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HLAVNÍ ČLÁNKY – ARTICLES

Dear friends!

It is a great pleasure for me to greet you while you are opening the second issue of Geography – Journal of Czech Geographic Society, volume No. 105. The 29th International Geographic Congress will be organised in the Seoul in August this year. This whole issue of Geography has been prepared in English so that it could be used for a quality presentation of Czech geographers at the Congress. We suppose that in future Geography – Journal of Czech Geographic Society will continue to publish geographical articles written by experts from all Czech geographical institutes and departments. Some articles will be published in English in future (with extensive Czech summary). Czech written articles, however, will prevail, foreign language summaries will be provided. Therefore this issue is a sort of exception as regards both language and contents.

We believe that foreign readers will welcome the English written articles and we also believe that No 2000/2 Geography – Journal of Czech Geographic Society will contribute to the promotion of Czech geography abroad.

Ivan Bičík, President, Czech Geographical Society

Vážení čtenáři,

právě jste otevřeli druhé číslo Geografie, časopisu, který letos vychází ve 105. ročníku. Počátkem srpna letošního roku proběhne v Soulu 29. kongres Mezinárodní geografické unie (IGU/UGI). redakční rada připravila toto číslo v angličtině, aby se jím mohla česká geografie na významném setkání geografů z celého světa prezentovat. Předpokládám, že i nadále bude náš časopis sloužit nejen k publikování odborných výsledků geografů všech pracovišť Česka, ale měl by být i organizačním a informačním materiálem geografů zejména naší republiky. Proto lze i v budoucnu očekávat, že některé články (resp. celá monotematická čísla) budou publikovány v angličtině (s větším českým shrnutím) a většina dalších i nadále v jazyce českém (s cizojazyčným summary). Proto lze toto číslo považovat za spíše výjimečné.

Českým čtenářům přejeme, aby se pře obtížnější čtivost v článcích orientovali. Věřím, že zahraniční čtenáři časopisu tuto výjimku v použitém jazyce spíše přivítají a věřím, že tímto způsobem přispěje Geografie – Sborník České geografické společnosti k propagaci naší práce v zahraničí.

Ivan Bičík, prezident České geografické společnosti

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IVAN BIČÍK, MARTIN HAMPL

CZECH HUMAN GEOGRAPHY: RESEARCH AND PROBLEMS

I. Bičík, M. Hampl: *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 explored and assessed. Secondly, theoretical issues of human geography are discussed, such as the cognitive function of 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.

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1. Introduction

The aims of this contribution are of two kinds. The first one is, in a number of aspects, of an informative nature, as it is related to the characteristics of the Czech human geography at present, and especially in the second half of the 1990's. It thus presents both a description of the thematic orientation, as well as the cognitive and applicable results of the Czech human geography in the period between the two last IGU congresses. Description of the state is nevertheless also connected with an evaluation of the causes and problems of the current research trends. Moreover, the evaluation of such trends requires a wider context in a form of an overview of changes in the Czech human geography, both from the development and international viewpoints.

The second main aim of this contribution is to discuss some general problems of cognitive functions of human geography which, in number of aspects, points out to possible directions of future research. The stress here is placed on the general level of research. The "national specificity" of research, it is argued here, can be considered as being of secondary importance and, in addition, as something which can be directly read off from the overall orientation of the present research, as well as from the particularities of the present development of the society in the Czech Republic (continued of post-Communist social transformation, integration into European structures, etc.). On the contrary, the conceptual questions about the position of geographical research within the integral knowledge of society, as well as of the understanding of the relation between society and environment, problems of regularity or randomness in formation of geographical organization of the society, or the up to now

ambiguous specification of the research subject of human geography, represent the fundamental problems which, at the same time, represent the main sources of internal doubts within human geography worldwide. The final part of this paper will therefore briefly discuss these issues.

2. Paradigm transformations in post-war human geography and the isolation of Czech geography

The development of geography, and of human geography in particular, since the Second World War can be legitimately characterized as unusually dynamic. This dynamism is evident especially in comparison with the development in the 19th century, as well as in the first half of the 20th century. The transformation of the concept of environmental determinism to the possibilist one was going on for a long time without taking radical forms. For that reason, controversies over idiographic versus nomothetic character of geography or discussions about the relation human – physical geography were not sharp which was certainly due to the still predominantly descriptive character of geography. Also, for that reason, discussions about the key theoretical questions were inconclusive. The situation changed quite dramatically after the Second World War, whereas three principally different concepts appeared in turns over the latter half of this century (see Cloke et al. 1991, Holt - Jensen 1988). The initial paradigm, which can be characterized as idiographic, represented in principal the heritage of the precedent long-term development of geography (Hartshorne 1959). The stress placed on the unique character of geographical phenomena has necessarily led to the preference of descriptive method. A further consequence of this heritage was a limited interest in applied use of geographical findings or in "problem solving" in general. Geography was maintaining its essentially educational and informative function, that it rather a cultural function than a specific scientific/cognitive one.

The descriptive and unproblematic orientation of geography raised a sharp criticism of younger generations of geographers in the late 1950's and in the 1960's in the United Stated and in the United Kingdom. Under the influence of the then fashionable positivist methodology of science a radical attempt was made to build a "nomothetic" geography with a large exact methodical aparatus. The cost of this major methodological and methodical enrichment of geography was nevertheless a substantial reduction of the qualitative content of geographical systems. Therefore, positivist geography has been often qualified as "spatial science"., It is, however, necessary to mention also other contributions of this period, such as the integration of the formerly isolated school of location theories into the geographical cognitive system, world-wide spread of the research findings of the so-called Lund School (Hägerstrand 1967) or systemization of methods and models (Haggett et al. 1977). The principal expected aims were nevertheless not attained, because the exaggerated interest in space structures lead to their breaking away from the "conditioning forces". Furthermore, the search for regularities in the organization of space *per se* did not bring any convincing results.

Another decisive upheaval occurred in the 1970's in connection with the interest in spatial manifestations of social differentiation and social problems.

