitive pressures and market forces within the EU, and (iii) ability to take on the obligations of membership, including adherence to the aims of political, economic and monetary union (EC 2000, 9-10; Mayhew 1998).

Importantly, the official criteria imply that in the potential accession countries far-reaching adaptations of institutions, organisational and individual behaviour have to take place. In brief, the adaptation processes have to stretch much further and affect whole societies and economies than only invoke necessary adaptations of the political and economic elites in the post-communist countries concerned. It is therefore important to know whether such accompanying behavioural and public opinion adaptations contribute significantly to current unifying processes of European integration. Accordingly, the central argument in this paper is that in the line with the classical claim of Deutsch et al. (1957), the current process of European integration has to be understood as "the attainment, within a territory, of a 'sense of community' and of institutions and practices strong enough and widespread enough to assure, for a 'long' time, dependable expectations of peaceful change" (1957, 5). The stress on the sense of community is particularly important, because it is "a matter of mutual

sympathies and loyalty; of 'we-feeling', trust, and mutual consideration; of partial identification in terms of self-images and interests; of mutually successful predictions of behaviour, and of co-operative actions in accordance with it" (1957, 36). Hence, this classical claim makes clear that variables on geopolitical sentiment and identity describing political opinions and mass interest articulations are central to studies on European integration, because common identity and sense of community have to be acknowledged also at the beginning of the third millennium as essential features of political integration (see also Sinnott, 1995). In other words, analyses concerned with processes of integration have to be focused on the question (i) whether current transnational integrative efforts of the political elites are supported by some sense of European community in the public opinion of the EU countries and in the candidate countries, and whether (ii) such a sense of belonging to an European community is spreading across the former divide of the Iron Curtain, and more specifically, whether (iii) value-orientation of the public opinion in the Czech Republic is westward orientated to the integration into the EU.

Accordingly, one way of assessing the extent to which the post-Cold War fragmentation of Europe is being surmounted and the European integration process tends to proceed, is to focus the analytic effort on explanation of public opinions in the fifteen member states of the EU about anticipated new enlargement of the EU towards the set of twelve accession countries (ten post-communist states from the former Soviet-dominated geopolitical orbit and Mediterranean Cyprus and Malta). Therefore, this paper attempts to confront the western and the eastern public opinions on the anticipated EU enlargement with respect to the anticipated membership of the Czech Republic. The structure of the paper is as follows. The second section focuses on the basic pattern of macro-geographical structure of the EU and its enlarged periphery of the current thirteen associated countries. The third section seeks to indicate the character of changing public opinion of the Czech electorate on the anticipated EU membership. The fourth section is concerned with statistical explanation of differences in support for the Czech accession in the EU in the public opinion in the set of fifteen EU countries. Finally, the concluding section draws major conclusions resulting from the analytic explanatory effort and also provides a reflection on current unifying and fragmenting tendencies in the post-Cold War Europe.

## 2. EU historical core, semi-peripheries and peripheries

The geopolitical divide of Europe that persisted for more than four decades after the Second World War was artificial. It did not correspond to any macro-regional division of politics, culture and religion, and it also made no sense in terms of the geography of diffusion of modernisation during the nineteenth century and the first half of the twentieth century (see Pollard 1981). In terms of a West-East gradient of modernisation (largely industrialisation), the Czech Lands (i.e. the current Czech Republic) certainly belonged to the western and most industrialised regions of the continent in that historical period. The modernisation process integrated the territory of the Czech Republic into the core area of industrial activities of western continental Europe. Therefore, from this general geopolitical and geo-economic viewpoint, one can see the current western-style institutional reforms and behavioural

adaptation of citizens in the Czech Republic as resulting from a "coming back" on the development trajectory of "open" societal systems with a corresponding reintroduction of competitive mechanisms and motivations of plurality of actors and interest groups in political and economic subsystems. In other words, it can be claimed that the current western-style behavioural adaptations and changing values orientations taking place in he Czech Republic must be seen as qualitative subjective processes of "westward orientation" (see also Dostál, Markusse 2001).

The EU is the major geopolitical and geo-economic compact of the continent. Moreover, in terms of complexity of political and economic integration the EU cannot be compared with another inter-state compact in the world. Despite this, the fundamental political and economic structure of the set of 15 EU countries and 13 candidate countries can be differentiated in accordance with two different criteria. First, there is the distinction in accordance with the date of EU membership and EU association of the candidate countries concerned. Second, there is the gross domestic product per capita in 2000 dimension to be used in the basic groupings of 28 countries. The GDP is usually a measure of the value at market prices of goods and services over a year. The GDP measure is in real terms and is expressed in purchasing power standards in order to make comparisons more meaningful by excluding effect of higher price levels in the EU and some candidate countries such as Cyprus or Slovenia.

The first (time) dimension distinguishes between the six countries (France, Germany, Italy, the Netherlands, Belgium and Luxembourg) that moved the supra-national entity called today the EU from the Treaty of Paris (the European Coal and Steel Community) of 1951 to the Treaties of Rome (the European Economic Community and European Atomic Energy) of 1957, and negotiated later enlargements in order to prepare accession of other (new) members (Preston 1997; Mayhew 1998). The original six members form the first grouping, i.e. the historical core of the European Community and were joined by the United Kingdom, Denmark and Ireland in a first wave of enlargement in 1973. The three countries of the 1973 enlargement have today a similar level of economic performance (GDP per capita in 2000) as the historical core of the EU. This suggests that these early candidate countries have profited in long term from their integration into the EU geo-economic and geopolitical compact. It appears that the 1973 enlargement group forms currently the second grouping, i.e. an old outer group of the historical core. Then came Greece in 1981 and in 1986 Spain and Portugal. This second enlargement is often called the Mediterranean wave and in terms of the economic performance these three members still form the third grouping, i.e. a periphery of the current EU. Most recently Austria, Sweden and Finland came in 1995 and this enlargement can be called the wave of EFTA (European Free Trade Association). These countries form today the fourth grouping, i.e. a new outer core of the EU. This last enlargement took place after the entity of European Community became European Union in November 1993 as a result of Maastricht Treaty of 1991. The time axis of EU membership can be further extended by the dates of EU association of candidate countries. The association with the EU has materialised in the form of Europe Association Agreements (EAA). During the period December 1991 – June 1996 there were signed EAAs of the EU with ten post-communist countries, and in 1994-1998 the EAAs came into force (EC 2000). The EAAs cover geo-economic issues of trade, cooperation areas including industry, customs, transports, and

environment. The agreements also cover geopolitical issues of political dialog, legal approximation and some security areas. Importantly, they aim to establish in short term a free-trade area between the EU and the associated country on the basis of reciprocity, but applied in an asymmetric way, there is more rapid liberalisation on the EU side than on the side of associated country. However, the first country to have an EAA was Turkey that signed an association agreement already in 1963 and applied for full EU membership in 1987. Due to the fall of the Iron Curtain and unsatisfactory records on political rights and civil liberties Turkey was not allowed to open accession negotiations, but to consolidate its custom union with the EU (Preston 1997, 213-219). This in contrast to Malta and Cyprus that signed EAAs in 1971 and 1973 and are allowed to negotiate on their EU memberships (Mayhew 1998, 95-99). These countries form in terms of their GDP per capita the fifth grouping, i.e. a periphery of old associated countries.

The ten post-communist countries have signed their EAAs in 1991-1996 and came into force 1994-1998. Once geopolitical conditions allowed, the post-communist countries were granted forms of association leading to free trade, though with some important limitations for agricultural and so-called sensitive products. Interestingly, Harrison (1995) suggests that there appears a close correlation between branches of sensitive sectors and areas of high subsidy within the EU. Moreover, the Copenhagen criteria mentioned above appear to be a clear restatement of the inviolability of the aquis commautaire, i.e. of full acceptance of the entire EU legislation and norms by accession countries. There are two groups of newly associated post-communist countries. On the one hand, there is the sixth grouping of so-called Luxembourg group of post-communist countries including Slovenia, Czech Republic, Hungary, Poland and Estonia. The group includes candidate countries with which the European Council in Luxembourg endorsed in December 1997 European Commission recommendations to open negotiations. In long-term perspective, one can anticipate that this group of countries will form a semi-periphery of the EU. This group of five post-communist candidate countries tends to show better institutional transformation and economic performance than the other newly associated countries (Dostál 1998; EC 2000). Other post-communist candidate countries seemingly have to anticipate significantly slower integration process and from a long-term viewpoint they will possibly form the seventh grouping, i.e. a "genuine" periphery of the future enlarged EU.

This basic differentiation of the set of 28 countries into seven groupings of countries allows the following assumptions that can be further used in an explanatory analysis of the public opinion on the eastern enlargement and on the EU accession of the Czech Republic. First, the historical core and the rich old and new outer cores of the current EU have to anticipate larger contributions to the EU budget when the newly associated countries will become members. Largely, one can assume that the countries forming the historical core will become all contributors to the EU budget and much less receipts or at least below-average receipts (Preston, 1997). Second, they have to anticipate a restructuring of current Common Agricultural Policy. This will have significant impact on the long-time established interest of agricultural sector especially in the countries of the historical core. Third, the countries in the EU periphery must expect a restructuring of existing Structural and Cohesion Funds. The impact of the Iberian enlargement implied an important structural spending (Baldwin et al. 1997). It can be expected that these

members will demand special budget allocations in return for accepting the financial support for the new members. Fourth, under EU rules, small countries are accorded far more votes per citizen than the larger ones. Clearly, eastern enlargement will bring pressures to change the EU rules, and not surprisingly, this will lead to reorientations in budget priorities and uncertainty about well-established financial distributions between countries, sectors and regions. The public opinion in the large countries can be concerned about overall effectiveness if "micro-states" will have to assume the same level of EU responsibilities as large states. Other concerns focus on the power of blocking coalitions of small states to frustrate ambitions of the larger ones. Whichever assumption will be correct, the anticipated eastern enlargement will inevitably change budgetary interests of the four basic groupings of the current EU member countries. New and low economic performance eastern entrants will be inclined to use their power as members to boost EU structural spending and try to change eligibility criteria. There is no reason to assume that the new entrants would be different from those of the Mediterranean enlargement. Finally, one may point out to fears in border regions of EU countries having as neighbours the candidate countries.

### 3. Changing public opinion on the Czech membership

It is obvious that across Central and Eastern Europe current motivations to join the EU are based on what the EU represents in terms of politics, economy, geographical location and also security. The EU is seen as successful post-war geopolitical and geo-economic compact that has facilitated integration in western Europe. The EU is also seen as a main source of trade, investment and aid. The much higher living standards in most of the EU countries than in the Czech Republic have led to expectations that association with and later accession into the EU will bring similar benefits. These considerations seem to combine in drawing the public opinion towards the magnet of the EU membership.

The realisation of the EU association agreement and the January 1996 official submission of the Czech application for the EU membership clearly shows the willingness of the Czech political elite to enter the EU. The application for membership is an autonomous decision for the country concerned. It is based on subjective assessments of the political elite of other possible options for geopolitical and geo-economic integration of the country. However, view and assessments among both political actors and the general public about the EU membership and its different implications can importantly differ. It is possible to discern emerging attitudes to issues that will be implied in the anticipated EU membership. On the one hand, it involves expectation concerned with necessary adjustments and adaptations that result from the membership. On the other hand, it also involves assessing challenges and opportunities. Moreover, there has been in the Czech Republic little discussion of the pros and cons of different elements of the rights and obligations of the membership. Until the economic downturn in summer 1997 there was considerable confidence in the Czech public opinion about getting in the EU. Understandably, there is some concern about the position of small countries within the EU and similarly there is wariness about steps towards political union in a country that recently abolished an unsatisfactory federal relationship with Slovakia.

Tab. 1 – Czech pubic opinion on the Czech membership in the EU (voting in a referendum)

| Answers | 08/96 | 04/97 | 04/99 | 09/99 | 05/00 | 10/00 | 03/01 | 05/01 |
|---|---|---|---|---|---|---|---|---|
| Yes EU | 46 | 50 | 46 | 44 | 42 | 48 | 45 | 40 |
| No EU | 41 | 34 | 40 | 39 | 42 | 37 | 37 | 38 |
| Undecided | 13 | 16 | 14 | 17 | 16 | 15 | 18 | 22 |
| Total | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 |

Source: STEM, Trendy 1996 – 2001. Prague 2001

The public opinion is important in establishing necessary legitimacy of the anticipated membership. In particular, when in the Czech Republic a referendum will be held on membership. Table 1 clearly indicates that the public support for the EU membership is now lower than in the early years of the political and economic transformation. At the most general level of whether or not the electorate would support the EU accession of the Czech Republic in a referendum the public opinion shows a decreasing support from a maximum of 50 % in 1997 to a significantly lower level of 40 % in 2001. The share of those who would vote against EU membership is stable, but considerable. One may draw the conclusion that those who supported membership tend to shift in the category of undecided voters. The Czech public opinion on EU accession seems to reflect current long and difficult negotiations on some basic elements of the EU membership. It seems that in particular anticipated constraints on one of the four basic freedoms of the EU integration, the free movement of labour force, has significantly contributed the declining support shown in Table 1. The poll findings must bee seen in a context of quite constrained knowledge of the Czech public on the EU membership that still is experienced as quite remote. Despite of the general support for a westward orientation of the country (Dostál, Markusse 2001), the Czech public seems more doubtful about who benefits from the relations with the EU. Opinion polls have shown that the public believes that private business, educational system, government civil servants and armed forces will largely benefit as ties with the EU become closer. In contrast, low income groups, manual workers and employees of state enterprises believe that they will loose. Interestingly, over 50 % of the public indicate that farmers will loose from the EU accession (Central and Eastern Eurobarometer no. 7; STEM, 1999; 2001). This certainly illustrates the low level of specific knowledge concerning the Common Agricultural Policy and of other sectors of the EU policy-making and political orientation of the EU in general.

In a survey commissioned by the European Commission in October 2001 in all associated countries (see Applicant Countries Barometer 2001), however, it appeared that a majority (54 %) of the Czech electorate would support in a referendum the accession of the Czech Republic in the EU (see Tab. 2). The highest level of support for EU membership was indicated in Romania and Bulgaria. It is necessary to note that due to lagging political and economic transformation (see the Copenhagen criteria; EC, 2000) the two countries cannot anticipate membership in a first group of candidate countries that will access into the EU. The lowest shares of support is in Estonia and in Malta where according to the survey only 40 respectively 38 % of the electorate would give a positive vote in a referendum on the EU membership. It is also necessary to note that the sample from the Czech Republic shows in the Luxembourg group an average level of support for EU membership. Moreover,

Tab. 2 – Public opinion in 13 candidate countries on EU membership (voting in referendum – survey results in October 2001)

| Country | For EU | Against EU | No answer | No participation |
|---|---|---|---|---|
| Romania | 85 | 3 | 6 | 7 |
| Bulgaria | 80 | 4 | 9 | 6 |
| Hungary | 70 | 10 | 7 | 13 |
| Turkey | 68 | 20 | 8 | 4 |
| Slovakia | 66 | 11 | 9 | 15 |
| Average13 cc | 65 | 18 | 9 | 8 |
| Cyprus | 62 | 25 | 11 | 2 |
| Slovenia | 56 | 22 | 13 | 9 |
| Czechia | 54 | 18 | 13 | 15 |
| Poland | 54 | 26 | 9 | 11 |
| Lithuania | 50 | 20 | 15 | 15 |
| Latvia | 46 | 32 | 12 | 9 |
| Malta | 40 | 36 | 14 | 11 |
| Estonia | 38 | 27 | 14 | 21 |

Source: Applicant Countries Eurobarometer 2001. European Commission, Brussels.

the European Commission survey also indicates that 75 % of the Czech electorate that intended to participate in the referendum would vote for the membership (Applicant Countries Barometer 2001, p. 6).

One may perhaps draw the conclusion that given the general westward value-orientation of the Czech public the anticipated EU referendum will deliver a majority for the EU membership. In view of this optimistic assessment it is important to know whether the Czech membership is supported by the public opinion of the fifteen members states and tends to provide necessary legitimacy for anticipated Czech accession.

## 4. EU public opinion on the Czech membership

Public opinion data on European integration are provided by Eurobarometer surveys. The Eurobarometer surveys are conducted on behalf of the European Commission (see Reif, Inglehart, 1991). This programme started in 1970. In 1974, the Eurobarometer surveys were launched as a regular programme to monitor public opinion in the member countries. Representative national samples of the public are since then interviewed in the spring and autumn of each year. Standard sample size of the surveys is approximately 1,000 persons per country of the population aged 15 years and older. Over 16,000 inhabitants have been interviewed face-to-face in the 15 member states. Most of the Eurobarometer questions are driven by policy considerations rather than scientific concerns. Despite this, there are clear advantages attached to the Eurobarometer data. In short, analytical possibilities are large and one can trace in macro-level analyses differences in opinions of the citizenry in the fifteen EU countries on the question "should the Czech Republic join the European Union?" (Eurobarometer no. 54, 2001, B.78).

Figure 1 shows how support for the Czech membership varies between the EU member states by indicating the percentage of positive answers in

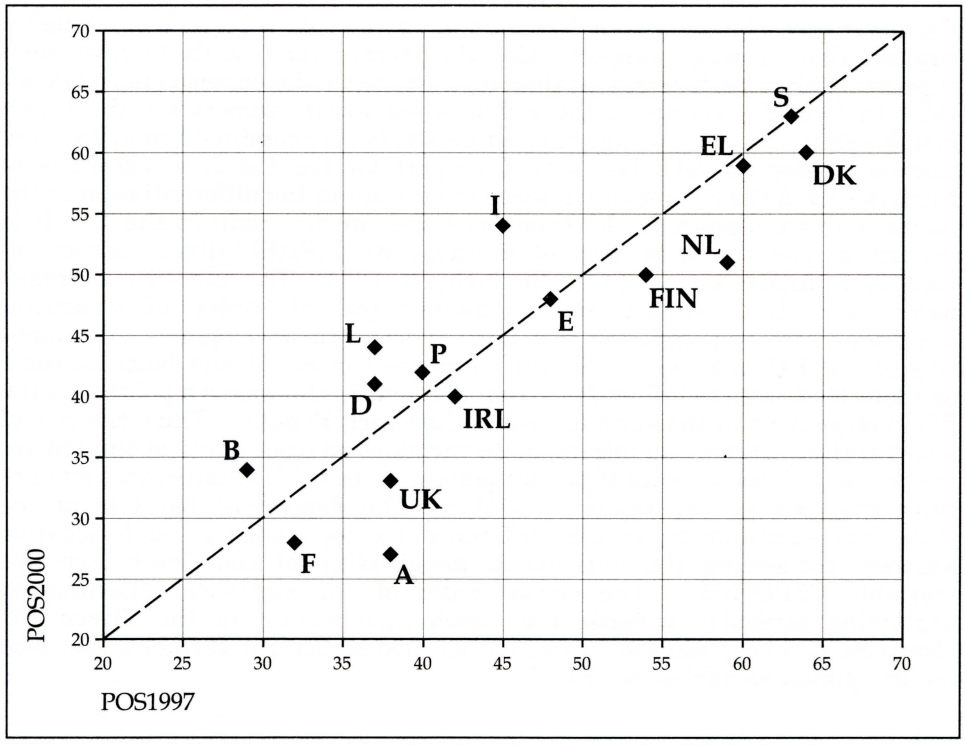


Fig. 1 – EU public opinion on the Czech membership in 1997 and 2000

autumn of 1997 and autumn of 2000. Closer comparison of the variation across the countries reveals some shifts in 1997-2000 in the support for the Czech membership. First, it appears that the strong support is expressed in the public opinion of Scandinavian members Sweden and Denmark and in Greece. A further conclusion to be drawn is that a high support (50 % or more) is given also by the public in Italy, the Netherlands and Finland. Second, it is significant to establish that the public opinion in France and Austria, but also in the UK and Belgium, is very low. However, also the support in Germany is low. One must note that there are important differences between West and East Germany. The public in West Germany gives support for the Czech membership of only 38 % (autumn 2000). The public opinion in East Germany indicates support of 53 %. It appears that the public opinion in the key countries of the EU forming so-called major axis of decision-making, France and Germany, tends to give only a low support for the Czech accession. This seems to be a serious handicap for necessary legitimacy of the anticipated membership. Third, it must be mentioned that Italy and the Netherlands, both members of the historical core of the EU, give clear support for the Czech accession. It is also important to point out that the electorates in Greece and also in Spain tend to support the Czech membership. This is significant, because the two countries belong to the EU periphery that is largely dependent on Structural and Cohesion Funds and the public in these countries could anticipate a redistribution of the funds following the accession. Fourth, it also appears that the support for the Czech accession has decreased a little since 1997. Importantly, one has to stress that the public in

Germany gives to the Czech Republic support of 41 %, which is a higher support than average support. Also the Netherlands tends to give more support for the Czech accession than its average for the eastern enlargement. Only in four EU countries the public gives lower support for the Czech membership than the average support for the twelve candidate countries (see Eurobarometer no. 54). The lowest support for the Czech accession is in Austria. Given the complexity of these tendencies in the differentiation in the public opinion support to the eventual Czech membership in the EU, it is needed to use the wide lens of multivariate LISREL (linear structural equations) analysis (see Saris, Stronkhorst 1984). The LISREL approach necessitates to construct an explanatory (causal) order of structural conditions such as population size, level of economic development or number of years of EU membership in the countries concerned and basic political opinions that seem to influence current opinions in the western polities on the EU enlargement in the specific case of the Czech Republic. Thus, the role of structural conditions and intermediate variables on basic political opinion are examined as determinants of public opinions on new EU enlargement and are thus analysed as explanatory variables. The dependent variable of the statistical examination is the difference between positive and negative answers concerning the anticipated membership of the Czech Republic (variable CZPONE54). The causal order of our statistical examination explaining attitudes towards the Czech membership in the fifteen EU countries is conceptualised in two blocks: five structural variables and four public opinion variables (see Fig. 2).

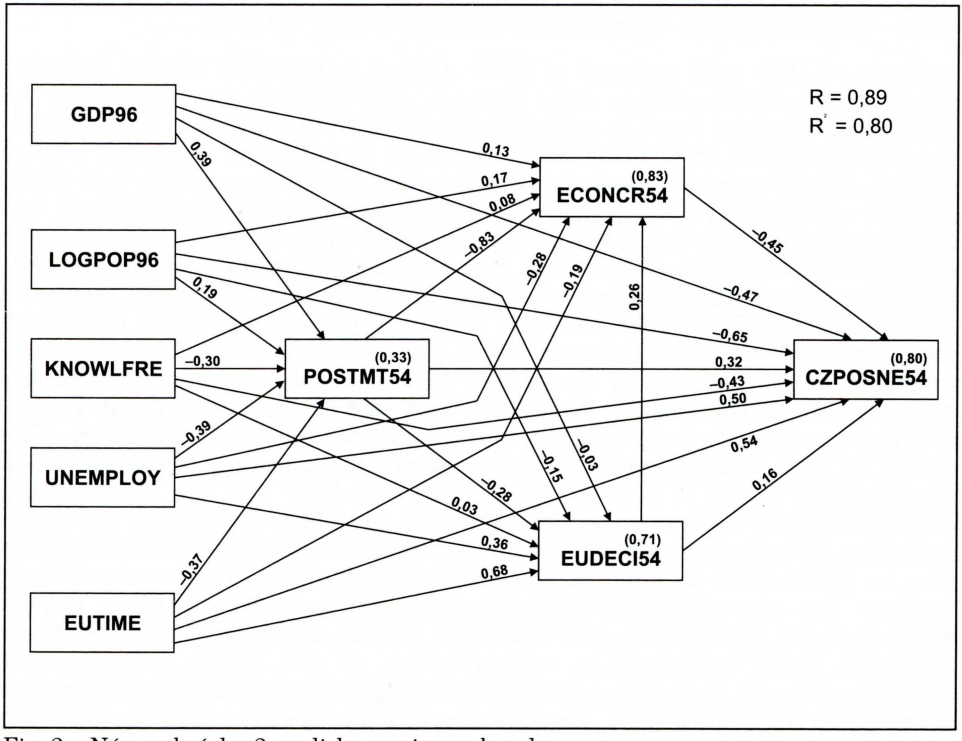

Fig. 2 – Název obrázku 2 anglicky – asi v soub. .cdr

### 4. 1. Structural variables

A first structural condition (variable GDP96) is the economic development level represented by GDP per capita in purchasing power parity in 1996 (Eurostat 1998, 45). Because the EU countries with high scores on this variable are the major net per capita contributors to the EU budget (Preston 1997), one can expect a negative effect of this variable on the dependent variable CZPONE54. A second structural variable to be examined in terms of its effects in the LISREL model is the population size (LOGPOP96). There have been claims underlying the importance of the population size expecting that the large EU members would be less in favour of membership of the post-communist countries because they are relatively small and would strengthen the position of the small EU countries and, in consequence, change current balance with the large member states and also further complicate the strained transnational decision-making in an EU of twenty or more members (Avery, Cameron 1998, 140ff). Given the enormous differences in population size, varying from tiny Luxembourg (0.4 million inhabitants) to reunited Germany (80 million inhabitants), the variable has been transformed in order to obtain more normal distribution. The third structural condition relates to basic language areas of the EU. Variable KNOWFRE (percentage of citizens speaking French) indicates differences across the fifteen countries in belonging to the French-speaking and French-knowing area. This structural condition is included in the model in order to check factually frequent claims (see for instance Emerson 1998) that French-speaking polities have geographical orientations in their eventual support for a new enlargement towards the south and south-east and thus tend to support the Mediterranean enlargement on the current southern EU periphery and not the eastern enlargement. The fourth structural condition in the fifteen countries to be examined on its effects in the model is the average unemployment rate in 2000 (variable UNEMPLOY) as a measure indicating the need for traditional welfare state involvement. For instance, Inglehart (1991) indicated in a cross-national comparison in the EU that with increasing level of economic development and social security also trust toward other nations slightly tends to increase. In consequence, one can expect a positive facilitating impact of this variable on the support for the Czech membership. Finally, a sixth structural condition is a simple, yet important one. Variable EUTIME indicates across the fifteen countries the number of years of EU membership. The major hypothesis to be tested in the model is whether the public opinion in the old member states is inclined to support more a new enlargement with the Czech Republic due to long-lasting experience with the EU institutions and procedures, with frequent incorporation of peripheral countries into the EU compact in the past and with advantages and disadvantages of the post-war European integration in general (cf. Sinnott, 1995; Preston, 1997).

### 4. 2. Public opinion variables

Next, there is in the causal order of our first model a block of three intermediate variables. Since the beginning of public opinion analyses in the EU the advent of post-materialist value orientation has been central in debates and research on public opinion patterns and trends. Post-materialist value orientation has been widely seen as a major cause influencing other trends in political opinion of the EU public (Inglehart 1997, 108ff). Basic claim on post-

Tab. 3 – Post-materialist public opinion (component loadings)

| Indicators | Component loadings Post-materialism |
|---|---|
| Human rights | 0.900 |
| Third World | 0.744 |
| Environment-consumers | 0.681 |
| drugs-crime | 0.575 |
| Research | 0.397 |
| Education-culture | 0.299 |
| Immigration policy | 0.116 |
| Social policy | –0.640 |
| Employment | –0.735 |
| Currency | –0.811 |
| Extracted total variance = 40.3 % | No rotation |

Source: Eurobarometer No. 54. 2000. European Commission, Brussels.

materialism argues that alongside of the coming of a post-industrial economy and advanced welfare state, a shift from materialist values and political orientation towards post-materialist ones takes place and derives from the tension between the public concerns with economic growth and the concerns with quality of life, such as environment, well-being, more say on the job, more say in government, development support for Third World aid, research and education or human rights. This in contrast to the traditional materialist value orientation stressing employment and social policy, stable economy, strong currency, or fighting rising prices. Given the great importance of this value orientation in the EU public in the literature, we attempt to substantiate the tension between post-materialism and materialism using available Eurobarometer no. 54 survey data from the same autumn 2000 sample that we also used constructing our first dependent variable CZPONE54.

One can use as suitable indicators percentages of respondents who indicated three most important policy areas they thought European Parliament has to concentrate on. Principal component analysis is employed (see Rummel 1970) in order to construct a common statistical dimension that represents the tension between post-materialist and materialist orientations of the public in individual EU countries and gives standardised scores for each country on the dimension (see Tab. 3). The ten policy areas selected in the survey show across the fifteen countries remarkable consistency.

The first unrotated principal component shown in Table 3 represents 40.3 % of the total variation of the ten indicators. The structure of component loadings shows clearly the assumed tension between post-materialist and materialist orientations. Hence, a complex score called POSTMT54 on this dimension can be used to show differences in post-materialist orientations across the fifteen countries. The highest score on the dimension belongs to Sweden. We assume that the complex measure POSTMT54 will have in the model a positive effect on the dependent variable CZPONE54. The second public opinion variable represents a basic positive attitude towards further internal EU integration. It is the average percentage of 18 policy areas that the public in the fifteen countries prefers to be covered by supra-national decision-making of the EU (Eurobarometer no. 54, B34-B36). In other words, one can assume that this variable indicates the inclination of the EU public to shift more competences in these fields from the level of nation-states to the EU level of decision making. This variable EUDECI is also assumed to have a positive effect on the dependent variable CZPONE54. The third public opinion variable is a measure representing systematic stress in the EU public opinion on the importance of economic criteria in evaluation of the anticipated

Tab. 4 – Public opinion on criteria concerning enlargement (component loadings)

| Indicator | Component 1 Economic criteria ECONCR54 | Component 2 Socio-environmental criteria |
|---|---|---|
| Human rights | 0.173 | 0.939 |
| Economic development | 0.893 | 0.116 |
| Acceptance acquis | 0.738 | 0.073 |
| No costs | 0.856 | –0.085 |
| EU interests | 0.884 | –0.159 |
| Crime and drugs | –0.022 | 0.970 |
| Environment | –0.081 | 0.968 |
| Pay share | 0.606 | 0.398 |

Source: Eurobarometer No. 54, 2000. European Commission, Brussels.

eastern enlargement (variable ECONCR54). Also this measure is derived with the help of principal component analysis. Table 4 shows the structure of component loadings on the first two components. The first component has a structure that is consistent with the highly overlapping economic values-orientated opinions on the coming enlargement. One can expect that this measure will have a negative effect on the support for the EU membership of the Czech Republic.

### 4. 3. Explaining the EU public opinion

These empirical dimensions representing structural conditions and public opinions and associated hypotheses are thus translated into the causal model shown in Figure 2. The LISREL model procedure estimates independent direct and indirect, or mediated, effects in complex models with a large number of variables. The multiple regression of this model indicates that the six structural conditions and three public opinion variables determine together 80 %of the total variation of variable CZPONE54 across the fifteen EU countries (R2 = 0.80). In consequence, this high level of determination makes is possible to estimate the various effects in the model and interpret them in terms of causal relationships.

It appears that the five variables representing the structural conditions together determine 33 % of the total variation of the POSMT54 scores throughout the fifteen countries. As assumed above, differences in the materialist orientation are significantly effected by the variable GDP96 representing the role of advance welfare state involvement and the importance of redistributive measures in the individual EU countries. The effect of 0.39 indicates that a shift of one standard deviation on this variable implies a significant shift of 0.39 of standard deviation on the POSTMT54 dimension. This effect is in accordance with the suggestion of Inglehart (1997) saying that in democratic redistributive societies (i.e. advanced welfare states) the shift towards post-materialist values is considerable. In contrast, the independent effects of other structural conditions except the population size measure, have clear negative effect on the post-materialism indicator. It appears that the public in French-speaking EU countries tends to be more materialistic (effect -0.30). Also the unemployment measure has a clear negative effect on the post-materialism variable (-0.39). Surprisingly, the independent effect (-0.37) of variable EUTIME shows that there is a general

negative tendency towards post-materialism in the old EU member countries. The determination level of the other intermediate variable EUDECI98 is considerable (71 %), and the estimated independent effects of two structural conditions on this variable are significant. The variable EUTIME has a strong effect (0.68) indicating that the old EU polities of the historical core wish to further strengthen the supra-national role of the EU institutions. The positive effect of the unemployment variable (0.36) shows that the public in the countries with higher unemployment rate tends to support a strengthening of decision-making at the EU level. However, there is also a negative effect (–0.28) of the post-materialism measure on the variable EUDECI98. This effect suggests that the EU polities with clear post-materialist orientations are not inclined to support further strengthening of the transnational EU decision-making. As expected, the post-materialism variable has a very strong negative effect (–0.83) on the measure of economic criteria on enlargement (ECONCR54).

As indicated above, the five structural conditions and the three intermediate variables statistically determine 80 % of the variation of the dependent variable CZPONE54. One may establish in Table 5 that the measure of post-materialism (POSMT54) plays a significant mediating role in the model (total indirect effect of 0.36). It appears that the variable indicating the level of economic development (GDP96) has a significant direct negative effect (–0.47) on the support for the eastern enlargement with the Czech Republic. This result shows that the richer EU polities are less inclined to support the anticipated accession. Further, the clear negative direct effect (–0.65) of the population size measure shows the tendency of the large EU polities to consider the Czech membership as less desirable. There is also a similar negative effect of the variable KNOWLFRE suggesting that the French-speaking parts of the EU do not tend to support a new EU enlargement with the Czech Republic. It is also significant that the variable EUTIME shows important facilitating impact on the positive public opinion on the Czech membership. The negative effect (–0.45) of the measure on economic criteria of enlargement (ECONCR54) is in accordance with general hypotheses structured in the model.

Finally, one may stress the importance of the total effects of the eight variables on the variable measuring the positive opinion on the Czech membership (Table 5). First, it appears that the post-materialism measure has a very strong positive total effect (0.68). This also is in accordance with the key hypothesis explained above (see Inglehart 1997). Second, the

Tab. 5 – Effects of explanatory variables on public opinion on the Czech membership (CZPONE54)

| Explanatory variables | Total effects | Indirect effects | Direct effects |
|---|---|---|---|
| GDP96 | –0.27 | 0.20 | –0.47 |
| LOGPOP96 | –0.60 | 0.05 | –0.65 |
| KNOWLFRE | –0.66 | –0.24 | –0.43 |
| UNEMPLOY | 0.37 | –0.12 | 0.50 |
| EUTIME | 0.40 | –0.13 | 0.54 |
| POSTMT54 | 0.68 | 0.36 | 0.32 |
| EUDECI54 | 0.04 | –0.12 | 0.16 |
| ECONCR54 | –0.45 | – | –0.45 |

population size variable has a significant negative total effect (–0.60). This suggests that in particular the small member countries tend to support the Czech membership. The variable representing French-speaking parts of the EU public has also a very clear negative total effect (–0.66) in the model. Third, the unemployment variable shows a significant positive total effect (0.37). It seems that the high support for the Czech Republic in Greece and some above-average support in Italy and Spain is responsible for this unexpected effect. These Mediterranean countries tend to support in spite of structural problems on national labour market. Perhaps, these polities seen in the Czech public an associate against hard free market measures that would limit current redistributive structural funds policies in the future. Fourth, there is also a significant positive effect (0.40) of the dimension indicating the number of years of EU membership. This outcome suggests that the public in the original members of the EU have enough confidence in the successfully concluded accession negotiations because they have experience with nine negotiations that led to accessions.

## 5. Conclusion

These statistical outcomes make clear that in the set of the fifteen EU countries there is an very important positive effect of post-materialist values on the positive public opinion about the new enlargement with the Czech Republic. The analysis also confirms the hypothesis that the polities of richer and larger EU countries are less inclined to give support for the anticipated enlargement. This outcome of the statistical examination is very significant. It was emphasised earlier that the countries of the historical core and the rich old and new outer core of the current EU have to anticipate larger contributions to the EU budget when the newly associated countries will become members. On the other hand, there are some indications that the public opinion in some countries in the historical core of the EU (Italy and the Netherlands) tend to support the Czech membership.

However, the most significant support for the accession of the Czech Republic comes from the Scandinavian countries. The electorates in the northern outer core of the current EU prefer the enlargement (widening) instead of giving support to efforts focused on further deepening of the geopolitical and geo-economic compact of the EU. The clear negative effects of the post-materialist dimension in the model on the opinion focused on a further strengthening of decision-making in Brussels (measure EUDECI54) and on the opinion stressing the economic criteria of enlargement (measure ECONCR54) indicate this significant tendency. Another significant tendency in the public opinion is the clear negative effect of the population size dimension on the support for the Czech membership. It seems that small EU countries tend to support the Czech accession. As explained above, under EU rules, small countries are accorded far more votes per citizen than the larger ones. Therefore, any eastern enlargement with small states will bring pressures to change the EU rules, and not surprisingly, this will lead to reorientations in budget priorities and uncertainty about well-established financial distributions between countries, sectors and regions. The public opinion in the large countries can be concerned about overall effectiveness of the EU if "micro-states" will have to assume the same level of EU responsibilities as large states. As mentioned earlier, other concerns in the

public opinion of the large EU countries focus on the power of blocking coalitions of small states that can frustrate ambitions of the larger ones.

The assessment in section three has shown the declining support for the anticipated Czech membership by the Czech electorate. It seems that the shrinking support for the integration into the EU is associated with ongoing difficult negotiations of the Czech political elite with the central actors of the EU. In this context, there arises the question whether there are significant differences in the effects of the model when as dependent variables are inserted the public opinions of the fifteen EU electorates regarding the accession of the other four candidate countries of the so-called Luxembourg group (i.e. Poland, Hungary, Slovenia and Estonia). Additional statistical examinations indicate that there are some significant differences in the effects of the five structural variables and the three explanatory public opinion variables. In other words, suggested explanations of variation in support for the EU membership of other candidate countries can differ from the one concerned with the Czech membership and summarised in this paper. Therefore, it seems that a strong and integrative sense of a larger European community based on "mutual sympathies and loyalty; of 'we-feeling', trust, and mutual consideration" as envisaged by Deutsch at al. (1957, 36) and some other observers of unifying and fragmenting tendencies in Europe, still has to emerge in the western public opinion.

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## Summary

## ROZŠIŘOVÁNÍ EVROPSKÉ UNIE A VEŘEJNÉ MÍNĚNÍ O ČESKÉ REPUBLICE: EXPLANAČNÍ ANALÝZA

Evropanům a mnohým lidem z jiných částí světa přineslo nové geopolitické rozdělení po pádu železné opony koncem osmdesátých let podstatnou a historicky důležitou změnu. Tato změna je možná tou nejdůležitější od konce druhé světové války. Pád železné opony s sebou nevyhnutelně přináší počátek složitého procesu přepracování mapy Evropy a potřebu změnit geopolitické a geoekonomické uspořádání kontinentu, vyznačit staré a nové semi-periferie. Během druhé poloviny let devadesátých se předpokládané rozšiřování Evropské unie stalo pro budoucí evropskou integraci rozhodujícím procesem. Je zřejmé, že fragmentace východní a střední Evropy v některých ohledech zkomplikovala vývoj evropského procesu sjednocování, avšak EU zůstává jediným klíčovým institucionálním prostředkem k vytvoření trvalé a silné evropské integrace.

Zdá se, že základní geopolitická a geoekonomická organizace prochází významnými změnami v historickém jádru EU, v jeho staré a nové semi-periferii i v jeho periferii. Členství vyžaduje kvalitativní přizpůsobení politických a ekonomických režimů, a tedy takových institucionálních opatření, která by byla kompatibilní se západními standardy demokracie a tržní ekonomiky. Je tedy důležité vědět, zda-li tyto doprovodné adaptace chování a veřejného názoru, významně přispívají k současným procesům evropské integrace. Jedním způsoben zhodnocení míry dosažené úrovně i pokračování procesu evropské integrace je analýza názorů veřejnosti patnácti států EU týkající se předpokládaného nového rozšíření EU směrem k přistoupení kandidátských zemí. Článek se pokouší srovnat západní a východní veřejné mínění z hlediska vztahu k očekávanému rozšíření EU, a to se speciálním ohledem na předjímané členství České republiky v EU.

EU je vnímána jako hlavní zdroj rozšíření trhu, investic a pomoci. Životní úroveň, která je ve většině zemí EU mnohem vyšší než v Česku, vzbudila očekávání, že přidružení a pozdější přistoupení k EU přinesou podobný prospěch. Zdá se, že tyto názory společně posilují ve veřejném mínění přitažlivost členství v EU. Veřejné mínění sehrává významnou roli v zajištění legitimity očekávaného členství, a to zvýrazněně, když se bude v České republice o členství konat referendum. Veřejná podpora členství v EU je v současné době nižší než v polovině devadesátých let. Přestože panuje veřejná podpora prozápadní orientace země tak se zdá, že si česká veřejnost není jistá tím, kdo bude mít výhody z připojení k EU. Průzkumy veřejného mínění ukázaly, že veřejnost věří, že užší vazba k EU

přinese značný prospěch soukromému podnikání, vzdělávacímu systému, vládním úředníkům a armádním složkám. Naproti tomu skupiny obyvatelstva s nižším příjmem a vzděláním, manuálně pracující a zaměstnanci státních podniků ve prospěch spíše nevěří.

Existence porovnatelných údajů Eurobarometru EU dovoluje provádět statistickou analýzu na makro-úrovni zemí, stanovit podobnosti a rozdíly mezi jednotlivými zeměmi a naznačit systémové podmínky, které je způsobují. Je možné v rámci makro-úrovňové analýzy vystopovat rozdíly v názorech obyvatelstva v patnácti zemích EU na otázku „měla by Česká republika přistoupit k Evropské unii?" (Eurobarometer č. 54, podzim 2000). Modelování LISREL (lineární strukturální rovnice) umožňuje zkonstruovat explanační (kauzální) systém stávající ze dvou skupin proměnných: pět strukturální (jako HDP na obyv.) a tři proměnné ukazující základní politické a hodnotové orientace (jako post-materialismus), které ovlivňují stávající veřejné mínění v patnácti zemích o rozšíření EU Českou republikou. Tyto strukturální podmínky a základní politické a hodnotové orientace jsou proto koncipovány jakožto určující faktory veřejného mínění o novém přistoupení České republiky. Poslední závislá proměnná je definována jako rozdíl mezi kladnými a zápornými odpověďmi a která tudíž ukazuje rozdíly v souboru patnácti zemí EU v podpoře pro vstup České republiky.

Celkové efekty osmi explanačních proměnných jsou významné. Za prvé je nutné zdůraznit, že intenzita post-materialistické hodnotové orientace má velmi silný positivní efekt na kladné veřejné mínění o členství České republiky v EU. Tento výsledek explanační analýzy je v plné shodě s klíčovou hypotézou celého modelu. Za druhé je nutné podotknou, že populační velikost země má významný negativní celkový efekt naznačující tendenci malých členských zemí podporovat české členství. Explanační model rovněž dokládá, že francouzsky mluvící části veřejnosti EU mají signifikantní celkový efekt negativní. Za třetí se ukazuje, že úroveň nezaměstnanosti má kladný celkový efekt. Zdá se, že vysoká podpora Česka v Řecku a nadprůměrná podpora v Itálii a Španělsku podmiňuje tento neočekávaný efekt. Tyto středozemní země mají tendenci české členství podporovat, přestože mají vážné strukturální problémy na trhu práce. Za čtvrté, je zapotřebí podtrhnout význam celkového pozitivního efektu dimenze dokumentující délku členství v EU. Tento výsledek naznačuje, že veřejnost členů historického jádra EU má více důvěry v úspěšné završení vyjednávání o přijetí České republiky, neboť mají zkušenost s devíti negociacemi, které vyústily v efektivní vstup nových členů.

Nejvýznamnější podpora pro přistoupení České republiky nicméně přichází ze skandinávských zemí. Voliči v severní zóně současné EU dávají přednost procesu rozšiřování, namísto aby poskytovali podporu úsilí zaměřeného na další prohlubování geopolitické a geoekonomické integrity EU. Tyto kauzální vztahy ukazují na význam preferencí ve veřejném mínění, které směřují k rozšiřování EU a odmítají další prohlubování stávající integrity EU. Malé země EU se kloní k podpoře vstupu České republiky a zdá se, že veřejné mínění ve velkých zemích EU vyjadřuje obavy z moci skupinových koalic malých zemích, která může podkopávat ambice zemí větších. Proto se zdá, že silný a integrující smysl širšího evropského společenství založeného na vzájemném porozumění a loajalitě, pocitu společenství, důvěře a oboustranné ohleduplnosti – jak předjímali a předjímají někteří pozorovatelé tendencí sjednocování a fragmentace v Evropě – se stále musí reprodukovat v mínění západní veřejnosti.

Obr. 1 – Veřejné mínění v EU na české členství v letech 1997 a 2000
Obr. 2 – Veřejné mínění EU v r. 2000 o českém členství: explanační model LISREL

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LUDVÍK KOPAČKA

# ENERGY, ECONOMY, AND ENVIRONMENT IN THE CZECH REPUBLIC

L. Kopačka: *Energy, economy and environment in the Czech Republic.* – Geografie – Sborník ČGS, 107, 2, pp. 139 – 155 (2002). The author deals in this paper with contemporary situation and problems of energy and power industry in the Czech Republic with respect to the transition processes since 1989. The paper analyses the roots of structural deformations and concentrates itself on some aspects of production and consumption of primary energy resources and electricity. After historical introduction the paper attempts to analyze the core of energy problem, changes of the overall energy balance, special attention is given to the importance, exploitation and environmental impacts of the coal mining and to the crucial crossway between brown coal and nuclear energy by the production of electricity. Conclusion evaluates main results of transition in the energy industry and deduces strategic courses of the solution of the Czech energy as a part of the general economic development.
KEY WORDS: transition – primary energy resources – energy demandingness – energy balance – hard (brown) coal mining – electricity production – steam (nuclear) power plants – uranium industry – environment.

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## 1. Introduction

The paper deals with contemporary energy situation and problems in the Czech Republic and analyses some aspects of both production and consumption of primary energy resources and of electricity and the roots of deformations.

Some historical, political, societal, economic, locational, geographical, social, regional aspects have to be taken into account by the evaluation of changes of energy industry. Special attention is given to the problems with mining, utilize and consumption of brown and hard coal in connection with strategic controversy between coal and nuclear power plants with respect to environment.

## 2. Historical-economic background

Difficult process of transition of the Czech society and economy takes place after the year 1989 in the time of escalating tendencies of globalization, integration, and forming of the "new economy" and information society in the world.

The transformation of the world economy in the 1990s, to which the starting platform was created by transformation and restructuring processes after the oil crises in 1973, escalated at the same time as the communist block collapsed and the Czech Republic started with the solution of accumulated inherited major problems in conditions of the return to the traditional western-directed geopolitical and geo-economic including geo-energy position and orientation.

The Czech Republic followed the first period of the world transformation since 1973 isolated behind the iron curtain. The adaptation on changing conditions in the world was very week and passive. The development slipped in many aspects against world tendencies. It concerns especially, energy industry (escalating character of coal mining, building of coal and nuclear power stations), environment (the most serious environmental damages fell on the period of so called normalization 1970 – 1989 after the occupation of Czechoslovakia by armies of Warsaw pact and energy industry played decisive role between them) and economy as a whole.

The Czech Republic follows the second period of the world transformation burdened by heavy heritage of deformations of all spheres of society, economic, social and regional life after fifty years of fascist and then communist totalities. The internal debts connected with amortization, deformations of structure and geographical distribution of activities, damage of environment were estimated on trillions of CZK.

An extreme absolute and relative resource demand (inclusive of energy) was one of the typical features of economic and industrial development during socialism. It was connected with an extensive character of the economy, and irrational territorial distribution and space organization. The overestimated and overloaded industry prevailed in the structure of economy (48 % of the economic active population) accompanied by hypertrophy of heavy industry (mining, metallurgy, chemistry, heavy machinery, building-materials), connected with transport and construction.

The development directed in this way left the traditions of the Czech economic history, contradicting the economic trends in the advanced countries among which Czechoslovakia was, even in terms of quality, before 1948. Moreover, it contradicted the geographical character of the Czech territory, raw materials, energy and natural conditions. Due to this, the disastrous environmental consequences logically accompanied the whole social and economic development in the long period between 1948 and 1989.

### 3. Energy and environment during transformation

While the energy industry belonged to the most preferred branches and spheres of life in the Czechoslovakia during socialist period (this tendency continues in the course of transition after 1989 too), environment was victimized to the high-ranking interests. Many of the regions and millions of people of the country suffered from immense damages, degradation and pollution of environment without corresponding real economic results.

Both transformation and restructuring of energy and power industry and solution of the environmental situation were counted between urgent targets in the post-November period. Both are interrelated and have international consequences. Let us to attempt analyse the energy problem in the Czech Republic according to some often and frequent questions.

## 3. 1. The core of the energy problem in the Czech Republic

Contemporary energy problems in the Czech Republic have several roots, reasons, and consequences. They have complex character and are close interrelated with the development and changes of the whole society, economy, industry, territory, landscape and environment.

Political, institutional, social, regional and other transition processes started in 1989 were not fully successful. The economic and industrial development passed from the initial deep decrease after November 1989 to the stabilization and successive growth. The hopeful economic development resulted into the economic decrease since 1997 (devaluation of the Czech currency by 20 %) with serious political impacts, to great extent due to the privatization failures (Švejnar 1997; Jonáš 1997, 2000). The economic growth was renewed again since 2000.

Transformation of energy industry including restructuring, modernization, improve of environment and other positive aspects belongs to the positive results of transformation. The energy problem of the Czech Republic has multidimensional character. Very often is reduced on the problem of coal mining and production of electricity in thermal coal and nuclear power plants. It is only a peak of the iceberg.

## 3. 2. Development and changes of the overall energy balance

Let us first to show the change of *overall energy balance* in the Czech Republic during transition according to Table 1. Total consumption of primary energy resources in the Czech Republic decreased by 23,5 % in the period 1989 – 2000 and the structure of consumption has been changed.

Production of domestic solid fuels decreased by 38 %. The share of domestic solid fuel on all domestic natural resources decreased from 92 to 86 % (8 and

Tab. 1 – Overal energy balance of the Czech Republic 1989 – 2000 (PJ, %)

| | Gross consumption of primary energy resources | | | Domestic natural resources | | | Import | | | Export | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1989 | 1990 | 2000[1)] | 1989 | 1990 | 2000[1)] | 1989 | 1990 | 2000[1)] | 1989 | 1990 | 2000[1)] |
| TOTAL | 2 151,2 | 2 076,1 | 1 628,8 | 1 884,1 | 1 730,5 | 1 232,2 | 664,8 | 592,1 | 735,8 | 222,5 | 158,9 | 354,8 |
| **Solid fuel** | **1 395,5** | **1 348,2** | **882,0** | **1 725,4** | **1 571,7** | **1 063,9** | **41,4** | **45,3** | **42,0** | **135,5** | **105,1** | **242,6** |
| Liquid fuel | 404,6 | 355,5 | 309,7 | 2,0 | 2,1 | 7,4 | 375,8 | 317,1 | 342,8 | 54,4 | 21,8 | 43,9 |
| Gaseous fuel | 212,7 | 226,4 | 319,3 | 8,5 | 8,4 | 7,1 | 229,4 | 209,8 | 319,5 | 20,8 | 24,1 | 0,8 |
| **Primary heat and electricity** | **138,3** | **146,0** | **117,8** | **148,2** | **148,4** | **153,8** | | | | | | |
| TOTAL | 100,0 | 100,0 | 100,0 | 100,0 | 100,0 | 100,0 | 100,0 | 100,0 | 100,0 | 100,0 | 100,0 | 100,0 |
| **Solid fuel** | **64,9** | **65,0** | **54,2** | **91,6** | **90,8** | **86,3** | **6,2** | **7,7** | **5,7** | **60,9** | **66,1** | **68,4** |
| Liquid fuel | 18,8 | 17,1 | 19,0 | 0,1 | 0,1 | 0,6 | 56,5 | 53,6 | 46,6 | 24,5 | 13,7 | 12,4 |
| Gaseous fuel | 9,9 | 10,9 | 19,6 | 0,5 | 0,5 | 0,6 | 34,5 | 35,4 | 43,4 | 9,4 | 15,2 | 0,8 |
| **Primary heat and electricity** | **6,4** | **7,0** | **7,2** | **7,9** | **8,6** | **12,5** | | | | | | |

[1)] preliminary data

Source: Statistická ročenka České republiky (Statistical Yearbook of the Czech Republic) 2001 (2001). Praha, ČSÚ (and relevant other issues)

Tab. 2 – Changes of the structure of the final energy consumption of households in the Czech Republic 1990 – 2000 (%)

| | 1990 | 1995 | 1998 | 2000 |
|---|---|---|---|---|
| TOTAL | 100,0 | 100,0 | 100,0 | 100,0 |
| solid fuel | 47,1 | 33,0 | 21,5 | 19,1 |
| liquid fuel | 12,8 | 0,0 | 0,2 | 0,1 |
| gaseous fuel | 15,0 | 28,9 | 37,5 | 37,9 |
| heat | 15,8 | 16,8 | 19,2 | 21,6 |
| electricity | 9,3 | 21,3 | 21,6 | 21,2 |

Source: Energetická bilance České republiky v letech 1998, 1999, 2000 (Overall energy balance of the Czech Republic 1998, 1999, 2000). Praha, ČSÚ (Czech Statistical Office) 2002

14 % was share of Dukovany nuclear power plant and of hydro power plants), but export of domestic solid fuel increased by 70 %. The share of the solid fuel on the total consumption of primary energy resources decreased from 65 % in 1989 to 54 % in 2000 – in fact it continues very high in comparison with developed countries.

The "low quality" of the structure of overall energy balance is multiplied by low quality of the coal, especially of brown coal, burned in the steam power plants with serious environmental consequences in the past (Kopačka 1994) as well as today, and by the import of practically whole amount of consumption of both liquid and gaseous fuel. Six millions tons of crude oil was imported in 2001, consumption of liquid fuel decreased by 23 % since 1989 with the same share around 19 % in 1989 and 2000. Import of gas was 6 milliard $m^3$ in 1990 and 9,2 milliard in 2000, consumption increased by 50 % since 1989 with share 9,9 % in 1989 and 19,6 % in 2000. Both low utilize of renewable energy sources and theirs inadequate support are another features of the Czech energy balance.

The development of the structure of the final energy consumption of households in the period 1990 – 2000 (Tab. 2) shows remarkable changes in the structure of final energy consumption and in utilization of individual energy sources. The shift is characterized by deep decrease of consumption of solid and liquid fuel and immense increase of gaseous fuel (from 15 to 38 %) and to a lower extent of electricity and heat.

The structure of overall energy balance is close connected with high energy-demanding economy. The resource demand at the end of socialism shows Table 3. The progress in reducing energy demands follows also from the fact that there is close relation between the consumption of primary energy sources, electricity and creation of GDP (Kopačka 2000b) on one side and between GDP and changes in the sectorial, or industrial structure, geographical distribution and organization structure on the other. More and more important role is played by both FDI and new technologies.

GDP created in the Czechia increased approximately by 3 % in the period 1989 – 2000, the consumption of primary energy sources decreased in the same period by 24 % and energy demand approximately by 26 % (production and consumption of electricity increased for comparison by 13 % and 2 % respectively). The development of indicators mentioned above in the transition period is depicted in Figure 1. With regard to the fact that at the beginning of the transformation the energy demand was per capita or per

Tab. 3 – Resource demand in Czechoslovakia (average 1981–85)

| | per 1 inhabitant | | | per 1000 USD of GDP | | |
|---|---|---|---|---|---|---|
| | Czecho-slovakia | Selected developed countries | Share | Czecho-slovakia | Selected developed countries | Share |
| **Consumption of primary energy sources (GJ)** | **200** | **100** | **2,0** | **21** | **8** | **2,6** |
| Production of steel (kg) | 974 | 325 | 3,0 | 104 | 26 | 4,0 |
| Consumption of steel (kg) | 714 | 371 | 1,9 | 77 | 29 | 2,7 |
| Production of cement (kg) | 681 | 425 | 1,6 | 73 | 34 | 2,1 |
| Freight rail-road transport (tkm) | 9206 | 2108 | 4,4 | 971 | 175 | 5,6 |

Selected developed countries: Austria, Belgium, Denmark, Norway, Sweden, the Netherlands, Switzerland
Source: VINTROVÁ, R. (1988): Kontinuita i přestavba? (Continuity or restructuring?). In: Politická ekonomie, 36, p. 240

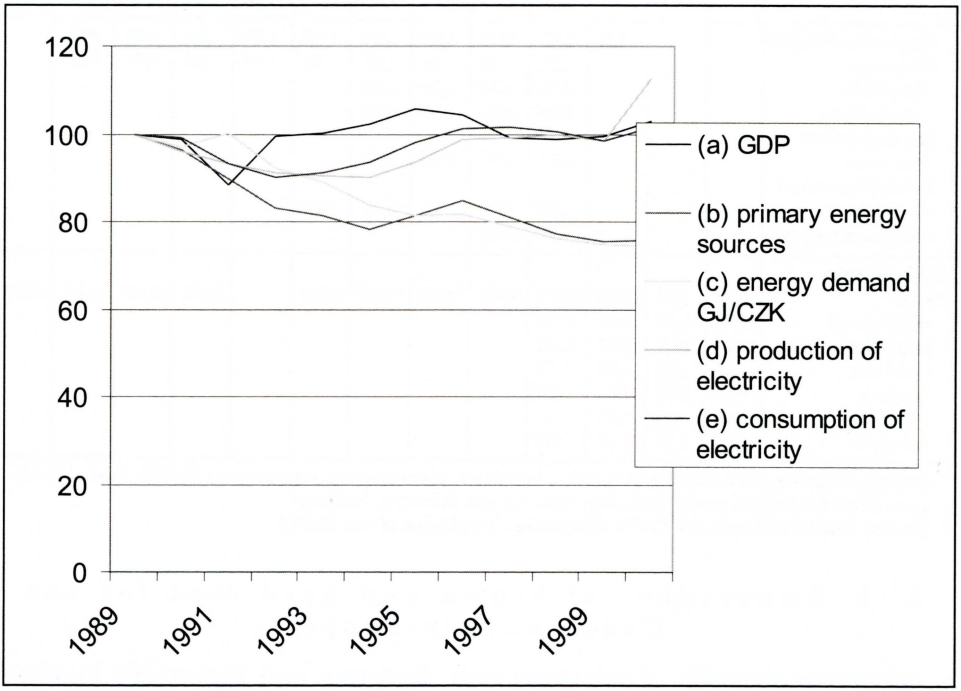


Fig. 1 – Development of GDP and energy demand in the Czech Republic 1989 – 2000 (1989=100)

GDP unit 2 – 2,6 times higher than in comparable advanced countries (Austria, Belgium, the Netherlands, Denmark, Switzerland, Sweden) the decrease was slow, insufficient and means actually a stagnation. Furthermore, during the last decade the advanced countries have kept on the tendencies of saving and decreasing the energy demands that since the period of the energy crisis have been encoded in science and research as well as in consumers' behavior.