A considerable wave of humanization followed that resulted in the explicit declaration of human geography as a social science and thus leading to a further deepening of the long-term dichotomy between human and physical geography. This new post-positivist paradigm, however, is not of an integrating type, as, by emulating the example of sociology, it creates space for diversification of research orientations of both structuralist and voluntarist type. The positive contribution of this wave is especially the stress put upon the problem orientation and the attantion paid to human activities. In a simplified manner we can speak about a shift from studying location of phenomena to studying location of problems, and/or from a geography of "passive objects" to a geography of "active subjects". The increased interdisciplinary character of research can be viewed as another enrichment. However, the issue of a controversial existence of geographical regularities and organizational principles is still present here. The explanation of geographical circumstances is primarily seen in the internal organization of the society that is in the circumstances that represent traditional domains of sociology, economics or political science.

The above characteristics thus allow for both positive and negative evaluations. In the former case, the stress on the dynamic intellectual movement, methodological development, problem orientation and deepening of the interdisciplinary cooperation all need to be pointed out. In the latter case, the lack of conceptual clarification of research within human geography needs to be mentioned at least, as well as the lack of continuity in building a coherent cognitive system. Without such a lack of conceptual clarity it is not possible to explain the principal and quite antagonistic transformations of paradigms within a relatively short time span. However, from the viewpoint of the Czech human geography, these transformations were not quite so dramatic. An obvious reason for this was the isolation of the Czech society, and by that also of geography, from the developments in the outside world. Due to this isolation, the development of knowledge was slower in number of aspects, but nevertheless without losing its continuity. The impact of positivism was most clearly manifested in the form of search for regularities in regional differentiation rather than in the attempt to model spatial structures. The impact of post-positivist trends was somewhat limited, not only because of the political isolation connected with tabooization of many social issues, but also because of a deformation of the social sphere itself. Finally, the impact of discussions within the Soviet geography has also been marginal: going from the inconclusive argument between monistic and dualist conceptions of geography (Anuchin 1960) to the inappropriate attempts to identify the conception of sociogeographical region with the conception of the so-called territorial productive complex (Kolosovski 1958).

In a number of ways, an intensive contact with the applied sphere was very important for the Czech geography during the totalitarian period. In the sphere of applied research, the problem orientation of human geography and the ability of interdisciplinary cooperation were progressively increasing. The most important field of activity was territorial/spatial planning that was relatively little affected by the governing ideology. Quite distinct from the regional planning that represented much more of a bureaucratic and political activity, territorial/spatial planning largely maintained its professional character. In addition, due of the absence of professional regional planning, the content of territorial planning was step by step extending towards the functions of integrated spatial planning. This orientation was near to human geographers, just as was the cooperation with urban planners.

3. A major current issue: geography of post-Communist societal transformation

The radical turn over in the social development of the Czech Republic after 1989 was quickly reflected in the orientation of the human geographical research. It was a consequence of two major, mutually augmenting influences. The first one was dismantling of the barriers to international cooperation and the opening of the possibility to chose freely from various research topics. The second one was a sudden rapid increase in the "demand" for geographical analyses of the transformation process that has just been taking off. This was the case with both the applied, as well as the theoretical research. The historical uniqueness of the process of "return" from a totalitarian to a democratic system, and from a centrally planned economy to a market one, has been connected not only with the rise of many principal practical problems in the post-totalitarian countries, but, at the same time, it has also represented an internationally attractive research theme for social sciences. In addition, the systemic character of transformation processes has directly required the application of current trends in social sciences, including human geography, which are characterized by the above mentioned orientation to practical problems and interdisciplinary approach.

The concentration of research interests on geographical aspects of societal transformation has undoubtedly lead to a sensible thematic rapprochement of the Czech and world human geography, and that in spite of the uniqueness of the transformation of post-totalitarian countries. It has been also due to the fact that post-totalitarian transformation has to be evaluated in a larger context; that is, within the framework of the development of post-industrial society, globalization tendencies and the interaction of global and local, etc. It is equally important to look for answers to general questions concerning the nature of geographical organization, the character of geographical regularities, or the link between human geography and other social sciences on the one hand, and with the environmental sciences on the other hand. It is nevertheless legitimate to distinguish the preferred themes and, on the contrary, the neglected ones in the present research of the Czech human geography. However, this differentiation is rather a consequence of research traditions and of limited research capacities on the side of geographical departments at universities than of the character of transformation processes., It is possible at present to trace four broadly defined "preferred" research topics:

(1) The greatest attention has been paid to the problems of regional development, including the issues of territorial administration, development of the settlement system and of the regional policy. Although many papers mainly dealt with partial components of development of regional differentiation (unemployment, banking, foreign investments, etc.), there was also a marked tendency to grasp the development of regional structures within the Czech Republic in an integrated way. A particular attention was also paid to the supranational connections, especially from the viewpoint of European integration processes (see for example Blažek 1997). Two monographs elaborated by teams of authors (Hampl et al. 1996, 1999) can be pointed out as representing the outcomes of integrally conceived research projects.. Another important publication was "Human Development Report, Czech Republic 1996" (Pavlík et al. 1996), elaborated in an interdisciplinary cooperation co-ordinated by the geographical division of the Faculty of

Science, Charles University. This research also involved investigations of theoretical geographical issues (Hampl 1998) and was linked up with the development of international cooperation (especially within the IGU Commission "Geography and Public Administration"). Many outputs of the research were also applied in practice: projects of administrative territorial organization, conception of regional policy and forthcoming membership in the European Union in this field, territorial plans of metropolitan regions, etc.

(2) A synthetically aimed regional research work, with a stress put upon the microregional level, has been carried out in joint research of geographical departments within two large grants (one of the Ministry of Foreign Affairs and one of the Grant Agency of the Czech Republic). Both projects are aimed at problems of border regions including trans-border cooperation. This research has been co-ordinated by the Ústí nad Labem branch of the Institute of Sociology, Academy of Sciences of the Czech Republic (see also the information about the project "Geogrant of border regions", Jeřábek 1998) and involved cooperation of geography departments of universities in Brno, Olomouc, Ostrava, Plzeň and Prague (see for instance Dokoupil 1996 and Šindler 1999). A research of that type not only deepens the cooperation of national geographical departments, but also strengthens the Central-European cooperation – close links exist with a number of universities, mainly regional ones, in Germany, Poland, Slovakia and Austria. Major attention has also been paid to the issues of revitalization of protected landscape areas (Vaishar, Mikulík 1996), as well as former military districts (Poštolka 1996 and a collection of papers published in a thematic issue of this journal – no. 3, 1998).