Tab. 4 – Hard coal mining in the Czech Republic in the period of transition (mil. t)

| | 1988 | 1989 | 1990 | 1991 | 1992 | 1993 | 1994 | 1995 | 1996 | 1997 | 1998 | 1999 | 2000 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Hard coal mining (brutto)[1] | | | | 27,318 | 26,076 | 25,688 | 24,478 | 23,494 | 23,429 | 22,758 | 22,030 | 19,709 | |
| **Hard coal mining for sale[1]** | | | **23,19** | **19,877** | **19,378** | **18,296** | **17,491** | **17,006** | **16,394** | **16,038** | **15,863** | **14,419** | |
| **Ostrava-Karviná basin[1]** | | | **20,84** | **17,789** | **17,271** | **16,419** | **15,942** | **15,661** | **15,097** | **14,280** | **14,760** | **13,468** | |
| Mine Darkov | | | | 1,968 | 1,845 | 2,469 | 2,598 | 4,125 | 4,310 | 4,310 | 4,170 | 4,265 | |
| Mine 9. květen | | | | 1,264 | 1,370 | 1,197 | 1,251 | | | | | | |
| Mine Lazy | | | | 1,525 | 1,598 | 1,828 | 2,010 | 3,977 | 3,539 | 3,170 | 3,704 | 3,336 | |
| Mine Dukla | | | | 1,670 | 1,567 | 1,452 | 1,258 | | | | | | |
| Mine František | | | | 0,633 | 0,623 | 0,596 | 0,606 | | | | | | |
| Mine ČSA | | | | 1,829 | 1,762 | 1,964 | 1,867 | 3,025 | 3,215 | 2,805 | 3,050 | 2,514 | |
| Mine Doubrava | | | | 1,106 | 1,077 | 1,129 | 1,250 | | | | | | |
| Mine Paskov | | | | 0,590 | 0,690 | 0,618 | 1,960 | 1,773 | 1,479 | 1,577 | 1,460 | 1,131 | |
| Mine Staříč | | | | 1,525 | 1,548 | 1,305 | | | | | | | |
| Mine J.Fučík (Odra) | | | | 1,049 | 0,983 | 0,851 | 0,631 | 0,450 | 0,207 | 0,231 | 0,039 | | |
| Mine Odra | | | | 0,896 | 0,705 | 0,497 | 0,102 | | | | | | |
| Mine Heřmanice | | | | 0,639 | 0,638 | 0,138 | | | | | | | |
| Mine Ostrava | | | | 0,811 | 0,544 | | | | | | | | |
| Mine ČSM | | | | 2,209 | 2,245 | 2,376 | 2,260 | 2,311 | 2,347 | 2,187 | 2,337 | 2,222 | |
| **other hard coal basins[1]** | | | **2,35** | **2,087** | **2,112** | **1,878** | **1,549** | **1,345** | **1,297** | **1,218** | **1,103** | **0,951** | |
| Kladno mines | | | | 1,232 | 1,320 | 1,286 | 1,268 | 1,302 | 1,297 | 1,218 | 1,070 | 0,926 | |
| Mine Kladno | | | | 0,724 | 0,797 | 0,780 | 0,780 | | | | | | |
| MineTuchlovice | | | | 0,509 | 0,523 | 0,506 | 0,488 | | | | | | |
| East Bohemian Coal Mines Trutnov | | | | 0,525 | 0,560 | 0,373 | 0,095 | | | | | | |
| Western Bohemian Coal Mines Zbůch | | | | 0,240 | 0,222 | 0,219 | 0,186 | 0,043 | | | | | |
| Rosice Coal Mines Zbýšov | | | | 0,090 | 0,010 | | | | | | | | |
| **Hard coal mining for sale[2]** | **25,503** | **25,07** | **22,082** | **19,522** | **18,486** | **18,297** | **17,376** | **17,169** | | **16,069** | **16,112** | **14,342** | **14,855** |
| coking hrad coal | 15,748 | 15,495 | 14,139 | 12,704 | | | | | | | | | |
| Ostrava-Karviná basin | 22,578 | 22,31 | 19,735 | 17,371 | | | | | | | | | |
| Kladno basin | 1,659 | 1,606 | 1,322 | 1,233 | | | | | | | | | |
| Plzeň basin | 0,368 | 0,339 | 0,309 | 0,24 | | | | | | | | | |
| Trutnov basin | 0,661 | 0,62 | 0,575 | 0,525 | | | | | | | | | |
| Rosice basin | 0,237 | 0,196 | 0,141 | 0,09 | | | | | | | | | |

[1] Source: Ročenka 2000 elektroenergetika, hornictví, plynárenství, teplárenství (2000). Praha, GAS s.r.o. (Yearbook 2000 power industry, mining, gas industry, heating)

[2] Source: Statistické ročenky ČSFR (Statistical Yearbooks of the CSFR)

## 3. 3. Importance of brown and hard coal for the Czech energy-supply

Numerous deposits of relatively rich, first-rate and favourable localized reserves of hard coal and brown coal played an important role in the economic history of the Czech Republic in last 150 years. Exploitation of coal acquired extraordinary importance in the time of totalitarian socialistic regime (1948 – 1989). To change this coal heritage and inertia in the form of huge mining – energy – power – metallurgy – heavy machinery – chemical complex was and is one of the main targets of transition after the year 1989. In a follow up to the considerable decrease in both the domestic brown coal mining (index 2000/89 58) and hard coal mining (59) the consumption of liquid fuels decreased as well and importance of gaseous fuels is increasing. As to these high-grade fuels the Czech Republic is fully dependent on the import, so far

Tab. 5 – Brown coal and lignite mining in the Czech Republic in the period of transition (mil. t)

| | 1988 | 1989 | 1990 | 1991 | 1992 | 1993 | 1994 | 1995 | 1996 | 1997 | 1998 | 1999 | 2000 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Mining of brown coal (brutto)[1] | | | | 78,352 | 69,830 | 68,511 | 61,025 | 59,026 | 60,690 | 56,165 | 51,964 | 45,369 | |
| **Mining of brown coal for sale[1]** | | | **74,360** | **72,530** | **64,487** | **63,335** | **56,242** | **55,244** | **56,366** | **53,825** | **48,619** | **41,524** | |
| **North Bohemian brown coal basin[1]** | | | **60,700** | **58,925** | **51,654** | **51,431** | **46,633** | **45,932** | **46,952** | **46,019** | **40,289** | **34,499** | |
| Most Coal Company Most | | | | | | 25,837 | 22,744 | 21,767 | 22,195 | 22,472 | 18,741 | 13,232 | |
| Mines Ležáky Most | | | | 7,622 | 7,140 | | | | | | | | |
| Mines Komořany (open cast mining) | | | | 22,216 | 18,815 | | | | | | | | |
| Mines Hlubina Litvínov (deep mines) | | | | 0,819 | 0,488 | | | | | | | | |
| Mines Bílina | | | | 7,613 | 7,159 | | | | | | | | |
| Northern Bohemian Mines Chomutov | | | | | | 22,186 | 21,123 | 21,551 | 22,365 | 22,990 | 21,548 | 21,267 | |
| Mines Nástup Tušimice | | | | 17,552 | 14,987 | | | | | | | | |
| Fuel Combinate Ústí n.L. | | | | 3,103 | 3,065 | 3,408 | 2,766 | 2,614 | 2,392 | 0,557 | | | |
| **Sokolov brown coal basin[1]** | | | | **12,105** | **11,414** | **10,641** | **8,699** | **8,528** | **8,512** | **7,059** | **7,678** | **6,513** | |
| Sokolov Coal Company Sokolov | | | | 12,105 | 11,414 | 10,641 | 8,699 | 8,528 | 8,512 | 7,059 | 7,678 | 6,513 | |
| Brown coal mines Březová | | | | 6,083 | 6,020 | | | | | | | | |
| Fuel Combinate Vřesová | | | | 6,022 | 5,394 | | | | | | | | |
| **South Moravian lignite basin[1]** | | | | **1,886** | **2,203** | **2,165** | **0,524** | | | **0,747** | **0,652** | **0,512** | |
| South Moravian lignite mines Hodonín | | | | 1,500 | 1,419 | 1,263 | 0,524 | | | | | | |
| Lignit Hodonín | | | | 0,386 | 0,784 | 0,902 | | | | 0,747 | 0,652 | 0,512 | |
| **TOTAL COAL MINING IN THE ČR[1]** | | | | **92,407** | **83,865** | **81,631** | **73,733** | **72,250** | **72,759** | **69,863** | **64,482** | **55,943** | |
| **Mining of brown coal (brutto)[2]** | **92,066** | **87,022** | **78,588** | **76,859** | **68,084** | **66,884** | **59,568** | **57,163** | | **57,446** | **51,419** | **44,790** | **50,307** |
| deep mines | 3,995 | 3,646 | 3,283 | 2,602 | | | | | | | | | |
| open-cast mines | 88,071 | 83,376 | 75,305 | 74,257 | | | | | | | | | |
| North Bohemian brown coal basin | 72,754 | 69,249 | 62,122 | 60,590 | | | | | | | | | |
| Sokolov brown coal basin | 19,312 | 17,773 | 16,466 | 16,269 | | | | | | | | | |
| **Mining of lignite[2]** | **2,231** | **1,972** | **1,814** | **1,500** | | | | | | | | | |
| South Moravian lignite mines | 2,231 | 1,972 | 1,814 | 1,500 | | | | | | | | | |

[1] Source: Ročenka 2000 elektroenergetika, hornictví, plynárenství, teplárenství (2000). Praha, GAS s.r.o. (Yearbook 2000 power industry, mining, gas industry, heating)

[2] Source: Statistická ročenka České republiky 2001 (2001). Praha, ČSÚ (Statistical Yearbook of the Czech Republic 2001) – and other former issues

mostly from Russia, as well as will be dependent on import of uranium fuel. Despite rapid decrease of production and consumption of domestic hard and brown coal took place during hitherto course of transition, these energy sources will retain an important role in the next decades too. The role of coal will be however much lower and will cease further social, regional, local as

Tab. 6 – Quality of the coal mined in the Czech Republic 1999

| | Coal mining for sale (mil.t) | Content of energy MJ/kg | % of the measure fuel[2)] | Humidity % | Ash % | Sulphur % |
|---|---|---|---|---|---|---|
| **Ostrava-Karviná Mines** | **11,246** | | | | | |
| suitable for coking | 5,934 | 29,20 | 99,6 | 9,20 | 6,90 | 0,50 |
| energetic | 5,312 | 24,60 | 83,9 | 7,30 | 17,20 | 0,50 |
| **Czech-Moravian Mines[1)]** | **3,148** | | | | | |
| suitable for coking | 2,222 | 27,89 | 95,2 | 10,60 | 10,00 | 0,62 |
| energetic | 0,926 | 17,70 | 60,4 | 14,34 | 30,79 | 0,43 |
| **Brown coal and lignite** | **41,524** | | | | | |
| Most Coal Company, Most | 13,232 | 13,75 | 46,9 | 28,43 | 29,54 | 1,31 |
| North Bohemian mines, Chomutov | 21,267 | 11,29 | 38,5 | 24,89 | 32,80 | 1,48 |
| Sokolov Coal Company, Sokolov | 6,513 | 13,47 | 46,0 | 39,38 | 19,82 | 0,86 |
| Lignite Company, Hodonín | 0,512 | 9,50 | 32,4 | 46,70 | 20,60 | 1,78 |

[1)] Mine ČSM in Ostrava-Karviná basin and Kladno mines
[2)] 1 kg of measure fuel = 29,3076 MJ
Source: Ročenka 2000 elektroenergetika, hornictví, plynárenství, teplárenství (2000). Praha, GAS s.r.o. (Yearbook 2000 power industry, mining, gas industry, heating)

well as structural consequences. Despite the increasing role of nuclear power and imported gas and oil, coal will remain the principal energy resource for generating electricity in steam power plants.

The course of suppressing coal mining industry in the Czech Republic is in fact delayed adaptation on the processes which took place in the developed countries after the year 1973 (energy crises). The speed of adaptation of energy industry and coal mining to considerable extent depends on the process of modernization, and the restructuring of the whole Czech economy and on the acceptation of the Czech Republic by EU.

Tables 4 and 5 show the development of both hard coal mining and brown coal and lignite mining according to coal basins and individual mining companies (mines) in the Czech Republic during transition. There are one basic hard coal basin (Ostrava – Karviná basin located in North-East Moravia) and two basic brown coal basins districts (North-Bohemian brown coal basin located in North-western Bohemia and Sokolov – Cheb brown coal basin located in Western Bohemia between Cheb and Karlovy Vary) on the territory of the Czech Republic. Table 6 shows the qualitative parameters of the hard and brown coal mined in the Czech Republic 1999 (measure fuel, content of humidity, ash and sulphur dioxide). The main consumers and buyers of brown coal are now thermal power plants and in the case of hard coal we can add production of coke for metallurgy purposes and exports (however modernization reduce the demand for coke).

Let us to descript the situation in basic brown coal basins important for producing electricity in a greater detail.

## 3. 4. Exploitation of brown coal in North-western Bohemia and Western Bohemia

*North-Bohemian brown coal basin* concentrates typical transformation problems of the Czech energy and power industry. It consisted from four areas: Chomutov – Kadaň, Most – Litvínov, Teplice – Bílina, and Ústí nad Labem. Two private mining companies operate in the basin just now:

Mostecká uhelná společnost (Most coal company), a.s. Most (13,2 millions tons 1999) and Severočeské doly (North-Bohemian mines), a.s., Chomutov (21,3 millions tons).

Decrease of brown coal mining slows down exploitation of coal and spares deposits for future utilization, leads to concentration of mining into several huge open-cast mines, reduces partly changes of terrain and landscape and is accompanied by process of reclamation and revitalization.

More than 100 villages and towns were demolished during socialism in this area. Now typical features are the collapse and destruction of industrial, transport and other infrastructure of former economy and the speed and extent of these events. Special environmental, esthetic, urban, social, and geographic problems are involved. There are limited possibilities to use buildings, equipment, areas for new functions and purposes. Process of destruction of functions and facilities is quicker than the rise and development of new activities. Region named "moon-like landscape" introduces today a mixture of both new and inanimate activities, suffers by highest rate of unemployment (over 20 %), and concentrates social pathology.

*Sokolov brown coal basin* – there are localized two main consumers of brown coal in Western Bohemia – steam power plant Tisová and dominating huge power and chemical plant in Vřesová. There was built new modern gas turbines power plant burning both gas generated from coal in Vřesová and imported gas (it is used to enrich burning process) at the beginning of 90s. Mining of coal was so extended by decades despite of strong environmental opposition against this power plant. Social and political reasons played an important role as well as inertia of the past. Extensive environmental investments (modernization, desulphurization) were realized and environment was improved substantially. However brown coal mining survived and power generation was enlarged near the spa-town Karlovy Vary. This town struggled for came-back on list of world-known spas at the same time.

Approximately six main tendencies we can mentioned which lead to the substantially improvement of environment in brown coal mining districts: 1) decrease of the amount of mined coal; 2) concentration of coal mining into a limited number of open-cast mines (in the area of Most, Chomutov and Teplice – Bílina) and shut down of small open-cast and deep mines; 3) the shift of consumption of brown coal mainly for production of electricity in steam power plants; 4) desulphurization, reduction of emissions of solid air pollutants (fly ash) and modernization of steam power plants; 5) reduction of local burning places and substitution of consumption of brown coal for heating by another sources of energy (rapid increase of the gas prices is in contradiction with this tendency); 6) reclamation of former mining plots and dumps by individual forms (forests, fields, orchards and even vineyards, lakes, sport and recreational areas – we can mention as examples automobile racing circle and horse-race stadium in Most).

The consumption will be concentrate more and more to production of electricity, the using of coal (prevailed burning in steam-power plants) will be less dangerous from the point of view of environment (especially pollution of air) because of finished both reduction of fly ash and desulphurization and modernization at the 1.1.1999.

Due to remarkable progress in solution of heating problem (shift to the utilize of both central and local heating based on gas, oil, electricity, restructuring of some power plants for combination production of electricity and heating water, thermal isolation of buildings etc.) the environment, especially pollution of air,

Tab. 7 – Balance of electricity in the Czech Republic 1989 – 2000 (GWh)

| | 1989 | 1990 | 1995 | 1999 | 2000[1)] |
|---|---|---|---|---|---|
| **Production, total** | **65,132** | **62,558** | **60,847** | **64,692** | **73,466** |
| steam power plants (%) | 78,4 | 77,6 | 76,2 | 75,9 | 78,4 |
| hydroelectric power plants (%) | 2,5 | 2,3 | 3,7 | 3,4 | 3,1 |
| nuclear power plants (%) | 19,1 | 20,1 | 20,1 | 20,7 | 18,5 |
| Imports | | 8,179 | 6,722 | 8,983 | 8,725 |
| Exports[2)] | | 8,871 | 6,304 | 12,258 | 18,742 |
| **Consumption in the CR** | **62,379** | **61,866** | **61,265** | **61,417** | **63,449** |
| Index production/consumption | 104,4 | 101,1 | 99,3 | 105,3 | 116,0 |
| Consumption in energy processes | 11,658 | 11,467 | 9,928 | 10,023 | 10,821 |
| electricity generation (%) | 39,2 | 38,7 | 39,9 | 48,8 | 52,9 |
| pumped storage (%) | 3,7 | 3,5 | 3,8 | 7,2 | 6,9 |
| heat production for distribution (%) | 16,9 | 16,7 | 17,0 | 15,7 | 14,3 |
| fuel extraction,preparation and upgrading (%) | 40,2 | 41,2 | 39,3 | 28,3 | 25,9 |
| Losses in networks | 4,075 | 3,996 | 4,768 | 4,627 | 4,683 |
| **Final consumption, total** | **46,646** | **46,403** | **46,569** | **46,767** | **47,945** |
| Index final consumption/consumption | 74,8 | 75,0 | 76,0 | 76,2 | 75,6 |

[1)] preliminary data
[2)] 1990; including exports and imports between CR and SR
Source: Statistická ročenka České republiky (Statistical Yearbook of the Czech Republic) 2001 (2001). Praha, ČSÚ (and relevant other issues)

improved rapidly from the regional and local point of view. The consumption of low energy-demanding goods as well as change of energy behavior and mentality of inhabitants was influenced by rapid increase of prices (coal, coke, heat, petrol, electricity, gas, water, sewage) (Kopačka 2000a, 2000b).

### 3. 5. Crucial crossway of the Czech power industry – brown coal and nuclear energy

It will be useful to show overall balance of electricity in the Czech Republic during transition before we attempt to answer this suggestive and difficult "Hamlet" question "be or not to be" (Tab. 7). The consumption of electricity increased by only 2 % in the Czech Republic in the period 1989 – 2000, production of electricity was by 13 % higher due to growing role of exports.

Economic prognosis from the 90s counted with much higher consumption of electricity. Slower development of economy and other factors resulted into the actual controversy between nuclear and brown coal thermal power plants with all consequences including international ones (relations with Austria, Germany). Paradox is that all power plants mentioned are operated by only one monopoly stock company ČEZ (Czech Power Plants) with majority of the Czech state (68 %) and so this "conflict" takes place in the frame of one firm. The unsuccessful privatization attempted by the Czech government at the beginning of 2002 not only did not resulted into liberalization of the power industry, but even there is tendency to integrate production of electricity with several distributing companies. According to plan of Ministry of industry and trade the firm will be privatized as a whole. Quite different tendency of liberalization of energy sector prevails in EU at the same time.

The "rivalry" between nuclear and coal power energy resulted first from the past development (the construction of nuclear power plant Temelín started before "velvet" revolution) and difficult course of transition. For the time being the Czech energy industry is lacking the energy policy within the frame of the general economic policy embodied in the basic development trajectories of EU and general economic and energy policy of EU (Energie1998).

The technical and mining technology problems are connected with functioning of brown coal steam power plants in Northern Bohemia as well as with social, political, local and regional ones. There will be three actors in the case when Temelín will be in operation: both nuclear power plants (Temelín and Dukovany), desulphurized and modernized coal thermal power plants, and foreign trade. Enemy for them will be internal and external prices and business politics.

Total investment expenditures of both huge lucrative programs of modernization of coal steam power plants and building of Temelín nuclear power plant exceeded 150 billions CZK and were attractive for many domestic and foreign companies (Austrian, German, American, between them for example Westinghouse, ABB).

Beside technical and production of electricity factors political and social aspects in regions and mining districts played important role by decisions to survive, modernize and desulphurize coal power plants too. I think that the political representatives were afraid of too fast suppress of industrial activities in strong left oriented mining districts. Communist party won really the elections in new established Ústí nad Labem region in Autumn 2000. Decrease of coal mining and faster closing of coal power plants (recently desulphurized by investment expenditures over 50 billions CZK) could call forth the chain reaction of impacts and worsen difficult situation with high employment rate in the industrial areas.

The building of the first block of Temelin nuclear power plant was completed relatively soon after the desulphurization, but nearly 10 years later than was primary term. Examining operation took place from September 2000 and is accompanied by plenty technical problems mainly in secondary circle and from the beginning by demonstrations both the Austrian and domestic environmental and local movements. There are tens of nuclear power plants located on the territory of the Europe, but nowhere there are such complications. It is the safety of nuclear power plants that is the prior issue in the nuclear power industry at the present, and it has to be taken into account in the nuclear power plant Temelín as well. But the risks of the nuclear power plants operation are not associated only with the former socialist countries. With energy resources the Czech Republic has available it is difficult to decide whether to stop nuclear power project.

Contemporary era is envious to nuclear power plants because people are in fear of safety and security and radioactive wastes. But measured by number and intensity of demonstrations it is envious to World Bank and International Monetary Fund too.

### 3. 6. Possibilities to produce electricity in the Czech Republic

There are three predominant and classic natural energy resources used for generation of electricity in the Czech Republic:

First is coal (brown coal and lignite, partly hard coal – domestic and imported). Production of electricity by steam coal power plants was about 57,6 GWh (78,3%) in 2000.

Second is nuclear energy. Production of electricity by only one nuclear power plant in operation Dukovany was 13,6 GWh (18,5%) in 2000.

Third is hydro energy. Production of electricity by hydro power plants fluctuates about 3 – 3,5 % according to climatic conditions. It was 2,3 GWh (3,1%) in 2000. The geographical conditions are not favourable for production of hydro electricity and most worthy is production by pumped storage plants to cover peak consumption of electricity.

Other two energy resources could have strong indirect influence on environment and energy demand. Both depend on the development of society and economy:

First is the development of production of electricity by small-scale producers and on the base of renewable or alternative energy resources (small hydro-, wind-, solar-, and biomass-power plants). This modern, in the world preferred and supported form has not favourable conditions in the Czechia from the point of view of technical, economic, institutional and legislature preferences like in western-European countries (for example Denmark, the Netherlands, Germany). These producers are not able to compete to huge thermal power plants, when great surplus of electricity is exported. Many wind-power plants are in operation on the German side of common boundary with the Czechia in Krušné hory Mts., on Czech side attempts to built wind-power plants too were not successful.

Last but not least savings are great energy resource in the Czech Republic. Development of economy and energy industry during the period of transition showed, that changes of structure of consumption of individual primary energy sources, modernization, savings of fuel and energy, prices etc. are the biggest energy source. The modernization of energy sphere to great extent depends on restructuring, modernization and level of the whole economy.

## 3. 7. Uranium industry and nuclear power industry in the Czech Republic – past, present, future

Nuclear power industry was based on the domestic deposits of uranium. The deposits in Jáchymov mining district were exhausted during 50s and in Příbram districts during 70s. Both served mainly for military purposes of former USSR. Uranium from Dolní Rožínka mining district (since 60s) and from Stráž pod Ralskem – Hamr na Jezeře district (since 70s) was exported to USSR (Russia) and enriched uranium fuel was imported.

Development of heavy industry was restored after the occupation of Czechoslovakia by armies of Warsaw pact in 1968 and based on the new escalation of coal mining (with addition of growth of oil and natural gas import) with the extremely demanding program of the nuclear industry covering the uranium mining and both machinery and construction of nuclear power plants. To give a clear idea, their installed capacity considered in the conception of the 2nd half of the sixties should have reached in Czechoslovakia at present 26 500 MW (Kopačka 1968), in the modified version 11 280 MW (Hospodářské noviny 1988). Today, only nuclear power plant Dukovany (1760 MW) is in operation in the Czech Republic.

The uranium mining gradually ended after collapse of socialist regime, when lost support and grants end. Uranium mining appeared quite ineffective in comparison with the price of uranium on world market. Now only a small amount of uranium is mined irregular for nuclear power plants in Dolní Rožínka. This deep mine will be shut up in the year 2004. Czech nuclear power industry will be since 2004 totally depended on export of nuclear fuel.

The core of the energy problem is not from the long-term point of view the choice between brown coal and nuclear energy. This argument is very frequent, in fact it is only one of many problems of the difficult process of transformation after the year 1989 in the Czech Republic. It is hardly imagine, that finished Temelín nuclear power plant will be closed and the production of electricity will be based on brown coal power plants. Controversial construction of Temelín nuclear power plant (original planned total installed capacity of 4 000 MW was reduced to 2 000 MW – first block 1 000 MW is just now prepared to operation, second block 1 000 MW is finished to start process of preparation to operation) and its permanently postponed completion was dramatized not only by the ecological movements and sensitive relationship with Austria, but particularly by high costs and long time of construction.

Nuclear power industry has some qualitative aspects in the Czech Republic. One of them is, that ambitious and from the point of view investment and technological demanding nuclear power program from 70s to the end of 80s advanced the level of the Czech engineering industry and machinery and of many branches of economy (industry, research and development, science). Experiences and experienced people could work in transformed and restructuring economy after 1989. Another schizophrenic aspect relates to environment. On one side nuclear power plants are "ecologic-friendly" and clean from the point of view of classic pollution and damages (air pollution by sulfur, nitrogen, and carbon dioxides, ash, vegetation). On the other they represent potential threat of nuclear catastrophe, produce radioactive waste, warmer the water, dominate the landscape.

### 3. 8. Energy and environment

Environmental situation had been improved substantially during the period of transformation after 1989. The reasons were mentioned in the chapters above. "Strategically" most important were: change of geopolitical and geoeconomic orientation including installation of democratic regime and market-like economy; transfer of capital, know-how, methods, and goods from developed countries; decrease of economy and industry on one side and modernization, rationalization, restructuring and redistribution on the other; reduction of coal mining and end of metal ore and uranium mining, desulphurization, modernization and structural rebuilding of energy industry and heating, especially of power plants; reduction of chemical fertilizers and means; environmental investments (water cleaning stations).

The best example of environmental improve is decrease of air pollution. It was the most serious environmental problem during socialism.

## 4. Conclusion

Regards energy industry epochal changes took place during transformation. Extremely high and demanding investments were realized and given into restructuring energy industry in the state weakened by forty years of totalitarian regime.

Remarkable changes were realized in the structure, utilize, consumption, distribution and effectiveness of energy during a relatively short time of transformation. The structure of consumption of primary energy sources (solid, liquid, gaseous, primary electricity) was changed substantially as well as production of electricity.

Solution of many problems accumulated in the energy sphere during socialism and unsolvable during this regime advanced expressively during the period of transformation since 1989. Change of the structure of Czech energy industry is extremely exacting (capital), requires rational conception of economic, industrial and energy policies, and is long-term aim. There is shortage of all these factors.

Impressive statistical numbers of the absolute decline in the consumption of primary energy sources, imposing restrictions of the brown and hard coal mining, unique speed of solving the desulphurization and reduction of fly ash of coal thermal power plants owned by the monopoly power company ČEZ, all this can be counted to positive as well as controversial merits of the transformation.

In 21st century the Czech Republic will have to face not only the impact of diminishing high-grade energy resources of oil and natural gas (with corresponding price development and territorial aspects connected with the over-lasting orientation to Russia). It will also have to face the increasing influence of diminishing domestic resources of fossil fuels as well as will have limited capacity to solve the energy issue either by alternative (renewable) energy resources that in EU should cover 12 % of consumption, or by nuclear energy.

It is high time – or might be already late, to solve the future of the power industry by investing into consumers and thus into the whole structure of economy and not to prefer power industry. Being tied down by economic parameters the sphere of power companies does not admit it. Monopoly position based on flexible price adjustment and non-liberalized environment do not create a competitive environment and consequently develop no pressure on price and quality.

There are two basic strategic ways to solve energy situation of the Czech Republic. Both are tightly connected with the general characteristics of the transformation, i.e. the priority of setting key targets (vision of the 21st century) and speeding up the process of EU entry.

The first is the conceptual restructuring of the whole Czech economy including industry and energy industry. On still enormous energy consumption it can bring *savings that are potentially great energy resource.* At the time when oil and natural gas reserves will be exhausted and the world returns to the coal, the Czech coal reserves will already be exhausted.

The second way is associated with the integration of the Czech economy into Europe and into the world, where *the solution to the Czech energy, ecological, social, regional and other issues becomes a part of European policy and solution.* This is proved by the extending liberalization of the power industry within EU and creation of internal electricity or natural gas market.

It can be proved that a number of current problems are fabricated and are impossible to solve due to the unwillingness to make final principle decisions.

The issues of Czech energy industry have to be solved within a long-time and not a short-time effect. That applies to the entire society and economy whom, unlike to past, the power industry serves.

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## ENERGETIKA V HOSPODÁŘSTVÍ A ŽIVOTNÍM PROSTŘEDÍ ČESKÉ REPUBLIKY

Obsahem příspěvku je problematika současného stavu energetiky v České republice jako výsledku vývoje a strukturálních a teritoriálních změn v období transformace po roce 1989. Průběh hlubokých transformačních změn energetiky, které budou pokračovat i v budoucím hospodářském a průmyslovém vývoji, výrazně ovlivnila jak změna systému a zahraniční orientace, tak míra deformací z předchozího socialistického období. Ani v samotné transformaci se nepodařilo vyhnout se řadě dalších deformací.

Autor se soustřeďuje na vybrané aspekty tuzemské produkce a celkové spotřeby primárních energetických zdrojů a elektřiny. Hodnocení vývoje a změn energetické sféry je zasazeno do širších souvislostí historického, politického, společenského, geografického a regionálního vývoje s ohledem na vývoj životního prostředí. Hlavní pozornost je v článku věnována černému a hnědému uhlí (zde až do úrovně dvou hlavních revírů, které tvoří základ výroby elektřiny) jako dosud hlavnímu a navíc domácímu energetickému zdroji a strategické dichotomii mezi uhelnými a jadernými elektrárnami s ohledem na ekologické a mezinárodní souvislosti.

V historickém přehledu jsou uvedeny hlavní rysy vývoje české energetiky ke stavu v roce 1989, ze kterého vycházela kvalitativně nová fáze dosavadní transformace. Hlavním znakem výchozího stavu byla enormní energetická náročnost spojená s předchozím extenzivním vývojem a hypertrofií průmyslu, zejména těžkého.

Vývoj energetiky a elektroenergetiky v transformaci po roce 1989, který je sledován v ekologických souvislostech, je rozdělen na osm dílčích okruhů. *První* si všímá obecně toho, co je jádrem energetického problému a proč je pro ČR tak důležitý. *Druhý okruh* dává přehled o vývoji a změnách celkové energetické bilance, o tendencích objemových a strukturální přesunů v domácí produkci a celkové spotřebě primárních energetických zdrojů a o minulé, současné a rámcově i o budoucí potenciální úloze domácích a dovážených zdrojů. Názornou ukázkou hlubokých změn struktury spotřeby podle zdrojů je vývoj konečné spotřeby v domácnostech v období 1990 – 2000. Zvýrazněny jsou kvalitativní parametry nejen z hlediska vlastních zdrojů, ale i jejich využití a spotřebitelů. *Třetí okruh* přechází k měnící se úloze černého a hnědého uhlí jako útlumového energetického zdroje, který však v současnosti i nejbližší budoucnosti stále představuje hlavní zdroj. Protože cílem článku je spojitost mezi energetikou a elektroenergetikou, je náplní *čtvrtého okruhu* těžba a využití hnědého uhlí ve dvou hlavních revírech - severočeském a sokolovském. Uvedeno je šest hlavních tendencí, které vedly ke zlepšení životního prostředí v hnědouhelných revírech. Jednou z nich je další posun ke spotřebě uhlí pro výrobu elektřiny v elektrárnách, které byly modernizovány a odsířeny. Navazující *pátý okruh* hodnotí vzniklou „hamletovskou" otázku rozporu mezi výrobou elektřiny v modernizovaných a odsířených uhelných elektrárnách a v jaderných elektrárnách zejména v souvislosti s postupným uvedením jaderné elektrárny Temelín do provozu. Vytvořená rivalita má závažné mezinárodní, hospodářské, ekologické, sociální, regionální, zahraničně-obchodní (vývoz elektřiny) souvislosti. *Šestý okruh* se proto soustřeďuje na možnosti výroby elektřiny v ČR v současnosti a zejména budoucnosti. Rozděluje je na ty, které souvisí s využitím dostupných energetických zdrojů včetně obnovitelných (a se změnou v přístupu k nim), a na velké zdroje v podobě úspor vyplývajících ze strukturálních změn celého hospodářství i samotné energetiky, integrace v rámci EU a z pokračujících kvalitativních změn. Obsahem *sedmého okruhu* je problematika uranového průmyslu a jaderné energetiky v ČR z rozporuplného ekonomického a ekologického hlediska. Uvedeny jsou „schizofrenické" aspekty relace mezi jadernou energetikou na straně jedné a uhelnými elektrárnami resp.životním prostředím na straně druhé. Právě vztah mezi energetikou a životním prostředím je stručně zhodnocen v posledním *osmém okruhu*.

Závěr studie shrnuje a zobecňuje závěry z dílčích kapitol v širším kontextu pozitivních a negativních aspektů transformačního vývoje. Ten však zasazuje do strategických výzev vyplývajících jednak z očekávaných prognostických změn v globální energetické situaci ve 21. století, jednak z vlivu blížícího se integračního začlenění ČR do EU. Z těchto tendencí vyplývá nezbytnost jasné, dlouhodobě zaměřené energetické koncepce provázané s celkovou koncepcí hospodářského, průmyslového a regionálního vývoje českého prostoru.

Obr. 1 – Vývoj HDP a energetické náročnosti v ČR 1989–2000 (1989 = 100). a – HDP, b – primární energetické zdroje, c – energetická náročnost GJ/Kč, d – výroba elektřiny, e – spotřeba elektřiny.

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JITKA RYCHTAŘÍKOVÁ

# CZECH MORTALITY PATTERNS: THE PAST, THE PRESENT, AND REGIONAL DISSIMILARITIES

J. Rychtaříková: *Czech mortality patterns: the past, the present, and regional dissimilarities.* – Geografie – Sborník ČGS, 107, 2, pp. 156 – 170 (2002). In the interwar period, life expectancy at birth in the Czech Republic was close to the levels observed in France. After the World War II, three dissimilar stages in the development of life expectancy at birth became apparent in the Czech Republic: 1. between World War II and the mid-1960s characterized by mortality decrease; 2. from the mid-1960s to the mid-1980s, showing the deterioration of the survival rate; and 3) from the mid-1980s or the beginning of the 1990s to the present with a reappearance of a new decline in mortality. The recent improvements in the survival rate have been primarily due to the reduction of mortality from circulatory diseases and at older ages. Significantly diverse cause-of-death profiles were found in the Ostrava, Zlín, Karlovy Vary and the Central Bohemia regions, with similar deviations for both sexes in 1994 – 1997.
KEY WORDS: Mortality – Czech Republic – regional differences by cause.

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## Introduction

The theory of epidemiological transition provides a basic framework for investigating patterns of mortality decline during the last two centuries (Omram 1971). With the use of this theory, three stages of transition can be distinguished: from a high to low infant mortality rate; communicable to non-communicable diseases; and from a small to a larger excess male mortality. However, since the beginning of the 1970s new phenomena in mortality change have appeared: mortality decline at advanced ages and a decrease in cardiovascular mortality (formerly considered as impossible to reduce), a lowering of the life expectancy differential between men and women, and the emergence of new communicable diseases including AIDS. As a result, recent structural changes in low mortality countries were named the Fourth Phase of the epidemiological transition in mortality and related health issues.

## Historical perspective of mortality change in the Czech Republic

The Czech Republic followed, with a delay compared to northern and western Europe, the stages identified by the theory of epidemiological transition. However, from the beginning of the 20th century and including the interwar period, mean length of life increased and male and female survival in the Czech Republic was close to the levels observed in France (Fig. 1). At

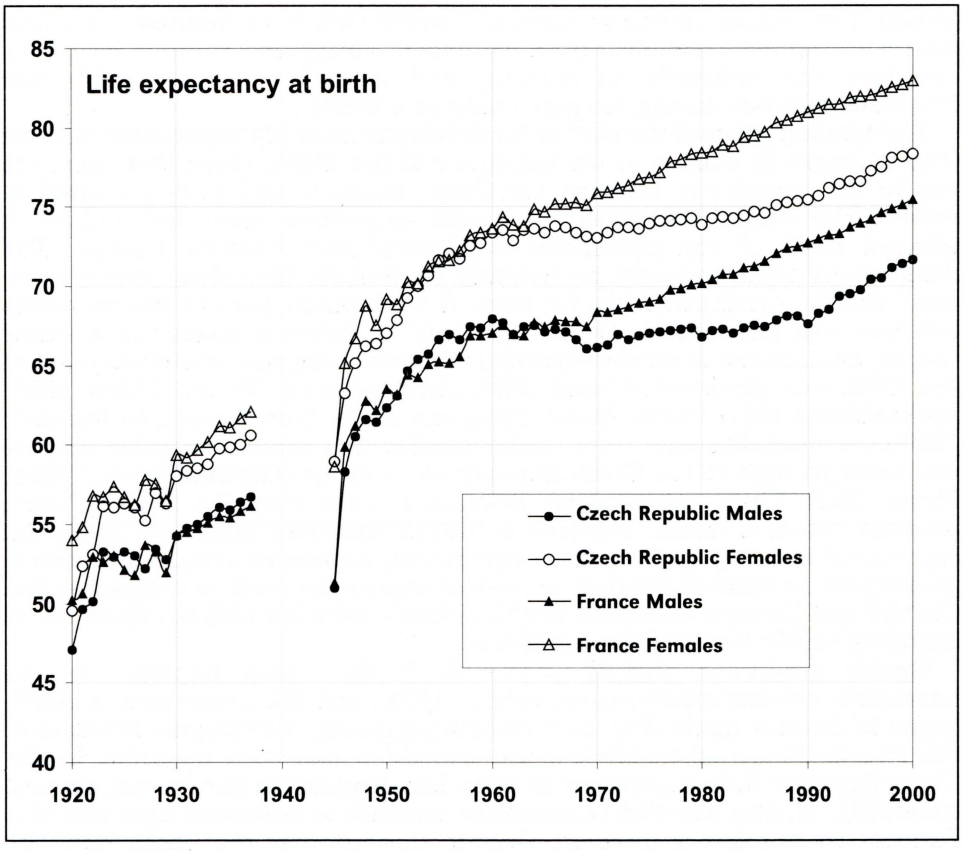


Fig. 1 – Development of life expectancy at birth in the Czech Republic and France since 1920. Life expectancy at birth.

that time the Czech lands of Bohemia, Moravia and part of Silesia (the current Czech Republic) belonged among the more economically advanced countries. In 1930, GNP/capita (in 1960 US dollars and prices: actual boundaries) was 720 (Bairoch 1981) and productivity in agriculture (Kirk 1946) was 145 (France: 890 and 176 respectively; Austria 715 and 134; Hungary 430 and 78; Poland 420 and 49; and Italy 525 and 73).

In the 1950s the mean length of life increased more rapidly in the Czech Republic than in France. Until the early1960s life expectancy at birth for Czech females was the same as their French counterparts, but Czech males had a longer mean length of life than French males (Fig. 1). This significant decrease in Czech mortality was due to the capability of a socialist country to develop rapid coverage of the entire population with basic but comprehensive health services. Immunization contributed to a marked decrease in infant mortality rate. Socialism also managed to eliminate extreme poverty. In 1948 under the communist regime the centralization process began in the Czech Republic. The Czech government nationalized the health care system with Act 185/1948 and in 1952 the Ministry of Public Health assumed control of all medical services. A hierarchical structure of medical services was established and based on a rigorous three-tier system (regional, district and community

levels). The "health-extensive approach" relied on a large number of medical staff with limited expenditures for equipment, drugs and maintenance. This approach was successful in reducing and controlling communicable and infectious diseases among the population as a whole.

The turning point of the dissimilar development in life expectancy at birth (Fig. 1) began to happen at the beginning of the 1960s. Since that time, the gap in life expectancy between the Czech Republic and France started to widen. The decline/stagnation in health conditions since the mid-1960s affected most of the population of Central and Eastern Europe. The deterioration was, however, particularly marked for the elderly and middle-aged adults – and primarily for men. A substantial part of the mortality increase was attributable to an "epidemic" of heart diseases. To a lesser degree, an increase in cerebro-vascular diseases, lung cancer and cirrhosis of the liver was observed (Unicef 2001; Rychtaříková, Vallin, Meslé 1989; Rychtaříková 1997; Vallin, Meslé, Valkonen 2001). For example, by the mid-1980s the mortality rate from cardiovascular and cerebro-vascular disease was twice as high in the Czech Republic as in France (Rychtaříková, Vallin, Meslé 1989). These degenerative diseases became from the 1970s a more frequent cause of death, required a "health intensive approach" involving specialized training, sophisticated equipment, expensive drugs and medical procedures. In spite of growing awareness among the medical profession, the Central and Eastern European health systems were not able to adjust to the changing health needs of the population.

Health conditions slightly improved in the Czech Republic in the immediate pre-transition years (1985 – 1989) and life expectancy at birth began to increase again (Fig. 1). Since the beginning of 1990s, the evidence of the Fourth Phase of epidemiological transition has been apparent in the Czech Republic. Life expectancy at birth has displayed a permanent upward trend (Fig. 1), and was due to mortality decrease at advanced ages and to a decrease in circulatory diseases. Despite the fact that the Czech Republic escaped a dramatic increase in the number of deaths (labeled the mortality crisis of the 1990s) observed in most post-communist countries (UNICEF 1994), the time delay of the Czech Republic in the reduction of mortality rate compared to France has not been reduced and life expectancy at birth has followed an almost parallel trend (Fig. 1).

In summary, three dissimilar stages in the development of life expectancy at birth became apparent in the Czech Republic during the post-war period: 1. between World War II and the mid-1960s characterized by mortality decrease; 2. from the mid-1960s to the mid-1980s, showing the deterioration of the survival rate; and 3. from the mid-1980s or the beginning of the 1990s to the present with a reappearance of a new decline in mortality. The period of transition after 1989 accompanied by political, economic, social and behavioral transformations has not - unlike other post-communist countries – negatively influenced the process of mortality decline which had already been initiated in the Czech Republic prior to the transition period. The recent improvements in the survival rate have been primarily due to the reduction of mortality from circulatory diseases and at older ages (Rychtaříková 1998a; Rychtaříková 1998b). In 2000 life expectancy at birth was 71.65 years for men and 78.35 for women (France 75.41 and 82.92). The increase in life expectancy at birth has currently brought the Czech Republic a little closer to the European average. However, the country is still, like all the other former socialistic countries of Central and Eastern Europe, lagging behind Western norms.

## Diversity of trends by age

Before World War II, infant mortality rate was substantially higher in the former Czech lands than in France (Fig. 2). The difference is not easy to explain and it might suggest there were a weaker social organization and less efficient health care system of mother/child protection. Contrary to the health situation prior to World War II, the infant mortality rate was lower in the Czech territory than in France during the 1950s. This rapid decrease in infant mortality rate at that time (Fig. 2) contributed the most to the increase in life expectancy at birth. A particularly active maternity and welfare policy, immunization, and universal access to health care resulted in rapid improvement of infant survival in the Czech Republic. From 1961, on the contrary, the reduction in infant mortality lessened, but an abrupt increase in IMR in 1965 was due to a legal change in the definitions of live birth and stillbirth. A downward trend reappeared in the 1980s, and has continued through the 1990s. In 2000 the Czech Republic and France displayed the same levels: 4.1 infant deaths per 1000 live births (Fig. 2). Therefore, the infant survival in the Czech Republic is among the highest in Europe (Vallin, Meslé, Valkonen 2001).

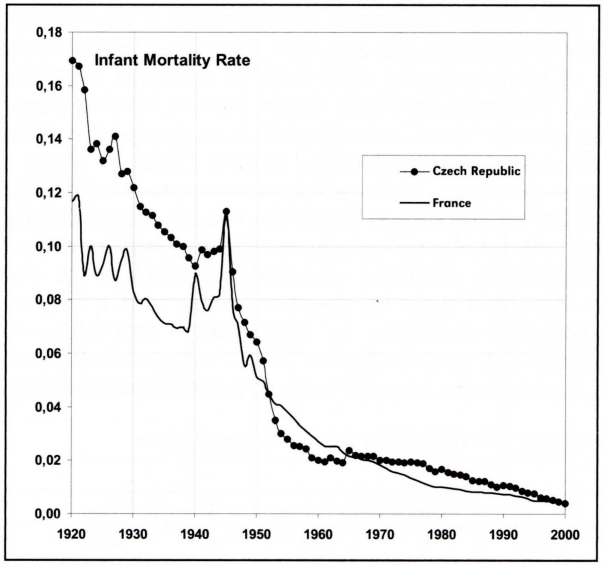


Fig. 2 – Development of infant mortality rate in the Czech Republic and France since 1920. Infant Mortality Rate.

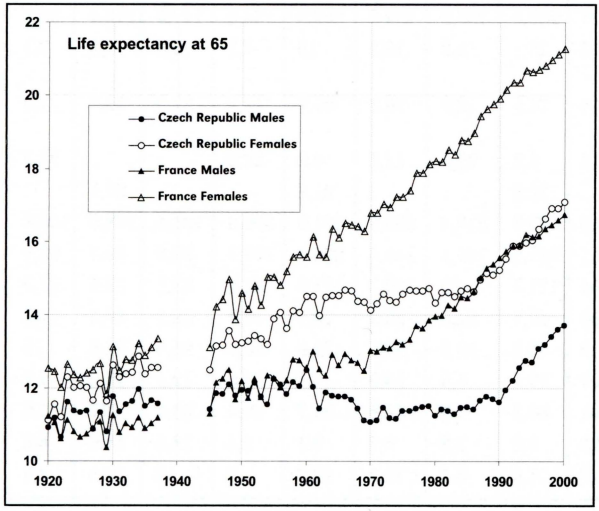


Fig. 3 – Development of life expectancy at 65 in the Czech Republic and France since 1920. Life expectancy at 65.

Older age groups show different time trends in mortality than infants. Prior to World War II life expectancy at age 65 was longer for males in the former Czech lands than in France and only slightly shorter for women. The higher Czech survival rate at 65+ persisted until the beginning of the 1960s. However, the trend reversed and an increase in mortality of 65+ was observed between 1960 and 1970

in the Czech Republic (Fig. 3). The reduction in life expectancy at 65 primarily influenced a shortened life expectancy at birth. A substantial part of the mortality increase of adults and the elderly was attributable to a very high frequency of cardiovascular diseases. Psychosocial stress, underdeveloped health care services (as compared to the West), and unhealthy lifestyles were responsible factors.

During the 1990s a decrease in mortality was observed in the Czech Republic and was primarily due to the reduction of mortality from circulatory diseases at older ages (Rychtaříková 1998a). Deaths from circulatory diseases have apparently been sensitive to the transition process in the Central and Eastern European countries. The Czech Republic experienced a decreasing risk and converged more quickly toward the EU average. However, circulatory mortality still represents one of the strongest contrasts in survival between the Czech Republic and France. The standardized death rate is almost three times higher for males and females in the Czech Republic as compared with France (Tab. 1). But malignant neoplasms and other causes (Tab. 1) show a significantly smaller difference between both studied countries. Further diminution of circulatory mortality in the Czech Republic would substantially advance the country toward western levels and patterns. Dietary habits are no doubt partly responsible for impeding progress of health conditions in the Czech Republic. Other factors involved may be greater stress and a higher smoking rate. The recent profound decrease in circulatory mortality at advanced ages in the Czech Republic is mainly due to better access to efficient health care, more modern and sophisticated equipment, expensive procedures,

Tab. 1 – Age-standardized death rate per 100 000 of the standard population (new standard)

| Country and year | Czech Republic | | | | | | France | | |
|---|---|---|---|---|---|---|---|---|---|
| | 1996 | | | 1998 | | | 1996 | | |
| Sex | Total | Males | Females | Total | Males | Females | Total | Males | Females |
| All causes | 744,8 | 977,9 | 570,7 | 706,6 | 926,6 | 541,6 | 489,3 | 671,7 | 345,2 |
| Malignant neoplasms | 187 | 257,6 | 138,2 | 182,9 | 250,9 | 136,5 | 147,2 | 213,4 | 96,8 |
| Malignant neoplasm of stomach | 12 | 18,1 | 8,2 | 10,2 | 15 | 7,1 | 5,3 | 8,3 | 3,1 |
| Malignant neoplasm of trachea, bronchus and lung | 38,4 | 72,5 | 12,9 | 36,2 | 67,7 | 12,9 | 27,3 | 51,8 | 7,2 |
| Malignant neoplasm of female breast | 13 | 0,2 | 22,4 | 12,8 | 0,2 | 22,2 | .. | .. | 21,7 |
| Malignant neoplasm of prostate | .. | 20,8 | .. | .. | 21,8 | .. | .. | 20,1 | .. |
| Diseases of the circulatory system | 394,8 | 499,7 | 318,4 | 368,9 | 461,5 | 300,8 | 134,4 | 178,5 | 100,8 |
| Ischaemic heart diseases | 176,1 | 239,6 | 129,1 | 148,6 | 206,7 | 106,3 | 39,8 | 60,4 | 23,9 |
| Cerebro-vascular disease | 104 | 121,7 | 92 | 100,2 | 111,9 | 91,3 | 33,1 | 39,9 | 27,9 |
| Diseases of the respiratory system | 30 | 42,7 | 21,8 | 26,2 | 39,7 | 17,4 | 32,1 | 48,3 | 21,8 |
| Diseases of the digestive system | 29 | 40,5 | 19,2 | 28,5 | 39,8 | 18,6 | 25,5 | 34,5 | 18 |
| Chronic liver disease and cirrhosis | 12,7 | 19,7 | 6,6 | 13,9 | 21 | 7,5 | 12,1 | 17,8 | 7,2 |
| External causes | 61 | 88,3 | 35 | 54,8 | 81,7 | 29,4 | 53,4 | 77 | 31,6 |
| Motor vehicle traffic accidents | 6,3 | 9,8 | 2,9 | 5,7 | 9,1 | 2,4 | 12,5 | 18,6 | 6,5 |
| Suicide and self-inflicted injury | 12,9 | 21,6 | 5,1 | 13,2 | 22,2 | 5 | 16 | 24,5 | 8,3 |

Source: http://www3.who.int/whosis/whsa/whsa_table4.cfm?path=whosis,whsa, whsa_table4&language=english

better drugs, and improved emergency services. In spite of a favorable turnover of mortality at advanced ages observed since the beginning of 1990s in the Czech Republic, the lag behind France has continued (Fig. 3).

## Current patterns of mortality by cause in regions of the Czech Republic

In studies dealing with regional dissimilarities within a country the general level of mortality as well as age and cause-of-death rates are usually shown. The approach used in this paper extends the above-mentioned concepts by studying *relative cause-of-death profiles*. Regions may achieve the same levels of total mortality (i.e. life expectancy) but at a radically different age or cause pattern.

A relative structure can reflect the underlying behavioral and environmental risk factors. Therefore, groups of regions with similar cause-of-death patterns may represent the same mortality structures although the differences in the level of total mortality can be observed. The structures tend to remain more stable as mortality declines over time.

The section uses the correspondence analysis method, to identify typical cause/causes of death in individual regions of the Czech Republic from 1994 to 1997. Row profiles (regions) and column profiles (death frequency by cause based on standardized rates) can be displayed as a two-dimensional plot with condensed information. Correspondence analysis (CA) is a multidimensional scaling technique (MDS) where the interest is primarily in joint plots of objects and variables. A basic concept is that of distance related to the issue of similarity or dissimilarity (between an object and a variable). The frequency table of data (contingency table) is converted into graphical displays in which rows and columns are depicted as points. Mathematically, CA decomposes the $\chi^2$ measure of association of the table into components in a manner similar to the decomposition of variance in principal components analysis. In CA the coordinates are computed so that each successive coordinate axis accounts for a decreasing portion of the total association ($\chi^2$) between the rows and columns. Regional differences in relative cause profiles (relative structure of mortality by cause) were analyzed using the method of simple correspondence analysis (based on two-way contingency table). The entry data consist of regions (rows) and selected groups of causes of death for males and for females are in columns. Relative frequencies of standardized death rate by cause add up to 100 % for each region. Each cell of the table contains the relative frequency of cause of death by region (Tab. 3). In this analysis only the first two dimensions are considered.

Regional dissimilarities in cause-of-death profiles are analyzed for six main groups of causes: malignant neoplasms, circulatory diseases, diseases of the respiratory system, diseases of the digestive system, external causes of death, and other causes. (See Tab. 7) The regions under study correspond to the administrative division that came into force in the Czech Republic since the 1st January 2000 (see Fig. 5). The data covering the period of 1994 – 1997 were converted according to this new administrative division. Standardized death rates by cause were computed for the 14 regions by using the method of direct standardization for the age groups of 15-19, 20-24,....80-84, 85+, for males and females in the four-year period of 1994 – 1997.

Tab. 2 – Age-standardizèd death rate by cause per 100 000 of the standard population Regions of the Czech Republic; years 1994-1997; Ages 15-19, 20-24,..85+; European standard

| Region | Medical cause of death | | | | | | |
|---|---|---|---|---|---|---|---|
| | 1. | 2. | 3. | 4. | 5. | 6. | Total |
| | Males | | | | | | |
| Praha | 3994 | 7553 | 550 | 662 | 1238 | 726 | 14723 |
| Central Bohemia | 4612 | 9824 | 495 | 654 | 1287 | 713 | 17584 |
| Ceske Budejovice | 4607 | 8700 | 687 | 523 | 1206 | 649 | 16372 |
| Plzen | 4742 | 8778 | 894 | 483 | 1252 | 671 | 16820 |
| Karlovy Vary | 5167 | 8790 | 1019 | 706 | 1572 | 723 | 17977 |
| Usti n L | 5165 | 9697 | 767 | 825 | 1410 | 786 | 18649 |
| Liberec | 4612 | 8872 | 506 | 687 | 1359 | 669 | 16705 |
| Hradec Kralove | 3988 | 8021 | 696 | 510 | 1181 | 637 | 15034 |
| Pardubice | 3874 | 8673 | 927 | 616 | 1265 | 572 | 15927 |
| Jihlava | 4125 | 8882 | 735 | 505 | 1073 | 597 | 15917 |
| Brno | 4016 | 8740 | 637 | 696 | 1196 | 530 | 15816 |
| Zlin | 3970 | 9420 | 580 | 772 | 1390 | 517 | 16648 |
| Olomouc | 4093 | 8730 | 700 | 680 | 1349 | 671 | 16223 |
| Ostrava | 4561 | 9178 | 1292 | 782 | 1391 | 628 | 17831 |
| **Czechia** | **4354** | **8838** | **732** | **664** | **1288** | **652** | **16529** |
| | Females | | | | | | |
| Praha | 2520 | 4943 | 271 | 371 | 624 | 503 | 9232 |
| Central Bohemia | 2281 | 6336 | 250 | 300 | 554 | 517 | 10238 |
| Ceske Budejovice | 2401 | 5542 | 350 | 304 | 500 | 495 | 9592 |
| Plzen | 2563 | 5927 | 505 | 283 | 628 | 557 | 10463 |
| Karlovy Vary | 2745 | 5923 | 550 | 347 | 619 | 569 | 10753 |
| Usti n L | 2722 | 6319 | 366 | 388 | 598 | 628 | 11019 |
| Liberec | 2459 | 5780 | 265 | 346 | 625 | 462 | 9937 |
| Hradec Kralove | 2262 | 5323 | 393 | 275 | 533 | 476 | 9262 |
| Pardubice | 2186 | 5663 | 489 | 297 | 617 | 498 | 9751 |
| Jihlava | 2163 | 5624 | 400 | 252 | 452 | 411 | 9301 |
| Brno | 2198 | 5462 | 330 | 312 | 472 | 362 | 9135 |
| Zlin | 2022 | 6006 | 264 | 338 | 477 | 367 | 9473 |
| Olomouc | 2189 | 5650 | 308 | 342 | 534 | 586 | 9608 |
| Ostrava | 2344 | 5801 | 608 | 395 | 519 | 445 | 10112 |
| **Czechia** | **2353** | **5696** | **366** | **332** | **551** | **486** | **9784** |
| Correlation coefficient between standardized death rates of an individual cause and total mortality | | | | | | | |
| Males | 0,838 | 0,814 | 0,401 | 0,548 | 0,697 | 0,417 | |
| Females | 0,731 | 0,763 | 0,398 | 0,381 | 0,559 | 0,700 | |

Note: 1. Malignant Neoplasms; 2. Circulatory diseases; 3. Diseases of the respiratory systém; 4. Diseases of the digestive systém; 5. External causes of death; 6. Other causes.

## Descriptive perspective

The region of Úsli n. L. shows the highest standardized death rate for males (18 649 p.100 000) and for females (11 019 p.100 000), see Tab. 2. On the contrary, Prague is the most favorable place to live for males (14 723 p.100 000) and the second for females (9 232 p.100 000). Brno has the lowest standardized death rate for females (9 135 p.100 000). The regions with the best (Prague) and the worst (Ústí n. L.) survival indices suffer from a high

level of air pollution but they substantially differ in population structures, especially regarding educational level. A higher proportion of people with a university degree live in Prague and they have the highest survival rate. The highest relative number of university graduates in Prague decreases the average mortality indicators. The region of Ústí n. L is disadvantageous due to a higher proportion of people with only a basic education and increased mortality risk. In addition, Ústí n. L has a high unemployment rate, unlike Prague which has the lowest unemployment rate in the Czech Republic. The unemployed experience worse health conditions (Unicef 2001, Unicef 1994). Regions showing a mortality level below the national average are mostly in the south-east and those with excess mortality are situated in the north and west. West-east polarization is very pronounced regarding malignant neoplasms and the standardized rate decreases from the west to the east. The highest rate is observed in Karlovy Vary and Ústí n. L. (western regions) while Zlín (east) displays the lowest level. Surprisingly, women in Prague experience a rather high mortality from malignant neoplasms, while male cancer mortality is below the national level (Tab. 2).

Circulatory diseases are the most frequent causes of mortality in the developed world. However the high percentage of deaths due to circulatory diseases (computed from the distribution of standardized rates by cause) can be related either to low mortality where these diseases are the primary cause of death or to a high mortality level due to less developed health services combined with an unhealthy life style common in Central and East European countries during the communist era. In the Czech Republic, the strong correlation (0.8) is observed between the standardized rate of total mortality and the standardized rate of mortality from circulatory diseases (low total mortality rates corresponds to low mortality rates from circulatory diseases; Tab. 2). Unlike neoplasms, regional patterns of mortality from circulatory diseases are not apparent and the increased risk is scattered throughout the Czech Republic. The highest levels are in Central Bohemia, Ústí n. L. (west) and Zlín (east). This observation likely reflects the social and health conditions – Including life style – of regional populations. However, relative frequency of deaths from circulatory diseases does not correlate with the total mortality rate (–0.3; Tab. 3). The lowest frequency due to circulatory deaths is observed in the region of Karlovy Vary (Tab. 3) but experiences a high total mortality rate, but Prague has a low standardized rate and a low frequency of circulatory deaths. Zlín and Central Bohemia show a positive correlation (high total mortality level correlating to a high proportion of circulatory deaths) while Hradec Kralové shows a higher proportion combined with a lower level.