(3) In the late 1980's and in the 1990's a large research team was formed with the aim to study long-term patterns in land use. This project is further related to historical-geographical evaluation of the human-nature interaction, to the research on the current transformation of agricultural sector and of rural settlement (see for instance papers by Bičík 1998, Bičík, Götz 1998). The main base for this research is the Department of Social Geography and Regional Development, Charles University, Prague, which cooperates with the universities in Brno, Olomouc, Ostrava, Plzeň and Ústí nad Labem. A unique data base on Land Use (since the year 1845, including more than 10,000 elementary units), is gradually approaching completion and deserves also a special mention, as does the international presentation of the results of this project, which took place mainly within the IGU Study group "Land Use/ Land Cover Change" and the Global Change Programme (directed by the IHDP and IGBP).

(4) Finally, one of the key themes of the Czech human geography have traditionally been population geography and urban geography. There is also a tradition of close cooperation between geographers and demographers, expressed also by integration of the Department of Demography and Geodemography into the Geographical Section of the Faculty of Science, Charles University, Prague. Key themes in this sphere again reflect the present social changes. Major attention has been paid to migration of population, both in the Czech Republic (see Čermák 1996) and at the international level (see for instance Drbohlav 1997 and Cattan, Grasland, Řehák 1996), as well as to the transformation of inner structures of cities, especially of Prague (see Sýkora 1998). Many papers deal with the regional differentiation of demographic processes, health situation of the population, etc.

The selection of research themes serves only a basic indicative and guiding purpose. Equally the quoted titles represent only a selection of a much more substantial publication activity – see the information about individual geographical research centres in the Czech Republic listed in another part of this issue. This selection of topics can nonetheless be claimed to provide a more or less representative picture which is based on the analysis of the recent publishing activity. In the period 1996 – 1998, 90 % of the nearly 90 papers published by the largest department of human geography in the Czech Republic concerned one of the four above-mentioned problems. This means in the same time that there are many themes that are not sufficiently cover by research. These are mainly issues in the domain of geography of transport, industry and partly also services and leisure. Papers on the regional geography of foreign countries are also rare, which represents a long-lasting deficiency of the Czech geography, largely due to its limited human and financial sources.

The above-mentioned research "debts" in human geography can be in the first place justified by a very limited number of university geographers, especially human geographers. Although their number, as well as the number of departments, has substantially increased in the 1990's, human geography still remains a very small discipline. Personal capacities of this discipline are undoubtedly insufficient when taking into consideration the needs of both the applied sphere (for that reason, the graduates have no serious problems with finding a job) and of university teaching - in the 1990's, the increase of the number of students was greater than the increase in the number of university teachers. At the same time, the interest of students in geographical disciplines has been higher than the capacity of geography departments for years. The difficult situation of mainly human geography is also illustrated by the fact that there are in the whole of Czech Republic only two independent departments with a distinctly human geographical orientation (in Prague and in Ostrava) and that in most non-specialized departments of geography physical-geographical is the prevalent orientation. In addition, after the abolition of the Institute of Geography at the beginning of the 1990's, geography has practically lost the possibility of doing research within the Academy of Sciences (small teams work now only in the Institute of Geonics in Brno and in the Institute of Sociology in Prague).

4. Conceptual problems of human geography: concluding remarks

Although many problems and limitations of the development of the Czech human geography still remain as a heritage of the totalitarian period, it is fully justified to state that in the 1990's there a principal step has been made in the direction of international trends both in the thematic orientation and in the modes of research. In that sense, the principal conceptual problems of the research have more or less "internationalized" and adopted a more general aspect. Their importance is great, as they represent research issues that have not been answered conclusively as yet. Frequent and often principal changes in the paradigm of human geography are an expression of this inconclusiveness because very often they concentrate more on the criticism of the previous concepts than on answering real issues, such as the subject specification of human geography, its position within the system of sciences, the question of existence of geographical regularities, etc. It is

therefore useful to conclude this paper by addressing several of these key problems.

(i) First, it is necessary to specify the subject of study of human geography, which consequently leads to determination of the position of this discipline in the classification of sciences. At present, the conception of human geography as social science is dominating which corresponds to its orientation at social phenomena and processes. But in what human geography differs from the other social sciences? Undoubtedly in its environmental orientation, because it inquires into environmental/geographical organization of the society. This naturally includes not only the aspect of space, but also especially the interaction between society and natural environment. The problem of monism and dualism of geography is thus primarily a problem of human geography, as in this case it is either possible to distinguish social and environmental conception, or, on the contrary, to stress the intersection, or more precisely integration of both conceptions. The position of human geography in the system of sciences must be thus characterized with the help of two classifying dimensions: on the one hand, according to the traditional viewpoint of the evolutionary complexity and, on the other hand, according to the non-traditional (and up to now lacking) viewpoint of structural complexity expressing polarity of the part and of the whole (element - environment). As shown by the included classification scheme, introduction of the principle of structural complexity has a general validity both for the classifications of real system and of empirical sciences. From that point of view, it is then possible to define human geography as an environmental social science and the subject of its study as environmental organization of society (geosocietal systems), see Fig. 1.

(ii) The classification of real systems themselves (and consequently also of the empirical sciences) is not sufficient for solving the essence of the problem of human geography's cognitive function. For that reason, it is necessary to attempt to answer the question as to whether the geosocietal system represents a specific and relatively autonomous structure in the organization of reality. This is in principle the problem of existence of regularities in organization of those systems, or, more generally, in the organization of the environmental systems. This could solve the long-standing dispute about the idiographic or nomothetic nature of geography. Geography has always dealt in the first place with the study of differentiations in the territorial distribution of qualitatively different phenomena. This subsequently led to a domination of interest in the "spatial structures" and in differences, or, more specifically, peculiarities, that – viewed from another view-point – represent "irregularities" from the rule of spatial structure. On the contrary, science legitimately puts stress on the search for similarities and regularities. This stress is nevertheless manifested in a simplified way. It is even possible to speak about an ideological habit to search for recurrence only in the similarity of partial phenomena and consequently to delimit taxonomic systems of types of those phenomena. Geographical phenomena – settlements, lakes, mountains, nodal regions, etc. – are however extremely differentiated as far as their size is concerned. This does not necessary exclude either recurrence, or regularity in geographical reality. As already shown by Korčák (1941), the differentiation of phenomena may be of certain type, that is regular, and there can exist a repetition of this differentiation within whole geographical systems. It is not difficult to empirically confirm this affirmation. Within geographical (environmental) systems, there is always a regular