Diseases of the respiratory system show the "highest" positive correlation coefficient between level and proportion (0.2; Tab. 3). Although this mortality accounts for less than 5 % in the total number of standardized deaths, different regions show large variations. A particularly high rate of mortality from respiratory diseases is observed in Ostrava (males: 1 292; females: 608 p. 100 000) and Karlovy Vary (males: 1 019; females: 550) compared with Central Bohemia (495 for males and 250 for females). The increased risk of mortality from respiratory disease appears primarily in long-term industrialized regions (Ostrava, Karlovy Vary, Pardubice, Plzeň, Ústí n. L.). While mortality from respiratory diseases can be related, to some extent, to the influence of the physical environment (climate, air pollution), mortality from digestive diseases is strongly connected to dietary habits and stress. However, the industrialized

Tab. 3 – Percentage of standardized deaths by cause
Regions of the Czech Republic; years 1994-1997; Ages 15-19, 20-24,..85+;

| Region | Medical cause of death | | | | | | |
|---|---|---|---|---|---|---|---|
| | 1. | 2. | 3. | 4. | 5. | 6. | Total |
| | Males | | | | | | |
| Praha | 27,1 | 51,3 | 3,7 | 4,5 | 8,4 | 4,9 | 100,0 |
| Central Bohemia | 26,2 | 55,9 | 2,8 | 3,7 | 7,3 | 4,1 | 100,0 |
| Ceske Budejovice | 28,1 | 53,1 | 4,2 | 3,2 | 7,4 | 4,0 | 100,0 |
| Plzen | 28,2 | 52,2 | 5,3 | 2,9 | 7,4 | 4,0 | 100,0 |
| Karlovy Vary | 28,7 | 48,9 | 5,7 | 3,9 | 8,7 | 4,0 | 100,0 |
| Usti n L | 27,7 | 52,0 | 4,1 | 4,4 | 7,6 | 4,2 | 100,0 |
| Liberec | 27,6 | 53,1 | 3,0 | 4,1 | 8,1 | 4,0 | 100,0 |
| Hradec Kralove | 26,5 | 53,4 | 4,6 | 3,4 | 7,9 | 4,2 | 100,0 |
| Pardubice | 24,3 | 54,5 | 5,8 | 3,9 | 7,9 | 3,6 | 100,0 |
| Jihlava | 25,9 | 55,8 | 4,6 | 3,2 | 6,7 | 3,8 | 100,0 |
| Brno | 25,4 | 55,3 | 4,0 | 4,4 | 7,6 | 3,4 | 100,0 |
| Zlin | 23,8 | 56,6 | 3,5 | 4,6 | 8,3 | 3,1 | 100,0 |
| Olomouc | 25,2 | 53,8 | 4,3 | 4,2 | 8,3 | 4,1 | 100,0 |
| Ostrava | 25,6 | 51,5 | 7,2 | 4,4 | 7,8 | 3,5 | 100,0 |
| Czech Republic | 26,3 | 53,5 | 4,4 | 4,0 | 7,8 | 3,9 | 100,0 |
| | Females | | | | | | |
| Praha | 27,3 | 53,5 | 2,9 | 4,0 | 6,8 | 5,4 | 100,0 |
| Central Bohemia | 22,3 | 61,9 | 2,4 | 2,9 | 5,4 | 5,1 | 100,0 |
| Ceske Budejovice | 25,0 | 57,8 | 3,7 | 3,2 | 5,2 | 5,2 | 100,0 |
| Plzen | 24,5 | 56,7 | 4,8 | 2,7 | 6,0 | 5,3 | 100,0 |
| Karlovy Vary | 25,5 | 55,1 | 5,1 | 3,2 | 5,8 | 5,3 | 100,0 |
| Usti n L | 24,7 | 57,3 | 3,3 | 3,5 | 5,4 | 5,7 | 100,0 |
| Liberec | 24,7 | 58,2 | 2,7 | 3,5 | 6,3 | 4,6 | 100,0 |
| Hradec Kralove | 24,4 | 57,5 | 4,2 | 3,0 | 5,7 | 5,1 | 100,0 |
| Pardubice | 22,4 | 58,1 | 5,0 | 3,0 | 6,3 | 5,1 | 100,0 |
| Jihlava | 23,3 | 60,5 | 4,3 | 2,7 | 4,9 | 4,4 | 100,0 |
| Brno | 24,1 | 59,8 | 3,6 | 3,4 | 5,2 | 4,0 | 100,0 |
| Zlin | 21,3 | 63,4 | 2,8 | 3,6 | 5,0 | 3,9 | 100,0 |
| Olomouc | 22,8 | 58,8 | 3,2 | 3,6 | 5,6 | 6,1 | 100,0 |
| Ostrava | 23,2 | 57,4 | 6,0 | 3,9 | 5,1 | 4,4 | 100,0 |
| Czech Republic | 24,1 | 58,2 | 3,7 | 3,4 | 5,6 | 5,0 | 100,0 |
| Correlation coefficient between standardized death rates of an individual cause and total mortality | | | | | | | |
| Males | 0,278 | –0,292 | 0,189 | 0,148 | –0,025 | –0,207 | |
| Females | 0,080 | –0,234 | 0,215 | –0,083 | 0,050 | 0,389 | |

Note: 1. Malignant Neoplasms; 2. Circulatory diseases; 3. Diseases of the respiratory systém; 4. Diseases of the digestive systém; 5. External causes of death; 6. Other causes.

and mining regions of Ostrava and Ústí n. L. possess the highest level. On the contrary, low risk is seen in Plzeň, Jihlava, and Hradec Králové. External causes are a heterogeneous mix that includes traffic accidents, suicides, homicide and other external causes. The Czech Republic, (the former Czech lands) was known as a country with a high suicide rate, primarily in the north and west. Current regional differences of standardized death rates from external causes are very small and do not show a special geographical configuration. The rates ranked by sex do not display the same regional pattern.

Descriptive perspective used for presenting Czech regional patterns showed several particular anomalies in the spatial distribution of mortality

Tab. 4 – Inertia and Chi-Square decomposition

| Singular Value | Principal Inertia | Chi-Square | Percent | Cumulative Percent |
|---|---|---|---|---|
| 0.05362 | 0.00287 | 8.6241 | 48.94 | 48.94 |
| 0.04057 | 0.00165 | 4.9371 | 28.02 | 76.95 |
| 0.02626 | 0.00069 | 2.0681 | 11.74 | 88.69 |
| 0.01728 | 0.00030 | 0.8955 | 5.08 | 93.77 |
| 0.01323 | 0.00018 | 0.5253 | 2.98 | 96.75 |
| 0.01066 | 0.00011 | 0.3407 | 1.93 | 98.68 |
| 0.00579 | 0.00003 | 0.1005 | 0.57 | 99.25 |
| 0.00489 | 0.00002 | 0.0718 | 0.41 | 99.66 |
| 0.00441 | 0.00002 | 0.0582 | 0.33 | 99.99 |
| 0.00071 | 0.00000 | 0.0015 | 0.01 | 100.00 |
| Total | 0.00587 | 17.6228 | 100.00 | |

Degrees of freedom = 154

by cause. Malignant neoplasms follow a more or less West-East axis while circulatory diseases are scattered throughout the entire territory. Some regions have a specific cause-of-death profile, while others display a non-specific structure. High standardized rates are found for several causes of deaths in Ústí n. L. (malignant neoplasms, circulatory and digestive diseases) while an unusually high mortality from respiratory diseases is very typical in Ostrava.

## Correspondence analysis perspective

Dissimilarities in proportions (relative frequencies by cause), irrespective of mortality level, were investigated in order to depict the most important regional anomalies. The results of correspondence analysis illustrate in a compact manner the differences in cause-death profiles of regions in the Czech Republic. Analyzed data are in Table 3. Males (6 variables) and females (6 variables) were joined in one model assuming that the behaviors and the impact of environment (physical and social) would contribute similarly to a risk of death for both sexes. The list of causes and their abbreviations are in the Table 7. The first coordinate axis accounts for the largest part of the total association between the rows and columns represented by $\chi^2$ statistic. (The coordinates in correspondence analysis are based on the generalized singular value decomposition of the matrix of relative frequencies; $\chi^2/N$ is referred to as the total inertia having similar meaning as variance and its decomposition in principal components analysis). Table 4 displays an inertia and chi-square decomposition table that includes total inertia, principal inertias of each dimension (eigenvalues), singular values (square roots of the eigenvalues), each dimension's percentage of inertia, and the total chi-square with its degrees of freedom and decomposition. The first coordinate (first dimension) accounted for 49 % and the second for 28 % of the total association (Fig. 4, Tab. 4). Therefore, the two first axes account for 77 % of the association, indicating that the association between the row and column categories is essentially two-dimensional. The total chi-square statistic is 17.62. The plot (Fig. 4) shows how regions are associated with medical causes of death. Table

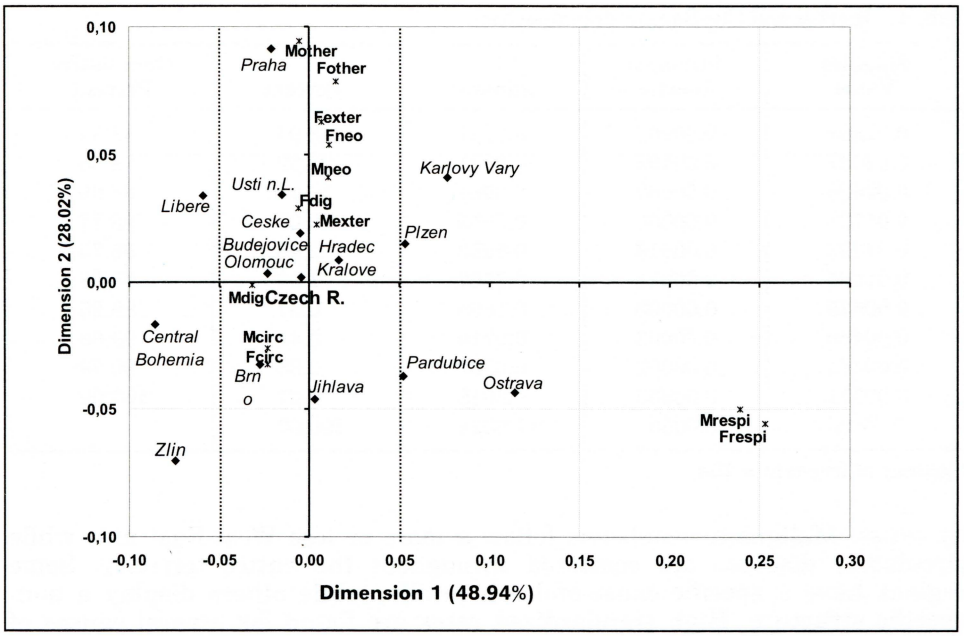


Fig. 4 – Plot of Simple Correspondence Analysis of regional dissimilarities in cause-of-death profiles

Tab. 5 – Observed minus Expected values (total = 0)

| | 1. | 2. | 3. | 4. | 5. | 6. | 1. | 2. | 3. | 4. | 5. | 6. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Region | Mneo | Mcirc | Mrespi | Mdig | Mexter | Mother | Fneo | Fcirc | Frespi | Fdig | Fexter | Fother |
| Praha | 0,02240 | ***-0,06925*** | -0,02541 | 0,01911 | 0,01947 | 0,03368 | **0,11064** | ***-0,15742*** | -0,03086 | 0,02389 | 0,03805 | 0,01570 |
| Central Bohemia | -0,00776 | **0,08289** | ***-0,05601*** | -0,00673 | -0,01683 | 0,00444 | ***-0,05644*** | **0,12068** | -0,04723 | -0,01268 | -0,00698 | 0,00265 |
| Ceske Budejovice | **0,05604** | -0,00804 | -0,00991 | -0,02423 | -0,01522 | 0,00135 | 0,03531 | -0,01644 | -0,00691 | -0,00463 | -0,01367 | 0,00635 |
| Plzen | **0,05781** | -0,03969 | 0,02728 | -0,03496 | -0,01265 | 0,00221 | 0,01732 | ***-0,05398*** | 0,03237 | -0,02017 | 0,01270 | 0,01177 |
| Karlovy Vary | **0,07608** | ***-0,14946*** | 0,03900 | 0,00030 | 0,03066 | 0,00343 | **0,05188** | ***-0,10622*** | 0,04190 | -0,00276 | 0,00463 | 0,01059 |
| Usti n L | 0,04119 | -0,04610 | -0,01282 | 0,01669 | -0,00870 | 0,00973 | 0,02433 | -0,03096 | -0,01797 | 0,00703 | -0,00656 | 0,02414 |
| Liberec | 0,03825 | -0,00905 | -0,04880 | 0,00643 | 0,01042 | 0,00275 | 0,02567 | -0,00341 | -0,03973 | 0,00587 | 0,02233 | -0,01074 |
| Hradec Kralove | 0,00223 | -0,00096 | 0,00450 | -0,01758 | 0,00120 | 0,01060 | 0,01508 | -0,02659 | 0,01288 | -0,01130 | 0,00428 | 0,00565 |
| Pardubice | ***-0,07119*** | 0,03583 | 0,04407 | -0,00182 | 0,00409 | -0,01098 | ***-0,05170*** | -0,00642 | 0,03842 | -0,00868 | 0,02372 | 0,00466 |
| Jihlava | -0,01819 | **0,08064** | 0,00411 | -0,02495 | -0,03603 | -0,00559 | -0,02389 | **0,07329** | 0,01471 | -0,02006 | -0,02543 | -0,01862 |
| Brno | -0,03553 | **0,06255** | -0,01560 | 0,01610 | -0,00859 | -0,01893 | 0,00288 | **0,05066** | -0,00819 | 0,00350 | -0,01522 | -0,03363 |
| Zlin | ***-0,08713*** | **0,10677** | -0,03380 | 0,02380 | 0,01757 | -0,02720 | ***-0,08756*** | **0,17098** | -0,03576 | 0,00862 | -0,01968 | -0,03660 |
| Olomouc | -0,04089 | 0,01441 | -0,00607 | 0,00907 | 0,01639 | 0,00710 | -0,03979 | 0,01771 | -0,02173 | 0,00857 | -0,00216 | 0,03740 |
| Ostrava | -0,02939 | ***-0,06364*** | **0,09163** | 0,01547 | -0,00075 | -0,01333 | -0,02639 | -0,03003 | **0,07195** | 0,01985 | -0,01634 | -0,01903 |
| Czech Republic | -0,00390 | 0,00308 | -0,00218 | 0,00331 | -0,00103 | 0,00073 | 0,00267 | -0,00184 | -0,00383 | 0,00295 | 0,00033 | -0,00029 |

Note: 1. Malignant Neoplasms; 2. Circulatory diseases; 3. Diseases of the respiratory systém; 4. Diseases of the digestive system; 5. External causes of death; 6. Other causes.
M males; F females
Values: eq or less than -0.05 in bold and italic
Values: eq or more than 0.05 in bold
Values: eq or less than -0.1 in bold, italic, and underlined
Values: eq or more than 0.1 in bold and underlined

Tab. 6 – Contributions to the Total Chi-Square Statistic

| Percents | 1. | 2. | 3. | 4. | 5. | 6. | 1. | 2. | 3. | 4. | 5. | 6. | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| region | Mneo | Mcirc | Mrespi | Mdig | Mexter | Mother | Fneo | Fcirc | Frespi | Fdig | Fexter | Fother | Sum |
| Praha | 0.097 | 0.459 | 0.733 | 0.475 | 0.248 | **1.478** | **2.608** | ***2.172*** | ***1.261*** | 0.882 | **1.315** | 0.253 | ***11.980*** |
| Central Bohemia | 0.012 | 0.657 | ***3.564*** | 0.059 | 0.185 | 0.026 | 0.679 | **1.276** | ***2.953*** | 0.249 | 0.044 | 0.007 | ***9.711*** |
| Ceske Budejovice | 0.606 | 0.006 | 0.111 | 0.765 | 0.151 | 0.002 | 0.266 | 0.024 | 0.063 | 0.033 | 0.170 | 0.041 | ***2.239*** |
| Plzen | 0.645 | 0.151 | 0.845 | ***1.592*** | 0.104 | 0.006 | 0.064 | 0.255 | **1.387** | 0.628 | 0.147 | 0.142 | ***5.967*** |
| Karlovy Vary | **1.117** | ***2.137*** | **1.728** | 0.000 | 0.614 | 0.015 | 0.573 | 0.989 | **2.324** | 0.012 | 0.019 | 0.115 | ***9.643*** |
| Usti n L | 0.327 | 0.203 | 0.187 | 0.363 | 0.049 | 0.123 | 0.126 | 0.084 | 0.428 | 0.076 | 0.039 | 0.598 | ***2.604*** |
| Liberec | 0.282 | 0.008 | ***2.705*** | 0.054 | 0.071 | 0.010 | 0.140 | 0.001 | ***2.089*** | 0.053 | 0.453 | 0.119 | ***5.985*** |
| Hradec Kralove | 0.001 | 0.000 | 0.023 | 0.402 | 0.001 | 0.146 | 0.048 | 0.062 | 0.220 | 0.197 | 0.017 | 0.033 | ***1.151*** |
| Pardubice | 0.978 | 0.123 | **2.206** | 0.004 | 0.011 | 0.157 | 0.569 | 0.004 | **1.954** | 0.116 | 0.511 | 0.022 | ***6.656*** |
| Jihlava | 0.064 | 0.622 | 0.019 | 0.811 | 0.847 | 0.041 | 0.122 | 0.471 | 0.286 | 0.622 | 0.588 | 0.356 | ***4.848*** |
| Brno | 0.244 | 0.374 | 0.276 | 0.338 | 0.048 | 0.466 | 0.002 | 0.225 | 0.089 | 0.019 | 0.210 | ***1.162*** | ***3.454*** |
| Zlin | ***1.465*** | **1.091** | ***1.298*** | 0.738 | 0.201 | 0.964 | ***1.633*** | **2.562** | ***1.693*** | 0.115 | 0.352 | ***1.376*** | ***13.487*** |
| Olomouc | 0.323 | 0.020 | 0.042 | 0.107 | 0.175 | 0.066 | 0.337 | 0.027 | 0.625 | 0.113 | 0.004 | **1.437** | ***3.277*** |
| Ostrava | 0.167 | 0.387 | **9.538** | 0.312 | 0.000 | 0.231 | 0.148 | 0.079 | **6.852** | 0.609 | 0.243 | 0.372 | ***18.938*** |
| **Czech Republic** | 0.003 | 0.001 | 0.005 | 0.014 | 0.001 | 0.001 | 0.002 | 0.000 | 0.019 | 0.013 | 0.000 | 0.000 | ***0.060*** |
| Sum | ***6.331*** | ***6.239*** | ***23.281*** | ***6.034*** | ***2.707*** | ***3.732*** | ***7.317*** | ***8.232*** | ***22.242*** | ***3.738*** | ***4.112*** | ***6.034*** | 100.000 |

Note: 1. Malignant Neoplasms; 2. Circulatory diseases; 3. Diseases of the respiratory system; 4. Diseases of the digestive system; 5. External causes of death; 6. Other causes.
M – males; F – females
Values: eq or more than 1.0 and negative in table 5 are in bold and italic
Values: eq or more than 1.0 and positive in table 5 are in bold
Values: eq or more than 5.0 and positive in table 5 are in bold and underlined

5 (observed minus expected values) and Table 6 (contributions to the Total Chi-square statistic) help to understand the plot (Fig. 4). Table 6 shows that 19 % of the total chi-square statistic is contributed by the Ostrava region, which is followed by Zlín at over 13 %, and Prague (12 %). Similarly, the combined respiratory mortality for males and females contribute over 45 % to the total chi-square, whereas the causes and regions nearer the origin of the plot contribute significantly less. The Ostrava region is farther from the origin than all other regions following the first dimension. Central Bohemia and Zlín are the extreme regions in the opposite direction. The cause-of-death profile of Ostrava is associated with strong excess mortality from respiratory diseases and Tables 5 and 6 show that respiratory problems are the only anomaly in that region and contribute over 16 % to the total chi-square. Both excess respiratory mortality and the Ostrava region are farther from the origin than all other active points and thus emphasize their marked specificity. The Central Bohemia region on the opposite side of the first dimension is characterized by the extremely low frequency of deaths due to respiratory problems. While Ostrava and Central Bohemia show one anomaly of their cause of death profile, the Zlín region experiences three marked anomalies: low frequency of neoplasms and respiratory problems (males and females), but very frequent circulatory diseases (Tab. 5 and 6, Fig. 4). Prague displays a particular pattern, but for females only. The capital city is characterized by a very high frequency of malignant neoplasms, a significantly below-average frequency of circulatory and respiratory deaths, and a high proportion of external causes. The Karlovy Vary region differs with a high frequency of neoplasms and respiratory diseases, and less significant circulatory problems.

Tab. 7 – Selected groups of causes of death with their ICD-9 codes and ICD-10 codes

| Cause of death | Abbreviation | ICD - 9 | ICD - 10 |
|---|---|---|---|
| 1. Malignant Neoplasms | (neo) | 140-208 | C00-C48 |
| 2. Circulatory diseases | (circ) | 390-459 | I00-I99 |
| 3. Diseases of the respiratory system | (respi) | 460-519 | J00-J99 |
| 4. Diseases of the digestive system | (dig) | 520-579 | K00-K93 |
| 5. External causes of death | (exter) | E800-E999 | V01-Y89 |
| 6. Other causes | (other) | Remainder | |

The regions listed above (Ostrava, Zlín, Prague, Karlovy Vary, and Central Bohemia) deviate the most from the origin and therefore show a particular cause-of-death profile (Fig. 4). These uncommon structures can reflect special underlying behavioral and environmental risk factors. Those findings would therefore require more detailed and complex statistical research. However, the hypothesis – different risk factors reflecting different social, economic, cultural, and health conditions in regions also generate different cause-of-death profiles irrespective of mortality intensity – was confirmed. Despite the apparent similarity of some regions regarding mortality levels, it was found that mortality profiles in these regions form distinctive configurations.


Fig. 5

## Conclusion

In the Czech Republic from the beginning of the 20th century and during the interwar period, mean length of life increased and was close to the levels observed in France. During the post-war period, three dissimilar stages in the

development of life expectancy at birth became apparent in the Czech Republic: between World War II and the mid-1960s and characterized by mortality decrease; from the mid-1960s to the mid-1980s and showing the deterioration of the survival rate; and from the mid-1980s or the beginning of the 1990s to the present with a reappearance of a new decline in mortality. The recent favourable development has currently brought the Czech Republic a little closer to the European average. Regional analysis of cause-of-death patterns shows a persistence of regional peculiarities very likely reflecting different underlying behavioral and environmental risk factors. Significantly diverse cause-of-death profiles were found in the Ostrava, Zlín, Karlovy Vary and the Central Bohemia regions, with similar deviations for both sexes. Interestingly enough, the capital city of Prague shows a distinctive pattern for women only.

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Summary

ÚMRTNOST V ČESKÉ REPUBLICE: MINULOST, SOUČASNOST A REGIONÁLNÍ ROZDÍLY

Úroveň úmrtnosti v českých zemích (současná Česká republika) byla v období mezi dvěma světovými válkami stejná jako ve Francii. Tato situace odpovídala tehdejšímu ekonomickému postavení českých zemí, kde hrubý domácí produkt na hlavu nebo produktivita zemědělství dosahovaly „západoevropských" standardů. Velmi příznivé úmrtnostní poměry byly zejména u osob starších čtyřiceti let. Po druhé světové válce lze rozlišit tři etapy ve vývoji úmrtnostních ukazatelů: 1. od poloviny čtyřicátých let do poloviny let šedesátých charakterizované snižováním míry kojenecké úmrtnosti a prodlužováním střední délky života při narození; 2. období mezi polovinou šedesátých a koncem osmdesátých let, které se vyznačovalo zejména zhoršováním úmrtnosti mužů a stagnací úmrtnosti žen; 3. prodlužování průměrné délky života v devadesátých letech v důsledku

zlepšení úmrtnostních ukazatelů starších osob (40+) a poklesu úmrtnosti na nemoci oběhové soustavy představující nový kvalitativní obrat. Tyto nové trendy přiblížily opět Českou republiku evropskému průměru. Regionální diferenciace úmrtnosti nebyla v rámci České republiky v porovnání s jinými evropskými zeměmi výrazná. Vyšší úroveň úmrtnosti je tradičně pozorovaná v kraji Ústeckém a naopak nejpříznivější ukazatele přežití vykazují kraje Pražský, resp. Brněnský. Snižující se úroveň úmrtnosti je dlouhodobě pozorována ve směru severozápad – jihovýchod. Cílem práce bylo ověřit zda pozorované regionální odlišnosti v úrovni úmrtnosti odrážejí také stejné typické struktury podle příčin. Studium relativních profilů struktur úmrtnosti podle příčin může korelovat se specifickými behaviorálními, environmentálními či dalšími faktory a tyto struktury nemusí být závislé na celkové výši úmrtnosti. I když v regionech České republiky v období 1994 – 1997 vysoká celková úmrtnost výrazně korelovala s vysokou intenzitou úmrtnosti na nemoci oběhové soustavy (0,8), tak procentuelní zastoupení nemocí oběhové systému ve struktuře příčin již s celkovou úmrtností nekorelovalo (-0,3). Nejnižší zastoupení bylo pozorováno v Karlovarském kraji, který se současně vyznačuje vysokou úmrtností. Hlubší pohled na specifičnost profilů úmrtnosti podle příčin byl proveden metodou korespondenční analýzy. Regionální anomálie – odlišnosti od průměrného relativního profilu úmrtnosti podle příčin byly zejména v Ostravském, Zlínském a Pražském regionu. Z hlediska příčin vykazovaly nejvíce atypičností nemoci respiračního systému, které byly vysoce nadprůměrné v Ostravském regionu. Zatímco odchylky od průměru byly v dotyčných regionech podobné pro obě pohlaví a potvrzovaly takto hypotézu o specifických faktorech sociálního prostředí tak Praha byla specifická pouze pro ženy. Tyto výsledky naznačují přítomnost specifických faktorů ovlivňujících délku života.

Obr.1 – Vývoj střední délky života při narození v České republice a Francii v letech 1920 – 2000
Obr. 2 – Vývoj míry kojenecké úmrtnosti v České republice a Francii v letech 1920 – 2000
Obr. 3 – Vývoj střední délky života ve věku 65 let v České republice a Francii v letech 1920 – 2000
Obr. 4 – Regionální rozdíly úmrtnostních profilů podle příčin metodou jednoduché korespondenční analýzy
Obr. 5 – Administrativní členění České republiky

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# DEVELOPMENT OF THE SETTLEMENT SYSTEM IN THE OSTRAVA AGGLOMERATION AND POSSIBILITIES OF ITS RESTRUCTURING

A. Vaishar: *Development of the settlement system in the Ostrava agglomeration and possibilities of its restructuring* – Geografie – Sborník ČGS, 107, 2, pp. 171 – 188 (2002). Large-scale coal-mining.regions were showing specific settlement from the 19th century. The original typical system with towns as centres and their hinterlands was remodelled to a mosaic of coal pits, miner colonies (later housing quarters) and industrial factories interwoven with a dense web of infrastructure. The region of Ostrava is one of examples; here the mining of black coal linked up with the metallurgy of iron, heavy engineering and chemical industry. The region's economic base has experienced a restructuring in connexion with social changes after the year 1989 with individual towns seeking new functions and place in the system of settlement.
KEY WORDS: settlement system – Ostrava agglomeration (Czechia) – coal mining and metallurgy restructuring.

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## 1. Specific features of settlement in mining regions

A stranger driving through the coal-mining region would easily lose his sense of direction being accustomed to the typical signs of drawing nearer to a town centre or leaving it behind. Extensive basins with either formerly or still existing coal mining show a specific structure of settlement, which is somewhat beyond the typical conception of arrangement of seats in centres. On the opposite, the landscape is characteristic of a seemingly chaotic alternation of seats, shafts, industrial and infrastructural premises, and mine dumps or landfils with industrial waste. The mine pits used to be once of central importance with all other activities concentrating in their neighbourhood. The layout of mines naturally depends on the localization of raw material.

The atypical structure of seats began to form at the time when the development of technologies required to change the energy base. Transition of the industry from wood to coal as a main raw material for energy in the 19th century entirely transformed the original structure of settlement in large basin areas. Extraction of coal was soon followed by developing heavy industries, metallurgy in particular. The basins became regions of conclusive

importance for their countries. However, their economic prosperity was at a cost of serious environmental problems.

The situation began to change in the second half of the 20th century when the new technologies brought a changed orientation of the industry. Progress was no more measured by tons of steel produced or consumed kW hours of electric energy but rather by the level of cybernetization, automation and miniaturization, which reduced coal and steel demands and made the coal basin regions face a problem of restructuring their economies. Furthermore, the number of people employed in the industry began to be generally falling to the benefit of services with industrial towns appearing in the stage of desindustrialization (Pacione 2001). And because the structure of settlement created during the last 150 years corresponded almost exclusively to the purposes of coal extraction, the issue of restructuring the system of settlement became pressing too – naturally together with the issue of revitalization of environment in the coal mining regions.

The most popular European regions of this type are the Ruhr Basin in Germany (Dürr-Grame 1993), the Midlands in England (Burdack 1993), Donbas in Ukraine or Upper Silesia in Poland (Klosowski-Runge-Prokop 1997). The last mentioned region links up with the Ostrava region on the Czech side of the border, whose settlement is a subject of this paper (Fig. 1). A specific feature of coal basin regions in post-socialist countries is the fact that the centrally-planned economy was not capable to respond in time to modern industrial technologies, conserving to a considerable extent the out-dated models of manufacture. This is why the changes experienced by west-European coal basin regions several tens of years ago have to be faced by the Ostrava industrial conurbation in an even more urgent form at the beginning of the 1990s.

The following contribution will try to suggest an answer to the question of what is going to be the way in which the settlement in the Ostrava region will cope with the economic restructuring occurring in the area. The settlement, which had shown typical symptoms of central system, based on the network of small towns in a marginal region, before the beginning of mining, was substantially changed by the extreme industrialization. The way of the course of its adaptation to new conditions after the finishing the mining activity is the question. It is interesting to observe, to which extent the functions of original centres of the settlement system can be restored, how the functions of the current middle-size towns will change and which place in the national settlement system the centre of the whole region – the city of Ostrava will shift.

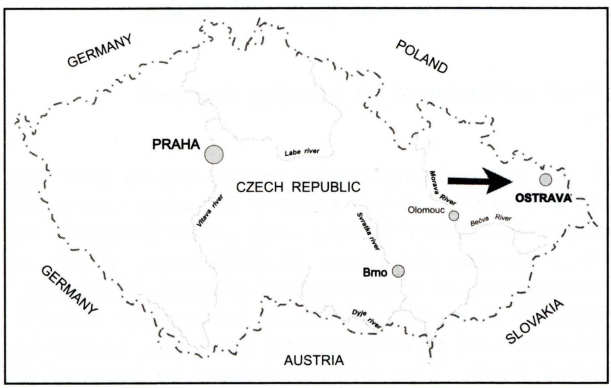


Fig 1 – Situation of Ostrava within Czechia

## 2. Historical development of the Ostrava conurbation

The agglomeration of Ostrava encompasses the city of Ostrava itself, the Karviná district and parts of the districts Frýdek-Místek, Nový Jičín and Opava (Fig. 2). One of geographers studying the history of settlement in the Ostrava region was for example Charvát (1992). Prehistorical settlement in the Ostrava region made use of the strategic hill Landek where a site of fortified settlement came into existence. However, any more important settlement did not develop in the area the reason being a considerable waterlogging of the floodplain and the peripheral location on the boundary between the Czech and Polish states. Relatively distant greater centres were Opava in the west and Těšín in the east.