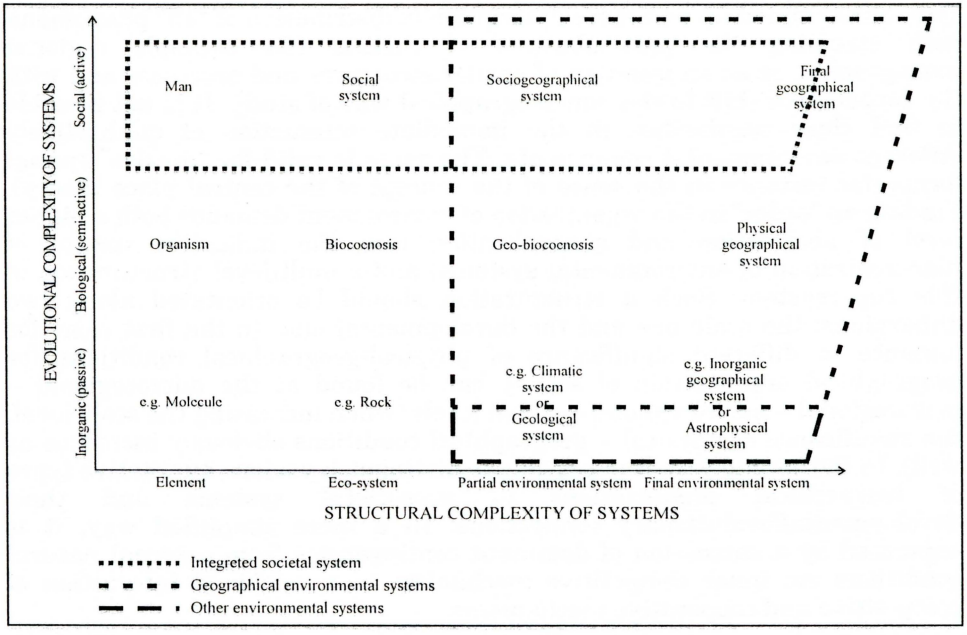

Fig. 1 – Classification of real systems. Source: Hampl et al. 1999, p. 16.

differentiation that can be qualified as a hierarchical one (decreasing frequency of phenomena in relation to an increase in their size). This is valid for settlements as for lakes, being it in the USA, France, Poland, etc. It also means that there exist – within our surrounding reality – two basic types/principles of organization: generic homogeneity of elements and hierarchical differentiation of environmental systems. A logical inference of this is that there are therefore two basic processes of understanding these types of organization: from the whole to its parts and from the parts to the whole. In studying interactions of both types of organization we can identify an integrated understanding of reality. In that sense, the cognitive function of human geography consists of a search for structural and developmental contingencies of hierarchic organizations of geosocietal systems; that is of the highest/most advanced (from the evolutionary point of view) hierarchical organizations of environmental systems. Connection of human geography knowledge with "other" scientific understandings of reality may then be done in two principal directions. The first one is studying interactions of social and natural geographic organizations, that is the development of evolutionarily higher and more advanced geosocietal organization within the physical-geographical organization. The second one is studying the interaction of the internal (social) organization of the society with its outer (geographical) organization.

(iii) Environmental systems in general, and geosocietal systems in particular, are extremely complex, because their formation results from the interaction of qualitatively different phenomena and processes. In addition, these systems in their total represent a multilevel organized "supersystem", that is, an integral environment. The efforts of geographers to "directly" study geographical environment in its present form could not thus be successful.

They either ended up as a mere description of distribution of "all" phenomena with stressing the particularities of regions (for example regional monographs), or as an isolation of partial structures and processes and with the consecutive shift to the non-geographical way of study. It is not possible to find clear regularities in the immediate interaction of qualitatively different environmental components. The same is valid for "precise" spatial forms (for instance in the sense of the concept of the central place theory). Finding an "order" in the organization of environment demands both a higher level of abstraction and generalization (see the indicative nature of hierarchization of environmental systems) and a multilevel structuration of this supersystem. Such a structuration should be orientated along two dimensions: the scale one and the developmental one. In the first case, for instance, a different significance of physical-geographical conditions for geographical organization of society can be found at the microregional – mezoregional – macroregional – global levels (when increasing the scale level, the significance of physical – geographical conditions obviously increases as well). In the second case it is possible to distinguish various qualitative types of hierarchical organizations of geosocietal systems and their developmental/evolutionary connections. In a more simplified way, it is expressed by a succession of dominant contingencies from external natural conditions via inner competitive mechanism to a combined interaction of competitive and cooperative mechanisms.

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Shrnutí

ČESKÁ HUMÁNNÍ GEOGRAFIE: TÉMATA A PROBLÉMY VÝZKUMU

Příspěvek je zaměřen na dva druhy problematik. Prvou je hodnocení změn ve výzkumné orientaci české sociální, resp. humánní geografie v průběhu 90. let. Je konstatováno rychlé přibližování k světovým trendům, které pochopitelně odpovídá společenským změnám po roce 1989, a tedy překonání někdejší politické, a proto i společenskovědní izolaci české společnosti. Transformační období přináší navíc významné aktuální problémy ve sféře regionálního vývoje, územní administrativy, sociální ekologie apod. Transformace post – totalitních zemí se tak stává „velkým tématem" i pro sociální geografii. Atraktivita této problematiky není přitom omezena jen na sféru aplikovaného výzkumu, ale uplatňuje se i ve sféře výzkumu základního. V druhém případě nabývá na důležitosti i v kontextu mezinárodního výzkumu díky unikátní povaze procesu „návratu k demokracii a k tržní ekonomice".

Současná česká sociální geografie, právě v důsledku svého otevření vůči světu, pociťuje ovšem i zesíleným způsobem neuzavřenost diskusí klíčových teoretických otázek studia. K těm patří stále se vynořující problém její předmětové specifikace vyjádřený dualitou možného přiřazení buď k sociálním nebo naopak k environmentálním vědám: připojené klasifikační schéma vyjadřuje v tomto smyslu pozici předmětu sociální geografie v průniku obou zmíněných skupin věd, resp. odpovídajících reálných systémů. Ještě závažnější je otázka

existence geografických, resp. geosocietálních pravidelností/zákonitostí. V tomto případě je možno rovněž zdůrazňovat „neobvyklost" geosocietální reality, resp. environmentálních systémů obecně: základním typem pravidelností jsou hierarchicky uspořádané velikostní diferenciace jevů v rámci environmentálních systémů.

Obr. 1 – Klasifikace reálných systémů. Vyznačená ohraničení se týkají integrovaného společenského systému (zahrnuje člověka, sociální systém i sociogeografický systém); geografických a ostatních environmentálních systémů. Sociogeografické systémy jsou tedy určeny průnikem sociálních a environmentálních reálných systémů (podrobněji viz Hampl a kol. 1999).

(Authors are with Department of Social Geography and regional Development, Faculty of Science, Charles University, Albertov 6, 128 43 Praha 2, Czech Republic.)

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BOHUMÍR JANSKÝ

A NEW SURVEY OF SOURCES OF THE AMAZON

B. Janský: *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.

1. An historical introduction to the location of the sources of the Amazon

1.1. Samuel Fritz – the Bohemian Jesuit and author of the map of the Amazon

One of strong motivations for our expedition to explore the sources of the Amazon was the achievements of a little known Jesuit of Bohemian origin, Samuel Fritz, who is known mainly in the Hispanic world as author of the first serious map of the Amazon.

After finishing his studies at the Faculty of Arts of Charles University and at St. Wenceslas seminary, Fritz entered the Jesuit order. In 1683 he was sent together with J. V. Richter and J. Burgr on a mission in the West Indies. Via Genoa, Seville, Cadiz and the Canary Islands, they arrived at the island of Martinique and then went on to Cartagena in Columbia. After a difficult journey up the Magdalena River, they progressively moved, via the Colombian towns of Popayán and Pasto to Quito in Equador, down the rivers of Pastaza and Napo to the main course of the Amazon. Then they went upstream to the mouth of the Huallaga River and to the seat of a Spanish mission in the settlement La Laguna.

Later Fritz visited the Omanguas and Yurimanguas tribes in the lower course of the Maranon River and the Ybanons and Aizuars tribes at the mouth of Rio Negro. During one of his expeditions in the region of the Amazon he was captured by the Portuguese and imprisoned at the Portuguese Jesuit College in Pará at the mouth of the Amazon for 18 months. When he finally returned to his Spanish mission in 1691, he had mapped the various tributaries, islands, Indian settlements of the Amazon, along his 1 300 km journey. After visiting the Spanish viceroy in Lima, he stopped at the upper course of the Marañon River and identified its sources in the mountain Lake of Lauricocha.

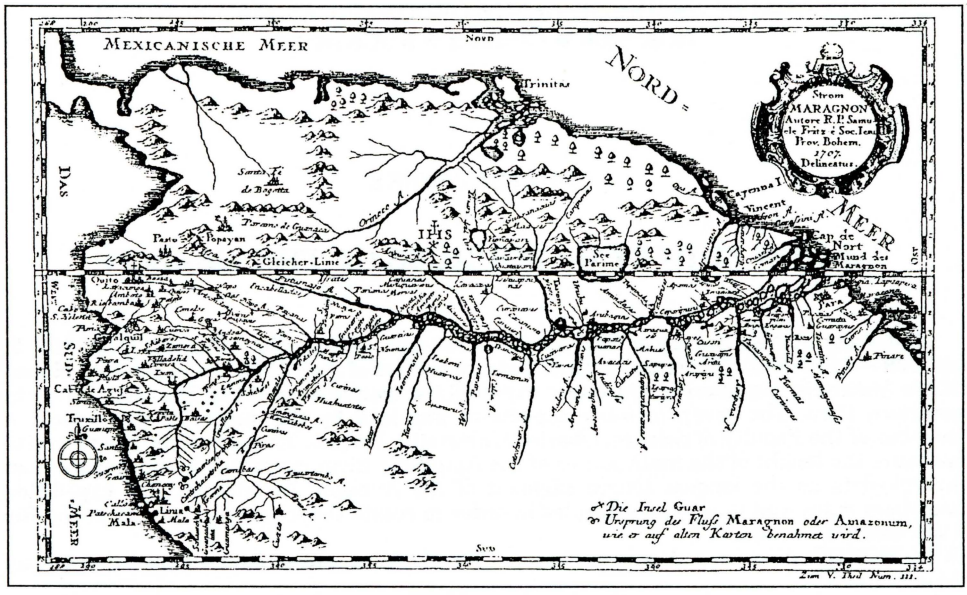

Fig. 1 – The map of the Bohemian jesuit Samuel Fritz from 1707

Even now this place is indicated as the source area of the largest river of the planet (see for example the New Encyclopaedia Britannica, 1998).

Samuel Fritz was the first human who explored and traveled the entire main course of the Amazon from the sources of the Marañon to its mouth. In 1707, he drew the second map of the river (the first was drawn by Guillermo Sanson), which was much more accurate than any existing one. The map, incredibly precise given when it was done, was drawn only with a protractor.

1.2. Changing opinions of the sources of the Amazon

Until the 1950's, the Marañon River was considered the source segment of the Amazon. Nearly 250 years after publication of the map of the Bohemian Jesuit Samuel Fritz in 1707, his identification of the Amazon source in Lake Lauricocha in Central Cordillera in the Peruvian Andes was still valid.

In the 1950's however, some data were published affirming that a second source stream of the Amazon, the Ucayali, was considerably longer than the Marañon River. In contrast to the earlier period when lengths of streams were established using maps at the scale of 1:2 500 000 or 1:1 000 000, more detailed maps at scales of 1:200 000 or 1:100 000 were now used. This enabled more accurate consideration of important river meanders and thus streams were found to be considerably longer.

In 1953, the French explorer Michel Perrin confirmed the conclusion of a Peruvian colonel, Gerardo Dianderas, that the longest source stream of the Ucayali River was the Río Apurímac measuring the source from the foot of the Huagra Mountains in the Cordillera Chila in southern Peru (department of Arequipa), to the north-west from the village of Cailloma. This contention was accepted by geographers for more than 15 years and for a long time it also appeared in Czech geography textbooks. This source was also mentioned by Rostislav Netopil in his publication, "Hydrology of continents" (1972).