Fig. 2 – The Ostrava agglomeration

A detailed characteristic of modern urbanistic development was worked out by Kuča (2000). The rural and fishermen's village Ostrava situated on the left bank of the Ostravice River is assumed to exist on the turn of the 12th and 13th centuries. From about 1279 Ostrava was an episcopal town and a no big centre of the northern portion of the Hukvaldy estate. The localization of Ostrava, stretching extremely to the North has a strategic reason as a counterweight to the castle in Silesian Ostrava and to the royal castle of Landek with the aim of controlling the trade path between Těšín and Opava. Unlike some other towns in the surroundings, Ostrava was spared during the Hussite and Czecho-Hungarian wars this strengthening its function as a centre based on market activities. Draper's trade started to grow from the mid-15th century. The population doubled to two thousand in the course of the 16th century.

A decline of Ostrava occurred in the 17th century its reason being a combination of unfavourable circumstances including plague (1625), consequences of the 30-year war, big fire (1675) and disgrace of estate lords. The decline went on also in the first half of the 18th century when the region suffered a repeated attack of plague taking turns with fires and floods. A great loss was the rerouting of the road from the Moravská brána (Gate) to Cracow bypassing Ostrava due to unfitted passage over the often flooded Ostravice River. The decline culminated in the annexation of a major part of Silesia by Prussia. This was a final disconnection of the remaining road from Opava to Těšín through Hlučín and Ostrava appeared on the state border. The number of its inhabitants dropped below a thousand.

The situation of Ostrava began to improve only after Galicia had been annexed to the Habsburg monarchy. The customs boundary ceased to exist and the Ostrava region became a centre for marketing Galician cattle. This however resulted in a disastrous hygienic situation. The first half of the 19th

century was in token of changing character of housing in Ostrava where stone or brick buildings started to prevail. A new road was built from Opava via Ostrava to Těšín and it was in connexion with this new route that a slow urban development slowly came to Silesian Ostrava too.

Regular extraction of black coal on Landek's foothills was launched in the year 1782. Mining in the territory of Silesian Ostrava exhibited higher volumes. In 1828 the Rudolf iron works were founded (predecessor of the Vítkovice Steel Works), which made use of high-energy coal and abundant water in the Odra River. The fast growing enterprise generated a pronounced demand for black coal right at the place. The beginning of massive urban changes was however induced only by the construction of railway in 1847, in which Ostrava marked a profit by supplying rails. When the railway was extended to Lvov in 1861, the coal from Ostrava won new marketing opportunities.

Heavy industry started to concentrate between the town core and Vítkovice from the 1840s. The urban development was spontaneous, largely influenced by the location of individual mining pits. The region saw a rapid growth thanks to the immigration of people from the Ostrava surroundings and from Galicia. Miners were seated in colonies erected in the vicinity of pits. This is how a mosaic of isolated seats came into existence, whose life was supposed to be temporary. Regarding the fact that the seats of companies and banks were in Vienna, nobody was interested in developing metropolitan life in Ostrava.

At the turn of the 19th and 20th centuries, Ostrava experienced a greater establishment of mid-classes, which instigated the development of metropolitan housing which was however limited by the preceding chaotic exploitation of the territory. There were apartment houses, public buildings and cultural infrastructure coming into existence. However, the immediate southern surroundings of the town core were affected by mining and industrial activities. Poor quality houses in the centre were rehabilitated and reconstructed after 1903. In 1900, Ostrava became a seat of the political district. This time saw another dramatic development and concentration of mining and industrial activities, power and chemical industries. The Vítkovice steel works were expanding. Environment was severely affected.

The end of monarchy was a main reason for seats of industrial corporations being moved directly in Moravian Ostrava and the industrial importance of the town further grew under the 1st Czechoslovak Republic. The housing standard improved, mainly thanks to the building of one-family houses in suburbs. The individual seats started to get closer to each other with their housing estates, which was further favoured by a good system of transport. Extended technical infrastructure helped to improve water supply. The metropolitan transformation of Ostrava was accomplished and its symbol became a newly built town hall.

Munich 1938 meant a short-time period of stagnation for Ostrava, which was at the time split into three states and nearly cut-off from the rest of Czechoslovakia. On the other hand, the period of protectorate raised the city of Ostrava to an important place in the war machinery. The whole town was unified into a single administrative unit. A new metallurgical combine started to be built in Kunčice. Housing started to be developed. At the end of the war, Ostrava was damaged by bombing and war operations.

After the war, Ostrava was one of priorities. Due to the transfer of Germans and war events, the town had to face a lacking labour force. This

Fig. 3 – Ostrava – Poruba: a monumental architecture according to the soviet model (Photo by A. Vaishar)

was one of reasons to start building housing estates. The first of them was Zábřeh and later Poruba (Fig. 3), erected in the western part of city limits in the spirit of so called socialist realism. Nová huť steel works were put into operation at the beginning of the 1950s. The population began to move to the housing estates built of pre-fab blocks of flats while the traditional parts of the town showed a stagnation.

Erection of housing estates went on during the whole socialist period. Important was especially the southern direction serviced by a new WE communication Rudná and a road artery leading to the Mošnov Airport, which joined Ostrava with the rest of Moravia. Poruba reached 100 000 inhabitants and there was a campus of the High School of Mining and a regional hospital built on its periphery. Building of the neighbourhood Fifejdy started in 1969 and some areas of lower urban quality situated to the north of the town core were rehabilitated. The rehabilitation was however not used for housing of mature conception. The Černá halda (Black spoil bank) to the south of the centre were recultivated and later served as a site to erect the Ostrava Exhibition Centre. The internal structure of Ostrava in the comparison with Katowice was studied by Vystoupil and Wecławowicz (1987).

Coal mining in Ostrava ended in the 1990s. Problems of restructuring induced a pressing economic situation and high unemployment. Hypermarkets, banks and other commercial buildings are the most characteristic urbanization feature of the last decade. Problematic is the stormy development of individual motoring, which calls for new traffic solutions.

### 3. Historical development of other most important parts of the conurbation

Other important towns of the Ostrava-Karviná conurbation are Karviná, Havířov, Orlová, Český Těšín and Bohumín, in wider surroundings Frýdek-Místek and Třinec.

A predecessor of *Karviná* is Fryštát (Fig. 4), which came into existence before the year 1305 on a vague mountain ridge between the watersheds of Olše R. and Petrůvka R. as a location town to secure the northern boundary of the Těšín principality. Fryštát was a centre of rural hinterland for the entire period of Middle Ages its character being that of a small town with a chateau that was later added an extensive park which was in the 19th century linked up with the spa premises of Darkov. Fryštát stood outside the major urbanization activities until the mid-20th century.


Fig. 4 – Karviná: the old center of Fryštát (Photo by A. Vaishar)

The beginning of building Karviná falls into the year of 1947 when the first satellite housing estate in the Ostrava region was founded to the north-west of Fryštát. The centre of construction works on new housing estates moved to the east in the period between the 1960s – 1980s. In 1963, the town happened to appear on the main branch of the railway track leading from Bohumín to Košice, which was rerouted due to undermining of the original route. The housing estate of Hranice was linked up with the complex of new spas in Darkov (Fig. 5).

Despite the intensive mining, building of pre-fab blocks of apartments and realigned communications, the original urbanistic character of Fryštát with its chateau, old Darkov spa and a small suburb of one-family houses remained preserved and became a zone of urban monument. This core was a base to be

Fig. 5 – Karviná: new spa buildings in the quarter Hranice (Photo by A. Vaishar)

extended with the recent construction of public buildings in Karviná including former House of the District Committee of the Communist Party of Czechoslovakia, in which seats the Faculty of Commerce and Enterprise of the Silesian University at the present time. On the other hand, the original village of Karviná practically ceased to exist due to undermining which was most intensive here in the entire Ostrava region.

Until the mid-20th century, the territory of *Havířov* had only rural seats of which the most important one was Šumbark. The area was very well suited for the construction of a large housing estate after 1945 since it was situated already outside the mining territory but yet within its favourable reach. The main core was built in the cadastral area of Dolní Bludovice in the 1950s and represents a masterpiece of socialist realism. Unlike Poruba, which truly copied Soviet models, the architecture of Havířov (Fig. 6) also includes some elements of Czech national arts. The seat came into existence with a favourable spatial arrangement. However, the construction of flats was at that time accompanied with a considerably delayed building of infrastructure and Havířov was therefore rather a lodging place than a real town. The original neighbourhood was later extended with a pre-fab part of the town with already loosened structure in the period between the 1960s – 1980s. Thanks to a lot of urban greenery Havířov can be considered the most successful deed of urbanization in the former socialist Czechoslovakia. Nowadays, Havířov, once the youngest town of the Republic, has the oldest population of the whole set investigated (17.77 % of population in the post-productive age).

Although *Orlová* was in historical terms one of the most important places in the north-west of the Těšín District, it became town only in the year 1922. The original colonization in the Middle Ages was of scattered character,


Fig. 6 – Havířov: the town hall (Photo by A. Vaishar)

organized along water courses and transit roads. The germ of Orlová was a monastery on whose place a country chateau was built after the monastery had been abolished. The situation changed by coal mining, which started in the first half of the 19th century. The connection to the original route of the Košice-Bohumín railway was of key importance.

The majority of incrementing houses in the 2nd half of the 19th century and in the first half of the 20th century appeared due to the construction of miner colonies of which the Monasterial Colony still exists in the devastated condition (Fig. 7). Although the whole complex had a considerably high amount of inhabitants, the residential structure was still scattered and was crossing the mining pits, spoil banks and railway sidings. Even after having been raised to a town, it was only the square that was of urban nature. Consequences of undermining started to show in the second half of the 20th century. The population in Orlová markedly dropped, the main railway track was moved outside the town limits. A new housing estate with infrastructure came into existence to the north-west of Orlová in the cadastral area of Horní Lutyně the new urban unit being nearly without any town-forming elements.

Těšín in its important strategic location was a centre of the medieval principality. Its main part stretched on the right (Polish) bank of the river Olza. In terms of traffic important left bank part was of rural character. Housing parts were distributed along the main roads. Municipal buildings started to be built in this portion of the town as late as in the 19th century. An important breaking point was the construction of the railway in 1867-69 and its extension to Žilina in the year 1871. *Český Těšín* came into existence in 1920 when the Olza River became state border.

As soon as Český Těšín was constituted, the then Czechoslovak government built a new representative town the reasons being prestigeous

Fig. 7 – Orlová: an old miners settlement (Photo by A. Vaishar)

and strategic. The housing character documents the Czechoslovak urbanism from the time between the two wars. Socialist housing quarters are not too compatible with the housing style from between the wars. Český Těšín/Cieszyn is a typical twin town, which developed after splitting the original town into two by the state border.

While Starý Bohumín is an insignificant small town situated on the periphery of the region, stagnating since the mid-19th century, the functional centre of *Bohumín* dwells in Nový Bohumín, situated in the entirely flat landscape of the Ostrava basin. Until the 19th century, the territory had a mainly forest landscape little affected by human activities. A railway station, which soon became the most important railway junction in the Ostrava region was built in 1847. The railway station linked up with a number of chemical and metallurgical enterprises. In the NW direction a town was aligned which was built of red bricks (Fig. 8). Core margins showed a more chaotic built-up area of workmen's colonies and one-family houses. Panel housing quarters were constructed especially in the second half of the 20th century in the north-west.

Each of the mentioned five mesoscale towns of the Karviná district apparently has a different history and origin. While Karviná grew up from the typical historical small town of Fryštát, Bohumín is the example of a new town founded in the industrial period; Havířov was newly founded as a genuine housing town in the period of Socialism, Orlová is the case of an expressive concentration of settlement and has never had the character of urban facility, and Český Těšín is an artificially created town after splitting the original seat with the state border. Although all the above mentioned towns have prevailing panel blocks of flats, it is well possible that the different historical development will show in the future – after the consequences of mining activities fade away.

Fig. 8 – Bohumín: the town hall in the part Nový Bohumín (Photo by A. Vaishar)

The most important town of the conurbation outside the Karviná district is *Frýdek-Místek*. The Silesian Frýdek was founded to guard the road from Olomouc to Těšín and Cracow in the strategic location against Moravia in the 1330s. Its suburbs were at the beginning extending along the roads to Těšín and Fryštát. The new-age development in the 19th century was connected with textile industries in the town and metallurgical industries in the surroundings and first of all with the connection to the railway in 1871. The town's development on the industrial basis continued also in the period between the wars. Extensive building of pre-fabricated housing quarters, which remodelled the original town structure, occurred in the 1980s. Destructive appeared to be consequences of a new highway with above-ground crossings which liquidated the sub-central part of the town. Nevertheless, the historical core of the town remained preserved.

The Moravian Místek came into existence some time later as a market and craftsmen's town situated on the important road leading from Moravia via Frýdek to Těšín and Galicia. Its development connects with draper's trade and weaving in the 18th century. These were followed by the development of other textile industries in the second half of the 19th century, which was the time to see a rapid growth of residential and infrastructural parts of the town, which continued between the wars and the town achieved a representative character in the 1930s. During the 1960s – 1980s, Místek was afflicted with a massive panel reconstruction. Four new pre-fabricated housing quarters took a sacrifice of the sub-central urban built-up area in addition to the historical square. The town of Místek took upon the appearance of an extensive neighbourhood, cut through with broad communications.

Another large town of the conurbation is *Třinec*. Before the foundation of iron works, Třinec was an unimportant rural seat in the foothills of the

Beskids Mts., making its bread primarily from agriculture. Localization factors speaking for the foundation of metal works in the first half of the 19th century was sufficient water in the Olše River, abundant timber in the surrounding woods, deposits of limestone, iron ore, building stone and brick loams as well as a sufficient labour force in the densely populated region. Opening the Košice-Bohumín railway in 1871 was of crucial importance. The growing population called for extensive building of flats and infrastructure. The construction works culminated in the 1970s in socialist housing quarters. Třinec, which is situated on an important highway from Český Těšín to the state border in Mosty u Jablunkova is a starting point for tourists arriving to the Beskids Mts.

## 4. General evaluation of the historical development of settlement in the Ostrava region

Before the start of black coal mining the Ostrava region was developing as a peripheral transit region in complex conditions on the contact point of Czech, Polish and German ethnic groups and a range of feudal and clerical concerns. The situation was corresponded to by the settlement, dwelling on several important centres of which we should mention Opava, Těšín, Nový Jičín and Frýdek. More important seats were as a rule rising at crucial transit roads. Leading branch of economy was agriculture, later drapery – particularly in the foothills of the Beskids Mts. A number of today's important towns were at those times rural seats.

Black coal mining meant an essential reconstruction of the settlement, unprecedented in our conditions. Individual stages of this process were described by Vičar (in Voráček et al. 1973). The developing coal mining first instigated metallurgical production and later other industries such as power generation industry, chemistry, engineering, and the Ostrava region became a fuel, power and iron base of the Austrian-Hungarian monarchy, which stimulated the construction of a railway connection between Vienna and Cracow. The centre of settlement was gradually displaced to Ostrava and to the space situated in the eastern direction from the town itself, the extent and form of the shift greatly remodelling the original residential structure.

Similar tendencies continued also in the socialist period in the first half of which the development of the Ostrava region was a priority. Huge housing quarters and whole new towns were arising in place of the spatially limited miners' colonies, which however missed and are missing up to these days some basic town-forming elements. Immigration from the surroundings and from the whole country reached enormous volumes of people. Mining and industrial activities were ate the same time intensifying which showed in the devastation of natural environment. Mining took a sacrifice of numerous original seats. The landscape was interwoven with a network of over-dimensioned road communications. Several dam lakes were built. The population was characterized by above-standard financial income that was however not corresponded to by the achieved stage of social and cultural development. The society's attention beginning to turn to other directions towards the end of the socialist period, it began to be ever more clear that the developmental potential of the Ostrava region – based on heavy industry- was approaching depletion.

The transition to market economy brought several important impulses for the Ostrava settlement system. It was first of all a structural reconstruction of the economic base in the region. Coal mining activities were closed in Ostrava and gradually slowed down in the Karviná area. A majority of industrial giants in the region have serious economic problems. Hamilton (1999) differs three types of surviving of old industrial enterprises in new conditions. Main concerns in the Ostrava region correspond to his category of the paternalistic enterprises, which suffer from technological backwardness and preceding exclusive relation to the COMECON markets, which have too many workers and are deeply in debts, but which are able to reach a massive state subsidy as flagships of the national industry, ensuring employment. Czechia overtook the German model, in which banks are the main shareholders of such enterprises.

Along with the cardinal requirement of improving labour productivity the labour force is released from industries at such a rate that it is far not possible to absorb the redundant people from industry by the formerly under-sized services. According to running results of the 2001 population census, there are 72.6 % of economic active people in Ostrava employed in different branches from agriculture, forestry, water management, mining and processing industries (in Prague 87.2 %, in Brno 80.1 %). In other towns in the Ostrava region, the values of this coefficient fluctuate between 57.2 % in Třinec and 68.5 % in Český Těšín.

The situation of the Ostrava region was geopolitically affected with the split of Czechoslovakia in 1993. The area once again finds itself situated on the borderland periphery, far from the main seats and from the western state border, which represents a contact point with advanced Europe.

The panel housing quarters do not meet requirements of the ageing population for qualitative dwelling any longer. This is why the population from large seats moves to small towns and large and mesoscale villages, which however corresponds with the national trend. Prospective in this direction appears to be a certain tendency to displace a part of the population to seats in the foothills of the Beskids Mts.

A part of towns in the Ostrava region lost their up to now main functions and badly struggle to find a compensation. The settlement cannot return back to the standard structure existing before the development of mining but at the same time cannot go on in the existing form.

## 5. Present prospects of main settlement centres in the Ostrava region

We have to realize that industry is no more decisive for sustained prosperity and position of important settlement centres in the residential structure; it is rather tertiary and quaternary functions. Industries are justified in the form of advanced technologies linked up with the scientific and research base or as a complementary branch to employ a part of the labour force. It follows unambiguously that towns, which based their perspective on heavy industry will soon have to face retreat from glory.

At the present time, all mentioned towns of the Ostrava region fight with the problem of a relatively high unemployment (Table 1). The unemployment has some peculiarities in this region. The lost labour opportunities were very

Tab. 1 – The level of unemployment (%)[2] in selected towns in the Ostrava region Town

| | 30. 6. 1999 | 31. 12. 1999 | 30. 6. 2000 | 31. 12. 2000 | 30. 6. 2001 |
|---|---|---|---|---|---|
| Ostrava | 14.4 | 15.9 | 16.4 | 16.6 | 16.2 |
| Karviná | 17.8 | 18.8 | 19.0 | 18.9 | 18.6 |
| Havířov | 13.7 | 15.1 | 16.1 | 16.4 | 16.3 |
| Bohumín | 13.6 | 14.7 | 15.9 | 16.2 | 15.5 |
| Český Těšín | 16.5 | 17.5 | 17.3 | 17.3 | 17.4 |
| Orlová | 18.4 | 19.9 | 20.7 | 20.4 | 19.7 |
| Frýdek-Místek | 14.7 | 16.4 | 16.5 | 15.4 | 14.9 |
| Třinec | 10.5 | 11.4 | 11.4 | 12.2 | 12.2 |

specific, socially preferred with high incomes in the last political system. Even in the 1st half of 2001 amounted the average income in Ostrava 14 999 CZK per one employee, which responds the 4th place among Czech districts[1]. From it follow structural problems of employment, worse preconditions of re-qualification, less motivating milieu for foreign investors, who are accustomed to a low price of labour force in regions with a high unemployment etc.

The level of unemployment generally relates to the level of education. In this respect is the situation in Ostrava unfavourable. The share of people elder than 15 years with the university education reaches in Ostrava 10.5 %, which is at the least of all comparable cities of Czechia (Prague 23.2 %, Brno 17.9 %, Plzeň 12.5 %). Among the middle-size towns in the Ostrava surroundings, the most favourable education level has Frýdek-Místek (9.2 %). This value is better than in other towns impacted with the restructuring of heavy industry (Kladno, Most, Teplice, Ústí nad Labem), but by one third worse than in classical Czech middle-size towns (Olomouc has 15.5 % people with an university education). Karviná has the lowest level of education among the Czech middle-size towns at all (4.8 % graduated people). Also small towns in the Ostrava region have low shares of graduated inhabitants (the best situation being in Český Těšín – 8.6 % graduated people).

A great handicap for the majority of towns in the Ostrava region is the absence of cultural and historical values and in some cases also the absence of significant signs of town characteristic. Another problem is the non-existence of unambiguous and natural gravity centres of the town-hinterland type. The population's social structure is unfavourable, too – with people being still used to work as employees with a high level of social advantages and allowances.

Another factor to be taken into account is the unfavourable environmental situation which –although showing some tendencies to improvement- still remains very bad in the comparison with other regions and furthermore does not create good image for the region. In 2000, exhalations in the district of Ostrava-town amounted 2 565 tons of solid substances (most in Czechia), 14 676 tons of $SO_2$, 11 228 tons of $NO_x$ (comparable only with districts of northern Bohemia and Pardubice) and 70 465 tons of CO (district of Frýdek-Místek occupies the 2nd place)[3]. Taking into account the small area of the district, exhalations per 1 km$^2$ are extraordinary. Such a situation does not create good image of the region. A similar situation was found in the Ruhr

[1] Data of the CR Ministry of Labour and Social Affairs
[2] the webpage of the Regional Information System of the Ostrava Region: (6.5.2002)
[3] data of the Czech Ministry of Environment

Basin (Maier-Beck 2000). A crucial issue is apparently the replacement of industries with other functions – if possible at a diversified branch, organizational and size structure.

The city of Ostrava (population 319 162[4]) itself is exceptional in its entire system of settlement since it is an unambiguous centre of the whole region. It is also a provincial town, seat of two public and one private universities and a range of other quaternary activities, today also a centre of cultural and social life in the region and a partner for contacts with the opposite centre of Polish Upper Silesia Katowice. A certain advantage is the built-up technical infrastructure. Although the required reconstruction of industrial town quarters is costly, it makes it possible to go for modern concepts. This also applies to a possibility of creating of a new city centre in place of the former Karolina coke plant. A pre-requisite for the prosperity is an improved connection to the rest of the country by means of a speed motorway and a better passability of border-crossings to Poland. Another advantage is the existence of the Mošnov airport.

With no exception the towns of the Karviná district will most probably have to face reduced population, which is going to be rather considerable in some cases. Although the number of inhabitants is an important index as it defines the size of the local market, the quality of urban functions is of conclusive significance. Viewed from this point, the greatest chances seem to be those of the district town. It is worth pointing out at this place that it will not be the administrative function because the districts are expected to get extincted in a few following years. A decisive fact is that Karviná (population 65 491) has – as the only one of these centres – its historical core in Fryštát to derive the town's cultural and historical character. The Faculty of Business Economics of the Silesian University (which could improve the bad educational situation in the town), the functional spa of Darkov with the new premises in Hranice, the new industrial zone of Nové Pole with the potential of 2.5 – 3 thousand jobs and the border crossing should lay foundations to the necessary multifunctional character of Karviná. The existing housing quarters are expected to be a problem in the future.

The future profile of Český Těšín (population 26 572) as a cultural centre of Polish minority with the polygraphic tradition, town of secondary schools, theatre with the Czech and Polish scenes, the busiest road border-crossing with Poland, railway and highway junction and the seat of somewhat more diversified industries than in other centres of the Karviná district can be relatively satisfactory. In terms of culture and history the town can link up with the historical tradition in spite of the fact that the former centre of principality is on the Polish side of the border.

The other three towns are problematic in terms of their future prosperity. The future function of Havířov (population 87 021) is unclear with the role of housing quarter for coal mines and industries in Ostrava practically ending. The dwelling environment of the town is little attractive and the town's hinterland is minimal. The only industrial enterprise of shoe-making industry does not produce. The fact is that the town of this size requires a considerable amount of jobs to serve itself but the need is supposed to fall with the falling number of inhabitants. The document *Strategy of the town of Havířov* does not count with an extraordinary strengthening of town-forming

[4] population data see the running results of the 2001 population census, Czech Statistical Office

functions anyhow, with the foundation of a university being only at the 8th place in the list of priorities and considered little realistic in the same document.

Bohumín (population 23 408) grew up as a railway junction; its present developmental impulses are however those of motorways. The plan to extend the broad-gauge railway from Poland and to build a terminal for trading of western Europe with Ukraine and Russia is a certain hope. Industrial enterprises in the town face serious structural problems their fate being uncertain and will require a considerably reduced labour force even in the case that their significance is successfully restored. Most problematic seems to be Orlová (population 35 063) which is a neighbourhood with no unambiguous urban character and with no town-forming functions.

Frýdek-Místek (population 61 423) is another town that can build on the historical tradition. As a district town it has a relatively large gravity area which is however demarcated by the gravitational force of Ostrava in the north while reaching into the attractive Beskids Mts. in the south-eastern direction. The town has got the required social and cultural infrastructure its industrial structure being more diversified. It is situated on a relatively favourable traffic position.

Třinec (population 38 980) is clearly an industrial town whose past prosperity consisted in one giant enterprise. The town struggles for diversification within the framework of project supporting the Baliny industrial zone. In the future, the town might participate in the development of travelling and tourism in the foothills of the Beskids, which can be further fostered by the road border-crossing in Dolní Lištná.

It is to be expected that the region will record reduced population practically in all important centres. Although the developmental trend is anticipated also in other regions of the country, the Ostrava region will have the tendency further intensified by immigration from the region and redistribution of inhabitants within the region. The panel housing quarters will most probably be abandoned in a very distant time horizon with their inhabitants preferring settlement in smaller seats. The important centres of settlement will most probably have to face a conflict of competition. While the position of Ostrava in the residential structure of north-eastern Moravia is quite clear, the other centres will fight for next places in the hierarchy. Successful are going to be the centres that will be capable of using competitive advantages and eliminating disadvantages.

The pre-fabricated or brick housing quarters represent a considerable problem. This type of dwelling houses can be found throughout Europe including the western Europe. However, the problem of Ostrava is a high concentration of these housing estates, monotonous and monofunctional character of dwelling zones, poor spatial arrangement of apartments and poor workmanship of construction. There are 85.5 % o flats in blocks (in Brno 80.7 %, in Plzeň 83.7 %). More flats in blocks can be found in Prague, but only 30.6 % of such flats in Prague are in prefabs, whereas the same datum for Ostrava reaches 41.6 %. Smaller towns should theoretically have more flats in one-family houses, but Karviná (89.8 % flats in blocks) and especially Havířov (90.5 % of all flats in blocks) are beyond of this presupposition. Shares of flats in prefabs among flats in blocks exceed 50 % in all mentioned towns of the Ostrava region except of Český Těšín and Bohumín.

The result is an anonymous dwelling environment with houses requiring extraordinarily high energy supply, often at a very bad condition. Technical

equipment of prefabs (central heating, laying on the gas, bathrooms and WC) is though almost complete, but this advantage is redeemed with unfavourable values of the square standard of living. According to the running results of the 2001 population census, the average living square per person in Ostrava represents 16.9 $m^2$, in the other mentioned towns of the Ostrava region it fluctuates between 17.6 $m^2$ in Český Těšín and quite extreme 15.3 $m^2$ in Orlová and 14.9 $m^2$ in Karviná. Of comparable big cities, the lowest living square per capita is in Brno (17.8 $m^2$), of the middle-size towns in Moravia in Zlín (17.5 $m^2$). Reconstruction of these parts of towns in the Ostrava region is necessary but at the same time very costly and limited by the existing structure of the built-up area. The problem would require a separate study.

Nevertheless, we do not conclude that a way out would lead through the replacement of dwelling houses with one-family houses. This was the model chosen by the U.S.A. after the WWII, which resulted in serious traffic, energy and social problems. Being good for families, the one-family houses are less fitted for the ever increasing percentage of single people, childless couples, incomplete families and social cases notwithstanding the fact that it will be necessary to somewhat increase people's motility. All these facts indicate that a large portion of the population will still have to live in apartment houses.

The Ostrava region is not the first region of coal mining and heavy industry to pass through the stage of restructuring. The Midlands or the Ruhrgebiet have already gone through the transition, be it in different social conditions. The problem is therefore not perceived as a priority in the world literature. At a global scale, large cities rather struggle with uncontrolled growth in the developing world and with efforts to preserve identity and cultural values in the western Europe and northern America. The problem of restructuring the old industrial regions is at the present time more or less an issue of post-socialist countries. Similar problems are faced for example by the Leipzig region in the eastern Germany with extensive open-cast coal mining and linking industries (Kabisch 1997). There is an expressive differentiation of individual seats there occurring according to new conditions and towns' capabilities to accommodate to the changed conditions.

In respect of further development of the settlement in the Ostrava region we can ask three questions: What will be the future development of the main centre in the Ostrava region? What functions and positions will have the other centres in the region in the residential structure? What is the measure to what it would be possible to revitalize the function of the original provincial cores in the region?

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## Summary

### VÝVOJ OSÍDLENÍ OSTRAVSKA A MOŽNOSTI JEHO RESTRUKTURALIZACE

Ve velkoplošných regionech těžby uhlí se od 19. století vytvářelo specifické osídlení. Původní typická středisková soustava měst a jejich zázemí byla přemodelována a vznikla mozaika šachet, hornických kolonií (později panelových sídlišť) a průmyslových podniků, protkaná hustou sítí infrastruktury. Tyto regiony se staly ekonomickými základnami svých zemí, za což však zaplatily těžkými environmentálními problémy. Ve 2. polovině 20. století došlo v souvislosti s vývojem výrobních sil k postupnému snižování významu těžkého průmyslu a ekonomika pánevních regionů západní Evropy procházela restrukturalizací. V souvislosti s ní se měnil i obraz osídlení.

V bývalých socialistických státech byl proces úpadku těžkého průmyslu zpomalován zásahy státu. Osídlení v pánevních oblastech tudíž mohlo reagovat na změněné podmínky jen minimálně. Takovým případem je i Ostravsko, kde na těžbu černého uhlí navazovala metalurgie železa, těžké strojírenství a chemický průmysl. Historický vývoj této oblasti byl kromě těžby modifikován i polohou na hranici styku české, polské a německé kultury v kontextu historických událostí 19. a 20. století. Na počátku období ústředně řízené ekonomiky patřil rozvoj Ostravska k prioritám tehdejšího režimu. Velké investice byly vloženy zejména do výstavby průmyslových podniků a bytů, zatímco sociální infrastruktura zaostávala. Počet obyvatel se v důsledku intenzivní imigrace rychle zvyšoval. Pracovní síla byla charakterizována nadprůměrnými příjmy, ale podprůměrnou kulturní úrovní. Životní prostředí regionu patřilo k nejhorším v celé Evropě.

Teprve v souvislosti se společenskými změnami po roce 1989 dochází k restrukturalizaci ekonomické základny regionu. Těžba uhlí v samotné Ostravě byla ukončena, v jejím okolím utlumena. Jedním z hlavních problémů regionu je odlehlost od centra a poloha na východní hranici rozděleného státu. Jednotlivá města hledají nové funkce a místa v systému osídlení.

Ostrava se vyprofilovala jako jednoznačné středisko oblasti s krajskou funkcí, se třemi univerzitami a dalšími kvartérními funkcemi. Je i kulturním a společenským centrem a také partnerem pro kontakty s protějším střediskem polského Horního Slezska Katovicemi. Výhodou je vybudovaná technická infrastruktura. Nutná rekonstrukce průmyslových částí města je sice finančně náročná, ale umožňuje zvolit koncepčně moderní řešení. To se týká i možnosti vytvoření nového centra města. Předpokladem prosperity je zlepšení napojení na zbytek státu dálniční komunikací a zlepšení průchodnosti hraničních přechodů do Polska. Výhodou je existence letiště Mošnov.

Historický vývoj ostatních důležitých středisek Ostravska byl rozdílný. Ukazuje se, že největší šance má Karviná, která má historické kořeny a k nim administrativní, vysokoškolskou a lázeňskou funkci. Jen o něco hůře je na tom další okresní středisko Frýdek-Místek, které vzniklo z historického dvojměstí. Problematický je Havířov, který

vyrostl jako socialistické město na zelené louce a postrádá většinu městotvorných funkcí. Podobně ani Orlová nikdy nebyla plnohodnotným městem. Český Těšín vyrostl z prestižních důvodů v první polovině 20. století, dnes může těžit z pozice kulturního střediska polské minority. Bývalé středisko hutnictví Třinec může rozšířit své funkce jako východisko do rekreačních terénů Beskyd. Železniční uzel Bohumín zamýšlí revitalizovat svou funkci výstavbou překladiště na konci širokorozchodné železnice z Polska a Ukrajiny.

Jako v celém státě dochází i na Ostravsku k suburbanizačním a dezurbanizačním jevům, které jsou charakterizovány migrací obyvatelstva z velkých měst do malých měst a na venkov. V souvislosti s tím je důležitá otázka dalšího vývoje malých měst Ostravska, která byla dříve ve stínu velkých průmyslových středisek.

Obr. 1 – Ostravsko v rámci Česka
Obr. 2 – Ostravská aglomerace
Obr. 3 – Ostrava – Poruba: monumentální architektura podle sovětského vzoru (foto A. Vaishar)
Obr. 4 – Karviná: staré centrum Fryštát (foto A. Vaishar)
Obr. 5 – Karviná: nové lázeňské objekty ve čtvrti Hranice (foto A. Vaishar)
Obr. 6 – Havířov: radnice (foto A. Vaishar)
Obr. 7 – Orlová: staré hornické osídlení (foto A. Vaishar)
Obr. 8 – Bohumín: radnice v městské části Nový Bohumín (foto A. Vaishar)

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Analyses of population development, population forecasting, population policy, population ageing, demography of minorities, migration, household and family demography, differential and infant mortality, regional demography, historical demography, theoretical problems of demography.

*Chief pedagogical orientation*:
General demography, demographic analysis, population development in the Czech Republic and in the world, demographic models, population policy, population forecasting, applied demography.

*Main research projects since 1996 (project name and responsible person):*
Population Development in the Czech Republic (Z. Pavlík); The impact of social and biological risk factors on infant survival (J. Rychtaříková); Thematic Network for Integrated European Population Studies – NIEPS (T. Kučera, 5th Framework Program, EU); Central and Eastern European Demographic Network (T. Kučera, INTERREG IIc, EU); Spatial Patterns of Population Reproduction in the Czech Republic in 1992 – 1996 according to community level. CEU, RSS (J. Rychtaříková), Population in Prague in the 17th and 18th century (L. Fialová).

*Key periodicals:*
Populační vývoj České republiky (Population Development in the Czech Republic) 1996, 1997, 1998, 1999

*Department members:*
RNDr. Dagmar Bartoňová (migration, social, household demography, censuses)
RNDr. Boris Burcin (mortality, population forecasting, demographic modeling)
RNDr. Ludmila Fialová, CSc. (historical demography)
RNDr. Květa Kalibová, CSc. (general demography, demography of national/ethnic minorities, population development of the world)
RNDr. Jiřina Kocourková (population policy, fertility, mathematical demography)
ing. Jaroslav Kraus (GIS, SAS, applied demography)
RNDr. Tomáš Kučera, CSc. (population forecasting, demographic analysis)
prof. ing. Zdeněk Pavlík, DrSc. (population theories, policy, development of the world, theoretical demography)
doc. RNDr. Jitka Rychtaříková, CSc. (demographic analysis, models, mathematical demography)
RNDr. Libor Stloukal, Ph.D. (demographic analysis, reproductive health, fertility)
Mgr. Marek Tietze (theoretical demography, economics)

**Department of Cartography and Geoinformatics, Faculty of Science, Charles University, Prague**
*Address:* Albertov 6, 128 43 Praha 2, Czechia
*E-mail address:* karto@natur.cuni.cz
*Phone number:* 420-2-21952181
*Web site:* http://prfdec.natur.cuni.cz/~karto
*Head of Department:* doc. ing. Dalibor Moravec, DrSc.

*Chief scientific orientation*:
Theoretic cartography, cartographic informatics, cartographic modelling, digital technologies, geographic information systems and their modifications and applications, remote sensing and its applications.

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*Chief pedagogical orientation*:
Cartography from the viewpoint of cartographic models creation, bound to the remote sensing and GIS. Priority of creative approach, independent student's work on real projects.

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*Main research projects since 2000 (project name and responsible person):*
Climatic Regionalization, Slope Inclination, Exposition for Bonital Soil System of the Czech Republic (D. Moravec); Archaeological Potential of Bohemia – Archaelogical Research Liability (D. Moravec); Development of Technology for Reconstruction of Map Huber 1769. (P. Doubrava, D. Moravec, Opus Publishing Limited London); Informational Potentiality of Satellite Data with High Resolution for Creation Maps (P. Doubrava, D. Moravec); Informatization of the Map Collection of the Charles University Prague (P. Janský, D. Moravec, P. Doubarva); Modelling of administrative areas in districts (D. Moravec, P. Doubrava, HELM Corporation Ltd. Moira); Set of 64 basic map schemes of middle Nile in the scale of 1:100 000 (D. Moravec, P. Doubrava, P. Janský, GIS-geoindustry, Ltd and Sudan Ministry of Finance Chartum).

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*Key periodicals:*
Kartografie a geoinformatika. Mapová sbírka Univerzity Karlovy, Praha (Cartography and Geoinformatics. Map Collection of Charles University Prague.)

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*Department members:*
RNDr. Tomáš Beránek, CSc. (thematic cartography, cartographic expert systems)
doc. RNDr. Richard Čapek, CSc. (geographic cartography, mathematical cartography)
RNDr. Pavel Doubrava (digital processing of remote sensing)
doc. Ing. Miloš Chmelík, CSc. (cartographic modeling, geoinformatics)
ing. Petr Janský, CSc. (historical cartography, cartology)
Mgr. Blanka Hálková Malá (geoinformatics, GIS applications)
ing. Jan Kučera (remote sensing of the Earth)
prof. ing. František Miklošík, DrSc. (cartographic technologies, theoretic cartography)
doc. ing. Dalibor Moravec, DrSc. (geoinformatics, theoretical cartography, cartographic technologies)
ing. Jiří Müller (edition maps)
RNDr. Irena Rybová (thematic cartography, geographic cartography)

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**Department of Geography, Faculty of Science, Masaryk University, Brno**
*Address:* Kotlářská 2, CZ 611 37 Brno, Czechia
*E-mail address:* prosek@sci.muni.cz
*Phone number:* 420-5-42128111
*Web site:* http://www.sci.muni.cz
*Head of Department:* prof. RNDr. Pavel Prošek, CSc.

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*Chief scientific orientation*:
Physical geography (geomorphology, biogeography, urban and rural studies, sustainability), cartography, geoinformatics and remote sensing (computer thematic cart. geoprocessing, mobil GIS, GIS standards), climatology (historical climatology, climatic change, polar climatology), hydrology (HIS, regionalisation), human geography (regional development, geography of population, settlements, agriculture, industry and transport), geographical education.

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*Chief pedagogical orientation:*
Bachelor's and master study: Geography and cartography (geography, physical and human geography, regional geography and regional development, geographical cartography and geoinformatics), Secondary schools teaching geography.
Bachelor's study: Applied geography (Geoinformatics and sustainability, Geoinformatics and regional development), Multibranched geography.

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*Main research projects since 2000 (project name and responsible person):*
Migration and labor market (V. Toušek), Meteorological extremes and their impacts in the Czech Lands since the 16th century (R. Brázdil), Inco Copernicus ABDS for CEEC, Panel GI, GIS A2E, VirelesInfo (M. Konečný), Ecology of coastal Antarctic oasis (P. Prošek).

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*Key periodicals:*
Scripta Facultatis Scientiarum Naturalium Universitatis Masarykianae Brunensis, Geography (Published by Masaryk University, Brno); Folia Facultatis Scientiarum Naturalium Universitatis Masarykianae Brunensis, Geographia (Published by Masaryk University, Brno)

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*Department members:*
prof. RNDr. Rudolf Brázdil, DrSc. (historical climatology, climatic change)
RNDr. Petr Dobrovolný, CSc. (climatology, remote sensing)
doc. RNDr. Milan V. Drápela, CSc. (historic cartography)
RNDr. Vladimír Herber, CSc. (hydrology, education in geography)
doc. RNDr. Alois Hynek, CSc. (physical geography)
doc. RNDr. Jaromír Karásek, CSc. (geomorphology)
RNDr. Miroslav Kolář, CSc. (hydrology)
doc. RNDr. Milan Konečný, CSc. (cartography and geoinformatics)
Mgr. Ondřej Mulíček (social geography)
prof. RNDr. Pavel Prošek, CSc. (polar climatology, topoclimatology, physical climatology)
Mgr. Kamil Láska, Ph.D. (dynamic climatology, polar climatology)
Mgr. Zdeněk Máčka (geomorphology, pedology)
Mgr. Karel Staněk, Ph.D. (cartography and geoinformatics)
doc. Stanislav Řehák, CSc. (geography of transport)
RNDr. Václav Toušek, CSc. (regional development)
doc. RNDr. Jaroslav Vašátko, CSc. (biogeography)
RNDr. Antonín Věžník, CSc. (agricultural geography

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**Department of Geography, Faculty of Pedagogics, Masaryk University, Brno**
*Address:* Poříčí 7, 603 00 Brno, Czechia
*E-mail address:* svatonova@jumbo.ped.muni.cz
*Phone number:* 420-5-43129220
*Web site:* http://www.ped.muni.cz/wgeo/
*Head of Department:* prof. PhDr. Petr Chalupa,CSc.

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*Chief scientific orientation*:
The regional development with direction on the teaching of the scientific subjects.

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*Chief pedagogical orientation*:
Preparation of teachers of geography for the basic school.

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*Main research projects since 2000 (project name and responsible person):*
Landscape Model (J. Kolejka); Landscape Model as a New Tool for Applied Geoscience (J. Kolejka).

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*Department members:*
RNDr. Daniel Borecký (economic geography, regional development)
prof. RNDr. Jaromír Demek, DrCs. (physical geography, doctrine about landscape)
PaedDr. Eduard Hofmann, CSc. (didactic of geography)
prof. RNDr. Stanislav Horník, DrCs. (biogeography, ecology)
prof. PhDr. Petr Chalupa, CSc. (regional geography of Czechia, economic geography)
PhDr. Dana Chalupová (regional geography of America)
RNDr. Jaromír Kolejka, CSc. (landscape ecology, GIS and remote sensing)
prof. ing. Lubomír Lauermann, CSc. (cartography)
RNDr. Jozef Mečiar (population geography, political geography, regional geography)
RNDr. Svatopluk Novák,CSc. (cartography, physical geography)
PhDr. Hana Svatoňová (GIS and remote sensing)

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**Department of Geography Faculty of Science, Palacky University, Olomouc**
*Address:* Svobody 26 771 46 Olomouc, Czechia
*E-mail address:* geogr@prfnw.upol.cz
*Phone number:* 420-068-5634501 (secretary)
*Web site:* http://www.upol.cz/resources/geography/
*Head of Department:* doc. RNDr. Miroslav Vysoudil, CSc.

*Chief scientific orientation*:
GIS application in physical geography; climate of surface atmosphere layer; socio-economic research for landscape and urban planning; evaluation of teaching in geography.

*Chief pedagogical orientation*:
Master's level courses: geography – maths, geography – sports, geography – biology - geology, geography – biology – environmental studies.

*Main research projects since 2000 (project name and responsible person):*
Transformation of Spatial Intra-Urban Structures and their Reflection in Perception. Comparative Study: Prague, Bratislava, Olomouc and Prešov (Z. Szczyrba for Olomouc, RSS/OSSF); Study of Alpinekarst and Glacier Types of Georelief in the Austria (M. Vysoudil, AKTION Czechia – Austria); Second homes in the Czech Republic and its relation to other forms of tourism (P. Ptáček), The position of the border area in the regional development of Czech Republic with focus on an integration of CR into European structures (I. Smolová).

*Key periodicals:*
ACTA Universitatis Palackianae Olomucensis, Facultas Rerum Naturalium, Geographica, Published by Palacky Univerisity, Olomouc, ISBN 80-7067-839-9, ISSN 0231-9365.

*Department members:*
Mgr. Miloš Fňukal Ph.D. (regional and political geography)
Mgr. Renata Chmelová (hydrology, geoecology)
Mgr. Aleš Létal (biogeography, GIS, landscape ecology)
doc. RNDr. Miroslav Pluskal,CSc.(regional geography, didactics)
Mgr. Pavel Ptáček (settlement geography, regional development)
Mgr. Irena Smolová, Ph.D. (geomorphology, regional geography)
Mgr. Zdeněk Szczyrba, Ph.D. (economic geography, regional development)
doc. RNDr. Miroslav Vysoudil,CSc. (climatology, remote sensing)

**Department of Geoinformatics Faculty of Science, Palacky University, Olomouc**
*Address:* tr. Svobody 26, 771 46 Olomouc, Czechia
*E-mail address:* vitek@risc.upol.cz
*Phone number:* 420-068-5634513
*Web site:* http://www.geoinformatics.upol.cz/
*Head of Department:* doc. RNDr. Vít Voženílek, CSc.

*Chief scientific orientation*:
Fundamental research in all fields of geoinformatics – GIS, remote sensing, GPS, geostatistics etc., Applications of geoinformatics in geosciences (geography, geology, geoecology etc.), Cartography, Geography education on web.

*Chief pedagogical orientation*:
Bachelor's level course: Geography and geoinformatics.

*Main research projects since 2000 (project name and responsible person):*
Linking and Application of GPS and GIS technologies for landscape mapping (V. Voženílek); Regional Information System for Environmental Hazards (V. Voženílek).

*Key periodicals:*
ACTA Universitatis Palackianae Olomucensis, Facultas Rerum Naturalium, Geographica ( Published by Palacký Univerisity, Olomouc), ISBN 80-7067-839-9, ISSN 0231-9365

*Department members:*
ing. Zdena Dobešová (computer science)
Mgr. Emil Kudrnovský (geostatistics, geoinformatics in human geography)
Mgr. Michal Bíl (remote sensing, geoinformatics in physical geography)
Mgr. Pavel Sedlák (cartography, GIS, remote sensing)
doc. RNDr. Vít Voženílek, CSc. (GIS, cartography)

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**Department of Social Geography and Regional Development, Faculty of Science University of Ostrava**
*Address:* Hladnovská 9, 710 00 Ostrava, Czechia
*E-mail address:* surname@osu.cz
*Phone number:* 420-69-6241082
*Web site:* http://prf.osu.cz/ksg/
*Head of Department:* doc. RNDr. Vladimír Baar, CSc.

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*Chief scientific orientation*:
Ethno-national problems and multicultural systems, development of the border areas, urbanization and industrial regions, European and other world integrational processes, regional development, regional policy, city and regional marketing.

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*Chief pedagogical orientation*:
Professional training of geography teachers, European dimension in the geographical education, creation of the geographical text-books.

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*Main research projects since 2000 (project name and responsible person):*
Administrative, Economic and Territorial Decentralization of the Russian Federation (V. Baar); The Transfer and Difusion of Educational Moduls for Geographers in the Czech Republic and Its Neighbours (P. Rumpel, National Training Fund Leonardo da Vinci); The Preparation of Geography Teachers for Realization of European Dimenzion in Geographical Education (P. Šindler, A. Wahla); Globalization and Territorial Economic Development of the Region of Northern Moravia and Silesia (P. Šindler, A. Wahla); The Professional Preparation of Geography Teachers (A. Wahla); The Position of the Border Areas in the Regional Development of the Czech Republic With Regard to the CR Entry to the European Structures (P. Wilam), Asian Migrants in the Czech Republic (V. Baar).

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*Key periodicals:*
ACTA Facultatis Rerum Naturalium - Geographia-Geologia, published by Universitas Ostraviensis, Ostrava

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*Department members:*
doc. RNDr. Vladimír Baar, CSc. (political, cultural and historical geography, geography of Asia, Russia and Oceania, international relations)
Mgr. Eleonóra Hamar (sociology, ethnicism and nationalism, multicultural and multiethnic systems)
RNDr. Jan Havrlant, CSc. (regional geography of Czechia, environmental problems of Czechia, geography of tourism)
Mgr. Martin Kovář (political geography, geography of Africa and Arab countries, didactics of geography)
Mgr. Petr Rumpel, Ph.D. (political geography, local and regional development, European integration, theoretical geography)
doc. RNDr. Tadeusz Siwek, CSc. (perception of geographical space, geography of North America and Australia, cultural geography, global problems)
doc. RNDr. Petr Šindler, CSc. (political geography, urban geography and urbanisation, regional development)
Mgr. Monika Šumberová (international relations, international law, politology, diplomacy)
doc. PaedDr. Jaroslav Vencálek, CSc. (population geography, demography, social geography, territorial identity, sociogeographical synthesis)
doc. RNDr. Arnošt Wahla, CSc. (didactics of geography, geography of education, social infrastructure)

Mgr. Petr Wilam (geography of industry and transport, geography of Latin America, transborder co-operation)
Mgr. Petr Žufan (geography of agriculture, geography of services, science and research, geography of Europe)

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**Department of Physical Geography and Geoecology, Faculty of Science, University of Ostrava**
*Address:* 30. dubna 22, 701 03 Ostrava 1, Czechia
*E-mail address:* firstname.surnameosu.cz (e.g. Jaromir.Kanokosu.cz)
*Phone number:* 420-69-6160211
*Web site:* http://albert.osu.cz/~kfgg/
*Head of Department:* RNDr. Jaromír Kaňok, CSc.

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*Chief scientific orientation*:
Anthropogenic influence of the rivers of the Oder Basin; geoecology, geomorphology, soil erosion; thematic cartography, creation of small regional atlasses by GIS technology, mental maps.

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*Chief pedagogical orientation*:
Physical geography and geoecology, protection and creation of landscape (environmental geography), cartography and geoinformatics.

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*Main research projects since 2000 (project name and responsible person):*
Geographical and ecological changes of the environment and structures of industrial regions (V. Kříž)

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*Key periodicals:*
Sborník prací Přírodovědecké fakulty Ostravské univerzity (Faculty of Science of the Ostrava University Works). Geografie–Geologie, Acta Facultatis Rerum Naturalium Universitatis Ostraviensis. PřF OU, Ostrava, 1996 – 2002.

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*Department members:*
doc. RNDr. Ladislav Buzek, CSc. (geomorphology, soil erosion)
ing. Radek Dušek (mathematical cartography)
Mgr. Jan Hradecký (geoecology, geomorphology)
RNDr. Jaromír Kaňok, CSc. (anthropogenic hydrology, thematic cartography, GIS)
prof. RNDr. Ing. Vladislav Kříž, DrSc. (hydrology, anthropogenic hydrology, climatology)
Mgr. Monika Mulková (remote sensing, GIS)
Mgr. Lubomír Müller, CSc. (hydrology, statistics, operations research)
Mgr. Tomáš Pánek (applied geomorphology)
RNDr. Jan Prášek (applied geomorphology, morphotectonics, environment)
Mgr. Tomáš Rozehnal (geology, hydrogeology)

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**Department of Geography, Pedagogical Faculty, West Bohemian University, Plzeň**
*Address:* Veleslavínova 42, 306 19 Plzeň, Czechia
*E-mail address:* dokoupil@kge.zcu.cz
*Phone number:* 420-19-7329486
*Web site:* http://www.pef.zcu.cz/pef/kge
*Head of Department:* PaedDr. Jaroslav Dokoupil, Ph.D.

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*Chief scientific orientation*:
Cross-border development and cooperation, geographical information systems, the influence of highway construction on the landscape, job market, regional development strategy, dendroid graptolite, revitalisation of watercourses.

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*Chief pedagogical orientation*:
Compilation textbooks for all educational levels, study texts for universities, video-textbooks, collaboration on school atlases, teacher's handbooks compilation

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*Main research projects since 2000 (project name and responsible person):*
Status of border areas in the regional development of the Czech Republic with a view to the integration of the Czech Republic into European structures. (J. Dokoupil); Complex regional research of the West Bohemia (J. Dokoupil); Realisation of a West Bohemian geographical system (M. Novotná); Using of GIS for teaching of regional geography (M. Novotná); Occupation-related migration as an element of the Czech cross-border labour market in the context of European integration (J. Dokoupil)

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*Department members:*
Mgr. Pavel Červený (matematical geography and cartography)
PaedDr. Jaroslav Dokoupil, Ph.D. (regional geography and regional development)
Mgr. Jan Hájek (regional geography of the world, didactics geography, pedagogical practice)
Mgr. Jan Kopp (physical geography, geoecology)
doc. RNDr. Jaroslav Kraft, CSc. (geology, paleontology)
doc. PaedDr. Alena Matušková, CSc. (population and cities geography, didactic of geography and homeland)
Mgr. Pavel Mentlík (physical geography, geographical informational systems)
RNDr. Marie Novotná, CSc. (regional geography of the Czech Republic, socioeconomical geography of the Czech Republic, geographical informational systems)
Mgr. Zdeněk Reitspies (political geography, regional geography of the world)
PaedDr. Jiří Suda (physical geography)

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**Department of Geography, Pedagogical Faculty, J. E. Purkyně University, Ústí nad Labem**
*Address:* České mládeže, 400 21, Ústí nad Labem, Czechia
*E-mail address:* geograf@pf.ujep.cz
*Phone number:* 420-47-5214417
*Web site:* http://www.pf.ujep.cz
*Head of Department:* doc. RNDr. Jiří Anděl, CSc.

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*Chief scientific orientation*:
Regional research is focused on revealing the laws of physical and human geography, e.g. the environment, settlement structure; a methodological research (study programmes innovation); the concept of regions in human geography (on local, regional and macroregional level); ecological and environmental load assessment; regional development and cross-border cooperation.

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*Chief pedagogical orientation*:
Some 350 students are trained to become teachers at elementary and high schools. Study programmes for graduated students, preparation of study texts and instruments.

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*Main research projects since 2000 (project name and responsible person):*
Euroregion Elbe/Labe in facts, graphs and maps (Programme Phare, M. Jeřábek); Study programmes and the international charter of geographical education IGU (J. Anděl); Geographical Changes Of The Environment And Sociogeographical Regional Structure – Usti County (J. Anděl), Landscape Synthesis Aplicated Through GIS For Regional Planning (M. Balej), Environmental Education And Knowledge For Geography Teachers – Practical Courses (K. Kunc), Geography Multimedia Study (J. Anděl), Land Use – Land Units Using In Model Areas (J. Anděl)

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*Key periodicals:*
ACTA Universitatis Purkynianae, Studia geographica (Published by University of Ústí nad Labem)

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*Department members:*
doc. RNDr. Jiří Anděl, CSc. (regional geography, population geography)
Mgr. Martin Balej (geoecology, sustainable development)
Milan Bursa, CSc. (economical geography)
RNDr. Ivan Farský, CSc. (physical geography, cartography)

RNDr. Alena Chvátalová, Ph.D. (planetary geography, geology and geomorphology)
RNDr. Milan Jeřábek (population geography, regional development)
Prof. RNDr. Václav Král, CSc. (physical geography, geomorphology)
doc.RNDr. Karel Kunc (theory of landscape, environmental geography)
Mgr. Tomáš Oršulák (GIS, digital models)
PaedDr. Jana Peštová (teaching techniques in geography, mathematical methods)
doc. RNDr. Ladislav Skokan, CSc. (economical and regional geography)
Mgr. Eva Šindelářová (introduction in the geography, regional geography)

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**Department of Geography, Pedagogical Faculty, University of South Bohemia, České Budějovice**
*Address:* Jeronýmova 10, 371 15 České Budějovice, Czechia
*E-mail address:* kubes@pf.jcu.cz
*Phone number:* 420-38-7773098
*Web site:* http://www.pf.jcu.cz
*Head of Department:* doc. RNDr. Jan Kubeš, CSc.

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*Chief scientific orientation*:
Rural geography, landscape planning, geography of industry, geography of recreation.

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*Chief pedagogical orientation*:
Training future geography teachers for secondary schools.

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*Main research projects since 2000 (project name and responsible person):*
Second homes in the Czech Republic and relations to other forms of tourism (J. Kubeš).

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RNDr. Jiří Čekal (didactics of geography, geodemography)
Mgr. Miroslav Daněk (human geography)
prof. RNDr. Stanislav Chábera, CSc. (geomorphology)
doc. RNDr. Jan Kubeš, CSc. (rural geography, landscape planning)
Jindřich Rozkopal, p. g. (mathematical geography)
Mgr. Jiří Rypl (physical geography)
Mgr. Michal Vančura (human geography, geography of industry)

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**Department of Environmental Geography, Institute of Geonics, Czech Academy of Sciences, Brno**
*Address:* Drobného 28, 602 00 Brno, Czechia
*E-mail address:* geonika@geonika.cz
*Phone number:* 420-5-45422711
*Web site:* http://www.geonika.cz
*Head of Department:* RNDr. Antonín Vaishar, CSc.

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*Chief scientific orientation*:
Regional environmental studies in urban and rural systems under conditions of transition, environmental hazards, problems of protected landscape areas.

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*Main research projects since 2000 (project name and responsible person):*
Regional Assessment of Environment under Conditions of Transformation of the Czech Republic (O. Mikulík); New Prosperity for Rural Regions (A. Vaishar, RSS OSI/HESP); Floods, Landscape and People in the Morava Catchment Area (A. Vaishar), Suppression of Mining Activities and its Impact on Environment and Actions in the Litosphere (O. Mikulík)

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*Key periodicals:*
Moravian Geographical Reports (Published by Institute of Geonics, Brno, since 1993)

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*Department members:*
RNDr. Sylvie Hofírková (physical geography)
RNDr. Mojmír Hrádek, CSc. (geomorphology)

RNDr. Antonín Ivan, CSc. (geomorphology)
Mgr. Eva Kallabová (social geography)
RNDr. Karel Kirchner, CSc. (geomorphology)
Mgr. Alžběta Klímová (sociology)
PhDr. Barbora Kolibová (sociology)
ing. Jan Lacina, CSc. (biogeography)
RNDr. Oldřich Mikulík, CSc. (social geography)
RNDr. Jan Munzar, CSc. (climatology)
RNDr. Stanislav Ondráček (hydrology)
Mgr. František Pokluda (social geography)
RNDr. Evžen Quitt, CSc. (climatology)
Mgr. Anna Rafajová (biogeography)
Mgr. Šárka Střítežská (biogeography)
Mgr. Pavel Šotnar (social geography)
RNDr. Antonín Vaishar, CSc. (social geography)
RNDr. Jana Zapletalová, CSc. (geography of transport and recreation)

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**Department of Geography, Faculty of Education, Technical University, Liberec**
*Address:* Hálkova 6, 461 17 Liberec, Czechia
*E-mail address:* Vaclav.postolka@vslib.cz
*Phone number:* 420-48-5352311
*Web site:* http://www.vslib.cz
*Head of Department:* RNDr. Václav Poštolka

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*Chief scientific orientation:*
Department founded in 1998 is still looking for its main and specific scientific and applied focus areas (e.g. transfer of cross-border co-operation on the environmental, economic and social issues, esp. within borderland areas and its impacts).

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*Main research projects since 2000 (project name and responsible person):*
Regional and Local Management – project of new undergraduate curriculum in the frame of the trilateral University of Nisa / Neisse / Nysa (V. Poštolka); Cross-border co-operation and communication via creating Atlas of the Euroregion Nisa (V. Poštolka, K. Poplová).