Tab. 1 – Survey of opinions on the location of the Amazon sources

Author	Year	Source
S. J. Santos García	1935	Laguna Vilafro
Michel Perrin	1953	Cerro Huagra
plk. Gerardo Diánderas	1953	Cerro Huagra – Río Monigote
Helen a Frank Schreider	1968	Laguna Vilafro
Nicholas Asheshov	1969	Nevado Minaspata
Carlos Peñaherrera del Aguila	1969	Nevado Mismi – Carhuasanta valley
Loren Mc Intyre	1971	Nevado Choquecorao
Walter Bonatti	1978	Río Huarajo
Jean Michel Cousteau	1982	Nevado Choquecorao
Jacek Palkiewicz, Zaniel I. Novoa Goicochea	1997	Nevado Quehuisha – Apacheta valley

Source: Goicochea, Z. I. N. (1997), adapted

In 1968 Mr. and Mrs. Schreider designated Lake Vilafro as the source area of the Apurímac River, where Río Santiago has its source and which is situated about 11 km east from the village of Cailloma.

A year later the English journalist Nicholas Asheshov who visited the Cerro Minaspata summit (about 30 km south-west of Cailloma) together with the parachutist and adventurer John Ridgway confirmed that the source segment of Río Apurímac was situated exactly at that place.

In the same year, the eminent Peruvian geographer, Carlos Peñaherrera del Aguila, published a monograph entitled, "Geografía general del Perú". His published data were based on results of the research done by the Instituto Geográfico Nacional in Lima. The source of the Río Apurímac was given as Quebrada Carhuasanta at the northern foot of the Nevado Mismi Mountain and that source is precisely located with geographic coordinates – 71°40'36" of west longitude and 15°30'49" of south latitude.

In 1971 an expedition was organized under the auspices of the National Geographic Society and the International Geodetical Service. It was led by the photographer Loren McIntyre who was accompanied by the mountaineer Richard Brandshaw and a geographer Víctor Tupa. The aim of the expedition was to confirm the hypothesis of American cartographers that the Río Carhuasanta was the longest source stream of the Amazon. McIntyre announced that the most remote source originates at a small lake at the foot of Nevado Choquecorao Mountain, generally called Nevado Mismi. This place is situated less than 2 km from the source identified by Dr. Peñaherrera.

Other expeditions followed. In 1978 Walter Bonatti agreed with the finding of M. Perrin and designated as the source segment of the Amazon the Río Huarajo with its source at the foot of Cerro Huagra. In preparing a film about the Amazon, Jean Michel Cousteau visited the region of Southern Peru in 1982 and accepted the findings of McIntyre put forth theory about localization of the 11 years earlier.

The last expedition to attemt to find the source of the largest river of the planet took place in 1996. An international expedition led by the Polish adventurer Jacek Palkiewicz included two Russians (the glaciologist S.

Tab. 2 – Data regarding the length of the Amazon

Name	Country	Year	Lenght (km)
O. H. Walkey	Great Britain	1949	6 517
E. J. Devroey	USA	1950	6 595
C. Peńaherrera	Peru	1969	6 762
J. Marcinek	G.D.R.	1978	6 510
IIAP – Iquitos*	Peru	1980	6 885
J. Cousteau	France	1984	7 025
J. C. P. Grande	Brazil	1985	6 571
IGN – Perú**	Peru	1989	6 762
J. Marcinek, E. Rosenkranz	Germany	1996	6 516
P. Martini, J. Wagner	Brazil	1996	7 062

* Instituto para la Investigacion de la Amazonía Peruana
** Instituto Geografico Nacional del Perú

Ushnurtsev and the geographer R. Chayrutdinova from the Russian Academy of Sciences), four Peruvians (Z. N. Goicocheou from the Pontifica Universidad Católica del Perú, the hydrographers G. Faura and P. Rojas and the mountaineer J. L. T. Velasco) and the Italian adventurer T. Grego. The expedition located a new source segment of the Apurímac River the Río Apacheta, which had its source at 5 170 m at the foot of the Nevado Quehuisha Mountain in the Cordillera Chila range in the western Peruvian Andes. The authors consider this stream to be the longest and the most watery source. It originates at the highest altitude of all the identified source segments of the Apurímac River (tab. 1, 2).

2. Preparation of the current expedition and study methods

The author of this article began preparations for the expedition in 1990. He gave a series of lectures on hydrology and general physical geography at two Peruvian universities – *Universidad Nacional Mayor de San Marcos* in Lima and *Universidad Nacional San Antonio Abad del Cuzco*. He obtained from the then dean of the Faculty of Geography in Lima, Prof. Dr. Carlos Peñaherrera, his monograph *Geografía general del Perú* in which he published the theory that the source area of the Amazon was located at the northern foot of the Nevado Mismi summit in the Quebrada Carhuasanta (Departamento Artequipa). Although the author of the monograph had never visited this region, his hypothesis was based on data found on maps of the National Geographical Institute in Lima.

At that time the idea of preparing field research in this region arose. Literature, maps and aerial photographs of the region in question were gathered. In 1995, the author visited the Carhuasanta Valley with a geographical expedition from the Faculty of Science, Charles University, and proceeded to conduct a preliminary survey of the region. By 1999 sufficient financial resources and equipment necessary for fieldwork were gathered.

Before the expedition departed an analysis of the hydrographical network of the upper part of the Río Apurímac source area was completed using topographical maps at the scale 1:100 000 (sheets Cailloma 31-6 and Chivay 32-s). The lengths of all the streams that had been at any time designed as sources of the Amazon were measured up to the confluence of Río Santiago and Río Hornillos, situated at about 14.5 km east of the village of Cailloma, where the Río Apurímac begins. At the same time, aerial photographs at the scale 1:50 000 depicting the main ridge of the Cordillera de Chila Mountains and the upper course of Río Lloqueta with its four principal sources were studied.

Following instruments were used for field research: a laser range finder, LEM TM 30 (produced by Jenoptic, Germany) with tripod; special height gauges, ALTI PLUS 2 and BARIGO; a hydrometric propeller, C 20 (produced by OTT Messtechnik, Kempten, Germany).

3. Geographical location and natural conditions of the region

The study region is a part the Cordillera Occidental mountain range in the southern Peruvian Andes. The source area of the Apurímac River is situated on northern slopes of the main ridge of the Cordillera de Chila extending between 15°04'20" and 15°32'19" of south latitude and 71°36'38" and 71°54'00" of west longitude.