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*Key periodicals:*
Vědecká pojednání / Wissenschaftliche Abhandlungen / Prace Naukowe (issued by the Academic Coordination Centre at the Euroregion Nisa / Neisse / Nysa, Liberec / Zittau / Jelenia Góra)

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*Department members:*
Mgr. ing. Tomáš Hendrych (physical geography and landscape ecology)
RNDr. Jaroslav Líska (teaching of geography, regional geography)
RNDr. Alois Matoušek, CSc. (teaching of geography, regional geography)
RNDr. Ivana Pecháčková (regional and social geography, tourism)
Mgr. Klára Popková (cartography and geoinformatics, cultural geography)
RNDr. Václav Poštolka (political geography, environmental and land-use issues)
Mgr. Jiří Šmída (GIS, physical geography and landscape ecology)
Mgr. Jaroslav Vávra (teaching of geography, regional and economic geography)

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**Czech Geographic Society**
*Address:* Na Slupi 14, Prague 2, Czechia
*E-mail address:* perlin@natur.cuni.cz
*Phone number:* 420-2-21952206
*Web site:* http://www.geography.cz
*President:* doc. RNDr. Ivan Bičík, CSc.

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*Key periodicals:*
Geography – Journal of Czech Geographic Society
Geographical Views
*Characteristic:* Scientific society of Czech geographers

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*Structure:*
Socioeconomic section
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doc. RNDr. Vít Voženílek, CSc.

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# Geography – Journal of Czech Geographic society – abstract of articles in period 2000 – 2001

## Geography – Journal of Czech Geographic society, Vol. 105, 2000

**ARTICLES:**

BIČÍK Ivan, HAMPL Martin: *Czech Human Geography: Research and Problems.* – Geografie – Sborník ČGS, 105, 2, pp. 118–128 (2000). The contribution has two main aims. Firstly, it is an evalution of contemporary research trends in the Czech human geography. The consequences of the recent long – lasting isolation of the Czech Republic, as well as the impact of current world human geography are both expolred and assessed. Secondly, theoretical issues of human geography are discussed, such as the cognitive functionof geography, its relations to social and environmental sciences, problem of regularities in human geographical realm, etc.

Key words: paradigms of human geography – research topics – classification of real systems – hierarchical organization.

BRZÁK Martin: *Contribution to the geomorphology of the southernmost part of the Třebíč Massif.* – Geografie – Sborník ČGS, 105, 4, pp. 347–360 (2000). Geological maps, with the exception of the newest ones, present this part of the Třebíč Massif in the studied area incorrectly as a part of the Moldanubicum. Conspicuous Neogene tectonic forms (e. g. fault-line valleys, fault-angle valleys) were discovered in the SE marginal part of the massif. Relations between the Tertiary and the older (mainly Variscan) tectonics were studied. Regularity of spatial distribution of the most frequent durbachite forms, as low exfoliation domes, was founded.

Key words: The Třebíč Massif – durbachite – fault-line valley – fault-angle valley – exfoliation.

BUZEK Ladislav: *Erosion of forest soil under conditions of higher precipitation and snow melt (case study central part of the Moravskoslezské Beskydy Mountains).* – Geografie – Sborník ČGS, 105, 4, pp. 317–332 (2000). Water erosion is an important degradation agent not only on the agricultural land but it also shows up on the forested soil. It is associated with the progress of forest mechanisation and with changing forest cover and occurs especially under exceptional hydrometeorological situations. Intensive water erosion is often combined with gravitation processes (landslides). Research of water erosion has been organized by the Department of Physical Geography and Geoecology of the Ostrava University since 1976 in the central part of the Moravskoslezské Beskydy Mountains (especially in the basin of the Upper Ostravice River). The article shows results of analysis of suspended load régime between 1976 and 1998. Suspended load as a transition part of the erosional products is an evidence of the intensity of erosional processes of the observed catchment.

Key words: water erosion – suspended load – water runoff – precipitation.

DANĚK Petr: *Does exist a political culture of the Czech borderland?* – Geografie – Sborník ČGS, 105, 1, pp. 50–62 (2000). The article analyses the differences in voting behaviour of the population in borderland and „inland" of the Czech Republic as spatial units sharply differing in their migration history in the 1940's: the borderland being a target region of a large-scale resettlement following the expulsion of Germans in 1945-46, while the inland was source region of the migrations. The results of the 1992, 1996 and 1998 parliamentary elections were analysed on two hierarchical levels by ANOVA models to test the hypothesis that the borderland and the inland are significantly different from the point of view of voting behaviour of the population. Four out of eight variables describing voting behaviour have distinct values for the borderland and the inland, even after setting apart the impact of differences in the population structure by incorporation of covariates into the model. It suggests that the pre-war ethnic boundary within the Czech Lands is a significant contextual factor standing behind the variability of electoral results still in the 1990's.

Key words: voting behaviour – analysis of variance – migration history – social structure – borderland – Czech Lands.

DOKOUPIL Jaroslav: *Theoretical approaches to the problems of borderland with application in the Czech-Bavarian space.* – Geografie – Sborník ČGS, 105, 1, pp. 10–18 (2000). The paper deals with the functional impact of the border on the borderland with the help of theoretical models of situations in the borderland and border effects. The new situation in Europe demands to complete the existent theoretical constructions by new factors. Theoretical approaches are applied in the Czech-Bavarian space.

Key words: border – borderland – model – effect – Czechia – Bavaria.

HAMPL Martin: *Border regions in the Czech Republic: contemporary tendencies of development differentiation.* – Geografie – Sborník ČGS, 105, 3, pp. 241–254 (2000). – The article focuses on problems of current tendencies differentiating between borderland and inland, and among border regions themselves. First, the borderland – inland differences are still limited, but they will be probable deepening in future. Second, the differences among border regions are important both in intensity of settlement and in economic level, and in current development dynamics. Key factors of regional differentiation appear to be macro – locational position and inherited economic specialization.

Key words: regionalization and typology – factors of regional differentiation – problems of economic restructuralization.

HYNEK Alois: *Training Geography Educators.* – Geografie – Sborník ČGS, 105, 2, pp. 177–189 (2000). Czech didactic methods of geography ( teaching/learning geography) has just started its fifth wave in training geography educators at eight university faculties. The current debate is on developing a curriculum emphasizing the position of geography education as the applied discipline of the science/art of geography. 'Challenge for 10 million' is a national debate on the Czech educational system organized by the governmental Dept. of Schools, Youth and Physical Culture, being very critical to teaching geography at primary and secondary schools. That is the reason for the strong re-assessment of social, environmental/ecological, economic, cultural and political relevance on the subject of geography in the educational process. This discourse is also intended for international communication starting in the educational commission of IGU/UGI.

Key words: Geography educators – study programmes – didactic methods of geography – educational reform.

JANSKÝ Bohumír: *A New Survey of Sources of the Amazon.* – Geografie – Sborník ČGS, 105, 2, pp. 129–140 (2000). From the 16th of June to the 1st of July 1999 the expedition Hatun Mayu (meaning Big River in Quechua) explored the source area of the Apurímac River in southern Peru. The seven member expedition was lead by the author of this article, a member of the Faculty of Science, Charles University, Prague. The aim of the group was to measure the lenght of the main source of the Apurímac River currently considered by most hydrologists as the longest source segment of the Amazon. In addition, the expedition members maesured flows and altitudes in order to create the lenghtwise profile of the Río Carhuasanta stream.

Key words: Amazon – Apurímac River Río Carhuasanta stream – expedition Hatun Mayu.

JEŘÁBEK Milan: *Borderland in regional development and the relevant research.* – Geografie – Sborník ČGS, 105, 1, pp. 1–9 (2000). The geographic public receives another monothematic issue dedicated this time to the Czech borderland. Specific problems, conditioned by differentiated physical-geographical and mainly social-economic conditions of the given territory, have been studied since the 1930´s. The 1990´s have undoubtedly brought a new impulse to its development connected both with internal processes (democratization of the society, economic transformation, etc.) and external aspects (for instance its exposed position, transitory function, European integration). The running changes have become a challenge for researchers from different geographical work places studying, up to now in a more or less isolated way, only segments of the borderland (for instance those of Ústí nad Labem are interested in the Bohemian-Saxon border). Two similarly aimed projects monitoring the part of the Czech borderland, the importance of co-operation with neighbouring countries and integration of the Czech Republic into European structures have been solved with the backing of the Ministry of Foreign Affairs of the Czech Republic (1998 – 1999) and the Grant Agency of the Czech Republic (1999 – 2000). The authors of the published papers mainly come from the work places involved in these two

projects, but also other colleagues, including those from abroad, have been invited to take part. The intention of this volume is to stress the concrete problems or situations in the model borderland regions and to rise up a discussion on the problems of the borderland at present and in the future.

Key words: borderland – border effect – exposed position – transit – regional development – regional policy – Europe – differentiation – integration – Euroregion.

JEŘÁBEK Milan, KUCERA Katerina, MÜLLER Bernhard, PŘIKRYL Jan: *Perception of social-economic development in the Czech-Saxon borderland – case study on the local level of the towns of Kraslice and Klingenthal.* – Geografie – Sborník ČGS, 105, 1, pp. 19–33 (2000). As an example of observation of social-economic development in the borderland as a specific territorial type can be given a study of changes in two neighbouring towns at the Czech-German (Saxon) border, that has been in the last years in the centre of research interest of several institutions. This contribution is one of the outputs of the international project "Borderland as a space of mediation" backed by the German Federal Foundation for Environment in Osnabrück and solved by a work community including universities, research institutions and consulting companies. The findings obtained by inquiring population show the complicated character of the present development (at microregional/local level), ambiguous perception of running processes and a different degree of readiness to co-operation.

Key words: border – borderland – trans-border co-operation – border crossing.

KLIMENT Zdeněk: *Balance, regime and geochemistry of suspended sediment of the Blšanka River.* – Geografie – Sborník ČGS, 105, 3, pp. 255–265 (2000). The article evaluates the results of four-year measurements of suspended sediment in the Holedeč profile at the Blšanka River in the northwest Bohemia. The main attention is paid to the typology of the individual regime situation and to geochemical analysis of suspended sediment particles and active bank sediments.

Key words: Blšanka River – suspended sediment – geochemistry.

KOLLÁR Daniel: *Slovak commuter migration into Austria – reality versus imaginations.* – Geografie – Sborník ČGS, 105, 1, pp. 41–49 (2000). The commuter migration from Slovakia into Austria occupies a special position in Europe. The relatively short distance between Bratislava and Vienna encourages a rapid creation of information networks and permits job-seekers to find work in line with their qualification without too much financial outlay. Unlike other groups of migrants, the Slovakian commuters experience almost no dequalification and do not have to take up a marginal position on the labour market. It is remarkable that both the public opinion and the official statistics have failed to register this new development and therefore the realistic figures to fully comprehend it are lacking. The fact that this form of East-West mobility is being accepted without comment as "the new normality" may, perhaps, be attributed to the common bonds of the past.

Key words: East-West mobility – commuter migration – labour market – imaginations on the work.

NOVOTNÁ Marie: *Evaluation of Agricultural Landuse in the Pošumaví Region.* – Geografie – Sborník ČGS, 105, 1, pp. 34–40 (2000). This article gives account of the research carried on in the border area of the Klatovy, Prachatice and Český Krumlov districts. This region has specific features the significance of which surpasses its geographical limits. Its location near the state boundary has significantly influenced its economic and social development. Farming and forestry have always played a significant role among the economic activities of the population. Today we witness an enhanced development of the tertiary sector, primarily of the services focussed on tourism. Farming and forestry, however, will remain an indispensable sector due to their landscape formation function. The whole study is based on methods of the geographical information system (GIS). The data from the land registers of the cadastre offices have been used as well.

Key words: agricultural usage – arable land – prices.

ONDŘEJ Tomáš: *Planation surfaces of the Valašskobystřická vrchovina Highland and of its northern foreland.* – Geografie – Sborník ČGS, 105, 4, pp. 333–346 (2000). – The article deals with planation surfaces of the Valašskobystřická vrchovina Highland and with the development of its relief in the Upper Tertiary. The existence of recent tectonic activity, indicated by height differences in the same planation levels, was proved.

Key words: planation surfaces – neotectonics – Neogene development.

SIWEK Tadeusz, KAŇOK Jaromír: *Mapping Silesian Identity in Czechia.* – Geografie – Sborník ČGS, 105, 2, pp. 190–200 (2000). The aim of the article is to investigate the degree of regional identity among the inhabitants of historical Czech land Silesia, to compare it with the available census data and to draw a cognitive map of Czech Silesia, that means mapping how Silesians themselves imagine their region. A general mental map of Silesia was drawn on the basis of individual respondents' maps. The map shows the core, domain and peripheral areas of the Czech Silesia in minds of its inhabitants. This method was combined with interviews aimed at establishing respondents' sense of regional identity. The sense of Silesian identity is relatively strong among elderly people. It is quite weak among the young and – surprisingly – among the educated people. As every regionally based sentiment, Silesian identity is confronted with forces of globalisation.
Key words: regional identity – perception – Silesia – Czechia.

TOUŠEK Václav, VANČURA Milan, VITURKA Milan: *Geographical Aspects of Industrial Transformation in the Czech Republic.* – Geografie – Sborník ČGS, 105, 2, pp. 155–165 (2000). The share of industrial production on GNP has been decreasing over the 1990s in the Czech Republic and, in the same time, a branch restructuring took place. The industrial transformation is accompanied by a decline of labour force and an increase of unemployment. Better situation has been observed in the territories with an inflow of foreign capital. The article deals with the significant role of direct foreign investments for the regional development. The analysis of investment localization is linked with the theory of development polarization.
Key words: industry – transformation – foreign investments – development polarization.

VAISHAR Antonín, HLAVINKOVÁ Pavlína, KIRCHNER Karel, LACINA Jan: *Long-Term Impacts of the 1997 Floods in the Morava River Basin.* – Geografie – Sborník ČGS, 105, 2, pp. 141–154 (2000). In 1997 disastrous floods, unparalleled since meteorological and climatic measurements have been carried out, took place in the catchment of the Morava river and other Moravian rivers. The long-term impacts of the above-mentioned flood event on the landscape and society have been examined in four selected model areas with different natural and economic characteristics. Within the natural system, the long-term impacts include changes in riverbeds, landslides and changes in the biota. Within the social system, the most significant adverse impacts include the long-term damage to the psychical health of those affected by the flood. The main causes of the flood damage are connected with the formation of the settlement pattern during the period of industrialisation and urbanisation. The main methods of flood protection include the relocation of structures outside inundated areas, technical control and the adaptation to flood risks.
Key words: natural risks – floods – the Morava river – long-term impacts.

VOŽENÍLEK Vít, DEMEK Jaromír: *Modeling of soil erosion hazards as a response of land use changes.* – Geografie – Sborník ČGS, 105, 2, pp. 166–176 (2000). It is generally accepted that land use changes influence fluvial regime, especially generation of surface runoff, water discharge in water courses, and soil erosion. The disturbances in fluvial systems of old cultural landscapes caused by land use changes bring many difficulties in landscape management (floods, accelerated soil erosion, silting of river beds, etc.). The land use structure in the Trkmanka River catchment in the Czech Republic consisted until 1953 of fragmented plots (small patches of land, ribbons) and later has been changed into large fields with agricultural monocultures. The catchment is known for the highest values of soil erosion in the Czech Republic. Testing of common soil erosion models showed that they are not fitted for the catchment. A new model of soil erodibility is proposed in this paper.
Key words: soil erosion – modeling – GIS.

**REVIEWS**

BALATKA Břetislav, PŘIBYL Václav, VILÍMEK Vít: *Morphotectonic features of the relief in the drainage area of the upper Jihlava River.* – Geografie – Sborník ČGS, 105, 3, pp. 276–285 (2000). – The results of the morphostructural analysis based on detailed geomorphologic mapping, as well as an analysis of fissures and fault tectonics are presented. The research leads to a deeper knowledge on the geomorphologic evolution of the area.

Key words: morphotectonics – geomorphologic development – Českomoravská vrchovina Highland.

HAVLÍČEK Tomáš: *The population development in the borderland of South Bohemia and Upper Austria after the Second World War.* – Geografie – Sborník ČGS, 105, 1, pp. 77–85 (2000). The article briefly analyses the population development in the Czech-Austrian borderland and that in five time horizons during the period 1950-1997. The model territory (municipalities of four near-border districts) manifested a very intensive development of the number of inhabitants due mainly to the transfer of the inhabitants of German nationality after the Second World War and the establishment of the so-called iron curtain. What a strong barrier for population development was the existence of the iron curtain and has its fall caused new development tendencies? In general it can be said that nearer the locality was to the border line, more the number of inhabitants stagnated or even decreased. After the fall of the iron curtain the model territory has been getting more attractive and the number of inhabitants has been progressively growing.
Key words: population – borderland – South Bohemia – Upper Austria.

CHROMÝ Pavel: *Historical-geographical aspects of delimitation of the borderland and of its geographical analysis.* – Geografie – Sborník ČGS, 105, 1, pp. 63–76 (2000). The article deals with alternative possibilities of delimitation of border territories in Czechia from historical-geographical and cultural-geographical points of view and with the indispensable usage of historical analysis of territory in geographical analysis of territory. An attention is paid to suggestions of a possible orientation of regional geographical research and to spatial variability of Czech borderland in time. The conclusion outlines the typology of the borderland from the point of view of its inner differentiation of the functional-spatial dynamism and social-spatial transformations during the last 150 years.
Key words: historical-regional geography – cultural geography – historical-geographical region – border – borderland – regional identity.

OUŘEDNÍČEK Martin: *Theory of Stages of Urban Development and Differential Urbanisation.* – Geografie – Sborník ČGS, 105, 4, pp. 361–369 (2000). Two theories of urban development are described in this article. Both are based on stages of economic development. The article critically compares these theories and tries to figure out theirs common features to describe a single evolutionary model of urban development.
Key words: urbanisation – stages of urban development – differential urbanisation.

VÍTEK Jan: *Forms of phyllonite weathering and denudation in the Hrubý Jeseník Mts.* – Geografie – Sborník ČGS, 105, 3, pp. 266–275 (2000). – Weathering and denudation forms of phyllonite (retrogressively metamorphosed gneiss) in the Hrubý Jeseník Mts. (northern Moravia) are described in this paper. Rock mesoforms (frost-riven cliffs, ridges and tors) are results of cryogenic periglacial processes. Numerous microforms of rock surface (such as rock hollows, tafoni, honeycombs and rock perforations) were formed by selective weathering processes of unequally resting positions of heavy schistose rock.
Key words: Hrubý Jeseník Mts. – phyllonite – cryogenic forms – microforms.

## Geography – Journal of Czech Geographic society, Vol. 106, 2001

**ARTICLES:**

BIČÍK Ivan, JANČÁK Vít: *Czech Agriculture after1990.* – Geografie – Sborník ČGS 106, 4, pp. 209–221 (2001). The paper describes the Czech agriculture in thr transformation period after 1990. It analyses the basic changes, which has occurred in Czechia since the end of the totalitarian period. Attention is also paid to the development of the systém ob subsidies, to the changes in the intensity of agricultural production, to the changes in alimentary consumption and especially to regional impacts of the transformation processes in the Czech agriculture. The SWOT analysis of the Czech agriculture is also discussed.
Key words: agricultural production – alimentary consumption – transformation processes – regional impacts.

BRÁZDIL Rudolf, VALÁŠEK Hubert: *The Description of the Climate of Moravia by Kryštof Passy from the year 1797.* – Geografie – Sborník ČGS, 106, 4, pp. 234–250 (2001).

The manuscript of the "Introduction to the Knowledge on the Hereditary Markgraviate of Moravia" as an appendix to the lecture of political science at the Olomouc lyceum written in 1797 by prof. Kryštof Passy deals also in several paragraphs with the description of the climate of Moravia. The author, departing from the meteorological observations by Josef Gaar in Olomouc, mentions the description of air pressure, temperature and moisture, evaporation and wind. Besides the description of regional peculiarities of the Moravian climate, Passy tries to explain their causes and deals in detail with the effect of eight basic wind directions on changes in air temperature, air moisture and the course of weather from January to July. Passy's description is verified with respect to the results of modern measurements and the present-day knowledge on Moravian climate.

Key words: the climate of Moravia – meteorological measurements in Olomouc – meteorological elements – Kryštof Passy – Josef Gaar.

CZUDEK Tadeáš, HILLER Achim: *Development of the Odra River floodplain in the Ostrava Basin.* – Geografie – Sborník ČGS, 106, 2, pp. 94–99 (2001). – $^{14}C$ dating on 8 samples of subfossil trunks ("black oaks") indicates the Holocene age of the upper parts of the valley bottom gravel of the Odra River in the Ostrava Basin. These strata west of the town of Bohumín were redeposited during hazard floods shortly after 760 ± 70 BP.

Key words: floodplain deposits – radiocarbon dating – hazard floods.

DAŇHELKA Jan: *Dendrogeomorphological research of a landslide area near Čeřeniště.* – Geografie – Sborník ČGS, 106, 3, pp. 166–177 (2001). This paper presents the results of the pH research in a landslide area in the České středohoří Mts. on the right bank of the Labe River antecedent valley (Ústí nad Labem district, Czechia). At first some dendrogeomorphologic methods are outlined. A short view of physical geography of the region and the landslide locality is also mentioned. The history of landslide activity in the last 60 years and a geomorphologic map of area were constructed.

Key words: dendrogeomorphology – landslide activity – České středohoří Mts. – Labe River valley.

FIALOVÁ Dana: *Second Housing and Its Relations to Peripheral Regions.* – Geografie – Sborník ČGS, 106, 1, pp. 36–47 (2001). The article aims to define the role of second housing on the Czech territory with regards to the current settlement structure and its history. The emergence of second houses that came to existence through functional conversion of formerly permanently inhabited houses can serve as one of indicators for delimitation of peripheral regions. Such peripheral regions, however, have specific characteristics as the use of these regions varies greatly during the year and even during one week.

Key words: second housing – recreational house –settlement system –peripheral region.

FŇUKAL Miloš: *Political-Geographical Consequences of the Yugoslavia Crisis.* – Geografie – Sborník ČGS, 106, 3, pp. 133–147 (2001). The aim of the article is to interpret the changes of the political-geographical organization of the former Socialistic Federative Republic of Yugoslavia territory, with a special reference to the decline of this state. It evaluates the political-geographical influence of the position, geographical environment and historical development of the observed territory.

Key words: Yugoslavia – nationalism – disintegration.

HAVLÍČEK Tomáš, CHROMÝ Pavel: *Contribution to the theory of polarized development of a territory, with a special attention paid to peripheral regions.* – Geografie – Sborník ČGS, 106, 1, pp. 1–11 (2001). The article makes a survey of aspects for evaluation of a periphery in geographic sciences. The definition of the terms "periphery" and "marginality" is discussed. An attention is paid to evaluation aspects and types of polarities defining peripheries. A periphery is understood as a consequence of an asymmetry in organization of a territory, a society, etc. The article takes into account the development of the relation core/centre – periphery and, in their delimitation, differentiates the objective and the subjective viewpoints. Determining factors and actors' behaviour in the framework of the development of peripheries, or their individual types, are observed.

Key words: periphery – marginality – core – polarization of territorial organization.

JANČÁK Vít: *Contribution to the geographical research on peripheral regions at the microregional level.* – Geografie – Sborník ČGS, 106, 1, pp. 26–35. – The article deals with

the results of research on peripheral regions at the microregional level. The results of field research in four model territories selected in regions with different geographical conditions are evaluated. The resulting SWOT analysis of different model regions is given and compared. The second part of the contribution interprets the subjective perception of a selected population sample in the model territories, the results of a questionnaire inquiry done in all the model regions are evaluated and compared.

Key words: peripheral regions – microregional level – model region – SWOT analysis – questionnaire inquiry.

JANSKÝ Bohumír, PIVOKONSKÝ Martin: *Development of surface water quality in the Cidlina River catchment area.* – Geografie – Sborník ČGS, 106, 2, pp. 74–93 (2001). – The article evaluates the development and the present state of surface water quality in the Cidlina River catchment area. Besides the water quality, the article analyses individual economic activities, which significantly affect the water quality. The attention is paid not only to the water chemism, but also to the biological evaluation of the water quality. An analysis of water pollution causes is done and propositions how to improve the present state of water quality in the catchment are presented.

Key words: Cidlina River catchment area – surface water quality – sources of industrial, communal and agricultural pollution – classes of water purity – chemical and biological evaluation of water quality – water protection measures.

KOLEJKA Jaromír: *Geoecological aspects of flood origin and consequences.* – Geografie – Sborník ČGS, 106, 2, pp. 65–73 (2001). Natural and human factors affect the origin and course of floods in various combinations dependently on the scale. The role of global, regional, landscape and local level flood factors is discussed. The importance of the geographical position of the site endangered by a flood is also evaluated.

Key words: flood – landscape factors – scale – location.

MARADA Miroslav: *Delimitation of peripheral regions of Czechia and their features studied with the help of statistical analysis.* – Geografie – Sborník ČGS, 106, 1, pp. 12–24 (2001). The paper examines the possibilities of using statistical analysis when studying peripheral regions on the case of Czechia. At first, peripheral districts were delimited with the help of componental analysis on the basis of six indices. The only extracted component is interpreted and the distribution of districts component scores is depicted in a cartogram. Peripheral regions are shortly commented. Secondly, the calculated componental score was correlated to the districts location indices and to the physical geographical characteristics in view to describe the impact of natural conditions and geographic position on the current location of peripheral and core territories. The attention is also paid to the correlations of the componental score to the selected social economic indices and the established relations are commented. Finally, the author tries to formulate a definition of peripheral region under the conditions of the Czech Republic.

Key words: core – periphery – district – componental analysis – correlation.

PÁNEK Tomáš: *Morphostructural analysis of the Czech part of the Čantoryjská hornatina Hilly Region.* – Geografie – Sborník ČGS, 106, 3, pp. 148–165 (2001). The article evaluates the morphostructural construction of the Czech part of the Čantoryjská hornatina Hilly Region with taking full advantage of a detailed geomorphologic mapping and multicriterial morphostructural analysis. As a result of the upper Tertiary and Quaternary neotectonics, there arose a graded internally ranged morphostructure with features of vaulted deformations and faults.

Key words: Slezské Beskydy Mountains– Čantoryjská hornatina Hilly Region – mapping of morphostructures – flysch rocks.

RÖLC Robert: *Transport accessibility and regional significance of regional centres.* – Geografie – Sborník ČGS, 106, 4, pp. 222–233 (2001). The article is devoted to the comparison of three kinds of regionalization of the Czech Republic. The first one is the administrative division of the state. The second one is the regionalization of public transport (accessibility of regional centres). The third one is the system of natural/organic sociogeographic regions of selected centres. The degree of similarity of different regional structures, with a special regard to the consequences of the change of the number of regional centres (formerly 7, newly 13), is evaluated.

Key words: Regional centres – transport regionalization – change of administrative regions.

**REVIEWS**

DOKOUPIL Jaroslav: *Cross-Border Cooperation as a Constituent of the Regional Development of the Czech-Bavarian Borderland.* – Geografie – Sborník ČGS 106, 4, pp. 270–279 (2001). The article presents the development of the Czech-Bavarian borderland as a comparison of the preliminary results of the 2001 people, flats and houses census with the 1991 one. The mentioned comparison shows a certain revival in the West Bohemia borderland. Short-term features based on substantial changes of the situation are still prevailing within this revival. From the long-term point of view and in connection with the Czech Republic´s preparation for the entry to the European Union, the development of the borderland region is not sufficient.

Key words: Czech-Bavarian borderland – cross-border cooperation – population development.

PÁSKOVÁ Martina: *Sustainable tourism development.* – Geografie – Sborník ČGS, 106, 3, pp. 178–195 (2001). This article presents current issues related with the relationship between tourism and environment. It gives a brief overview of various definitions, aspects and approaches to the tourism sustainability. The article summarizes the negative impacts of tourism and explains the life cycle of the tourism destination. The purpose of the article is to draw attention to the fact that tourism is a complex socio-economic phenomenon, multidimensional in character, with significant impacts on the environment but depending also on environmental quality. This feedback mechanism has to be understood and incorporated into the policy making activities.

Key words: sustainable development – tourism destination – carrying capacity – life cycle – environmental indicators.

PŠENÁKOVÁ Petra, STUCHLÍK Evžen, LELLÁK Jan: *Morphometrical parameters of the Drásov drinking water reservoir near Příbram and of the flooded quarries of Řečický lom near Blatná and Smaragdové jezírko in the Brdy Mountains.* – Geografie – Sborník ČGS, 106, 2, pp. 110–121 (2001). Bathymetrical measurements were carried out in three water bodies in Central and South Bohemia: the Drásov drinking water reservoir and two flooded quarries – Řečický lom and Smaragdové jezírko, as a part of a limnological research done by the pedagogical staff and the undergraduate students of the Department of Hydrobiology, Charles University in Prague. Bathymetrical maps, the morphometrical parameters of the basins and the physical-chemical parameters of the water column, such as thermal condition, pH and dissolved oxygen and hydrogen sulphide concentration, are presented in the article.

Key words: bathymetrical map – morphometry.

SEDLÁK Pavel: *Digital geological data for geographical GIS applications.* – Geografie – Sborník ČGS, 106, 2, pp. 100–109 (2001). This article presents a view on the potential source of digital geological data in the Czech Republic. There are described the data gathered by the institutions of the national geological service, public administration, schools and some other organisations. The article also points to the criteria, which every user should respect when gathering digital geological data.

Key words: GIS – digital data – data sources – geology.

VAISHAR Antonín, KALLABOVÁ Eva: *The Development of services in small Moravian towns after the year 1990.* – Geografie – Sborník ČGS, 106, 4, pp. 251–269 (2001). A complex geographical analysis of twelve Moravian towns with less than 15 thousand inhabitants has been made. Within this analysis, the services fulfilling the following main functions have been evaluated: meeting the needs of inhabitants, solving the problems of workers dismissed from production, realization of town creating function and promoting cultural activities. An evaluation of towns has been made and the main barriers in service activities were identified. The level of services in each town depends, apart from the human factor, on the size of the local market, the status of the town in the settlement system and on each town's specific conditions. Nowadays, small towns are re-evaluating their visions of the future, where the role of services is important.

Key words: Moravia – small towns – tertiary sector – transition.

## ZPRÁVY – REPORTS

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Geography – Journal of Czech Geographic society, abstract of articles in period 2000 – 2001 (201): Geography – Journal of Czech Geographic society, Vol. 105, 2000 (201) – Geography – Journal of Czech Geographic society, Vol. 106, 2001 (205).

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