Administratively, the region belongs to the districts of Lari and Cailloma in Cailloma province, which is a part of the department of Arequipa in the south of Peru. The mining village of Cailloma, the starting point of the expedition, lies about 140 km north from Arequipa. The distance can be traveled by bus on gravel roads in about 12 hours, while a good cross-country vehicle can manage it in eight hours.

3.1. Georelief

The study region is a complex area of mountain ranges, river valleys, plateaus and a large intermontane basin. In the south the arc of the main ridge of the Cordillera de Chila Mountains with its highest summits (from the southeast to the northwest) rises: Mismi (5 597 m), Choquecorao, Hueracahua, Quehuisha, Calomorco, Ccaccansa, Jatunpila (5 437 m), Surihuiri (5 556 m) and Inaspata. At the same time the forms the main continental water-shed between the Atlantic and the Pacific drainage areas that is between the catchment area of the Apurímac River a tributary of the Amazon, and the Río Colca catchment area that, as Río Camaná (in its middle course, called Río Majes) flows into the Pacific Ocean. The northern and the western slopes of the mountains are not as steep as their southern slopes where the canyon of Río Colca has been deepened into unsolidified volcanic tuffs. The maximum height difference between the Río Lloqueta Valley in the north and the ridge line of the mountain range is 700 to 800 m, while the Río Colca Valley on the southern slope is incised to a depth of 2200 to 2500 m. After a distance of 30 km, the depth of the Colca canyon reaches 3 200 m.

From the viewpoint of the geological stratigraphy, rocks of both sedimentary and volcanic origin are dominant, dating from the Middle Tertiary to the present. In the Cordillera de Chila range, in the source area of Río Lloqueta and at the watershed with Río Ancollagua, rocks of Middle Tertiary appear at the surface and form the stratigraphic unit Tacaza. In its

upper part, which is up to 800 m thick, this formation consists of grey basaltic or ryolite lavas with frequent fissures filled by volcanic tuffs. In the deep cuts of rivers (for instance, below the confluence of both source streams of the Carhuasanta), there is frequently found a denuded thick lacustrinal formation (up to 1000 m, in Goicochea, Z.I.N., 1997) with laminarly arranged greenish, locally violet coloured sands and frequent fragments of volcanic rocks. In the upper part of the formation, lavas are clearly predominant – tuffs and conglomerates with blocs ranging in size from 0.5 to 10 m, are dominant in the deeper areas. The pleistocene is represented by the 20 to 150 m thick Barroso formation, consisting of greyish andesites and porphyries under the form of lava nappes or vaults. There however are also typical stratovolcanos with remnants of original parasitic volcanic cones.

The major part of the catchment area of the Río Apurímac's upper course is nevertheless formed by a large graded area and mainly by the very large Cailloma basin (Depresión de Cailloma). Pleistocene loams, sands and gravels, accumulated in the form of alluvia, glaciofluvial sediments and moraines fill the basin. Among the recent sediments, there are unsolidified sands, gravels and loams in the form of alluvial cones, fluvial alluvia, debris cones, and unsolidified material from stone and mud flows (huaycos).

Geomorphologic processes are also influenced by the extreme climatic conditions, the huge accumulation of snow, and the occurrence of glaciers. Under these conditions, numerous lakes of glacial origin were formed (including laguna "Bohemia"). Locally there is also permafrost that in summer (December-March) periodically melts at the surface.

3.2. Climatic conditions

Climatic conditions are mainly influenced by the high altitude which varies from 4 140 m a. s. l. at the confluence of the Río Santiago and Río Hornillos (the place of origin of Río Apurímac) and 4 319 m (Cailloma village) and up to the ridge of Cordillera de Chila reaching altitudes of about 5 500 m. The region is also isolated from the impacts of the Pacific Ocean and the Amazon Basin. During the three winter months (June – August) the mean monthly temperatures are below 0 °C, although night temperatures drop below –20 °C. During the expedition, the lowest temperature registered at the bank of Río Challamayo was –18 °C. In the warmest months (January, February), monthly averages reach about 6 to 7 °C. The nearest permanent climatic station in Yauri (3 915 m a.s.l.), situated about 50 km north-east, registers a mean annual temperature of 3.5 °C. The warmest month is January with an average temperature of 7 °C whereas the coldest is July (-0.6 °C). Average local rainfall is 662.3 mm. Although in the study region of the source area of Río Apurímac temperatures are slightly lower, the total annual rainfall at higher altitudes amounts to as much as 1 000 mm. The major part of the precipitation falls from November to March, while in January and February the region is covered by snow. The period, May-September, is characterized by low rainfall.

As in the majority of the mountains of the Peruvian Andes, glaciation of the Cordillera de Chila massif is of a local character. Because of the high altitude and the isolation from the ocean, there are favourable temperature conditions for the formation of glaciers. The decisive process in this case is the quantity of fallen snow. Glaciers and long-term snow cover encompass an area of 33.89 km^2. The lower limit of long-term snow cover lies on northern slopes of

the main ridge at about 5 300 m a. s. l. The majority of the 87 glaciers fill cirques, from which descend short slope or valley glaciers. According to the inventory of glaciers in Peru, published in the Atlas del Perú (1989), the total volume of glacier mass in Cordillera de Chila is 0.578 km^3, or about 1.03 % of the volume of all the glaciers in Peru.

In the source area of the Apurímac River glaciers, long-term snow cover and permafrost create very favourable hydrological conditions for streams, supplying water, especially in the summer months (from November to March). Accumulation of melt water in source areas influnces vegetation grouth as well. Especially large green cushions called *champa (Distichia muscoides)* absorb enormous quantities of water. They are made up of tightly tangled stems, leaves and roots of different species of trailing plants forming a sort of oval carpet. Depending on water content or the presence of permafrost, the surface may be months hard or, on the contrary, very soft. Champa and other plant species form, by successive growth and decay of their lower parts, huge (up to 10 m thick) layers of humolites in the source area of Río Carhuasanta. Among the numerous vegetal species are especially grasses: *ichu (Stipa ichu), sora (Calamagrostis eminens), chilhuar (Festuca orthophylla), tisna (Stipa obtusa)*. An important nutrient for herds of Tylopodous (lamas, alpacas and vicunas) is the low shrub *tola* (also called *llianta, Lepidophyllum rigidum*) that, once dried, is also used as fuel for fires. A very dominant plant on mountain slopes at altitudes higher than 4 500 m is *yarita* (also called *yareta, Azorella yareta*) often forming large, several metres high cushions. Becouse of its high content of resins, it is dried and, used as fuel.

4. Hydrographical and hydrological conditions of the source area of the Río Apurímac

Before the expedition began, a hydrographical analysis of the river network of the upper course of Río Apurímac and of all its sources was done using topographical maps from the National Geographical Institute in Lima

Tab. 3 – Results of the measurement of the lengths of streams in the source area of Río Apurímac (measured on topographic maps at a scale 1:100 000, IGN, Lima Peru)

Source	Source stream	Lenght* (km)
Laguna Vilafro	Quebrada Huancane – R. Santiago	35.3
Cerro Huagra	Río Huarajo – R. Santiago	37.9
Cerro Minaspata	Quebrada Yanacocha – R. Ancollagua – R. Challamayo – R. Hornillos	55.5**
Nevado Mismi	Laguna "Bohemia" – Q. Carhuasanta – R. Lloqueta – R. Challamayo – R. Hornillos	59**
Nevado Quehuisha	Q. Apacheta – R. Lloqueta – R. Challamayo – R. Hornillos	58.3**

* lengths measured from the source to the confluence of Río Santiago and Río Hornillos where the Río Apurímac begins

** when measured via the artificial canal (i.e. via Lago Parihuana – Río Challamayo -Lago Huarjuarco – Río Huarhuarco – Río Santiago) all lengths are 9.1 km longer

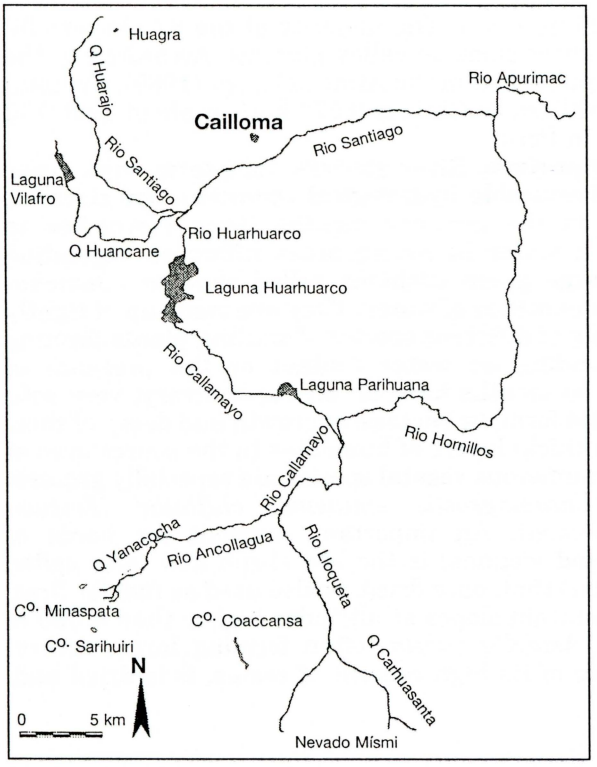

Fig. 2 – Region of Source Of Rio Apurimac

(Instituto Geographico Nacional) and aerial photographs of the upper course of Río Lloqueta. On the basis of these data the lengths of all the sources designated in the past as source segments of the Amazon were established.

The results of the measurements explicitly confirmed the initial hypothesis that the sources of the longest source stream of the Apurímac River must be found at the foot of the Nevado Mismi and Nevado Quehuisha massifs, where Río Lloqueta originates at the confluence of four source streams. Although in 1966 an international expedition headed by J. Palkiewicz designated the valley of Quebrada Apacheta as the main source, our measurements favoured the neighbouring valley – the Quebrada Carhuasanta (see Tab. 3).

In addition to measuring the lengths of the natural river beds, a remeasurement of the river network was done in the region Laguna Parihuana and Laguna Huarhuarco lakes where, in the past, an essential change of drainage occurred as a result of due to human intervention. This information originates with one of the participants of the Czechoslovak watercraft expedition in 1982, ing. Bobák, and also from the literature (see Asheshov 1970). It was also confirmed during our visit in the area. Some time after 1940 a mining engineer from Cailloma Mining Company dug a canal separating from the riverbed of Río Challamayo to feed the Parihuana lake. The work continued at the outflow from the lake, where a 2.7 km long underground tunnel was dug. Later on, a small dam and an aqueduct were built to bring water to two water power plants supplying local copper and silver mines. According to our measurements, this intervention extended the source segment of the Río Apurímac by 9.1 km compared with the natural riverbed via Río Hornillos.

Studying the results of the international expedition of 1996 confirmed that it is essential to carry out detailed measurements with the help of the latest instruments. Lengths were maesured with the latest version of a laser range finder, LEM TM 30, produced by Jenoptik and enabling measurements within a milimetre. We thus excluded the use of GPS that are not as precise. Given our work great doubt is shed on the results of expeditions noted above that used this instrument for measuring lengths.

4.1. Results of the field survey in the Carhuasanta Valley

Measurements works started in the base camp of the expedition at the confluence of both principal sources of the Río Lloqueta – that is the Carhuasanta and Apacheta, at an altitude of 4 781 m. When measuring, we proceeded along the main river bed so as to record all meanders. Up to the confluence of both principal sources of the Carhuasanta (5 026 m a. s. l.), the stream measured 6 521.1 m descending 245 m and with a mean inclination of 3.76 %.

The left source of Carhuasanta originates from a glacier lake indicated on maps as Laguna with its surface at the altitude of 5 233 m. The geographical coordinates of this sources are the following: 15°30'33" of south latitude and 71°41'34" of west longitude. On June 23, 1999 the minimal outflow of the lake was 9 l/s. This water flowed over a rock step at 5 228 m a. s. l. and in the form of a fine spray fell onto a firn field at 5 212 m. The upper edge of this small waterfall was only 15.5 m from the outflow of the lake. The total length of Carhuasanta from the left source equals 7 872.9 m. The left source has up to the confluence with the right source, a drop of 186 m with a mean inclination of 13.76 %.

The right source of Carhuasanta arises as a huge fissure spring under a 36 m high vertical rock wall at 5 238 m (the upper edge of the step is at an altitude of 5 274 m). The geographical coordinates of this source are 15°30'7" south latitude and 71°41'13" west longitude. The volume of the spring the day on June 24, 1999 was 20 l/s. The rock wall is penetrated by a vertical fault zone interfering against the slope. It is certain that the source is fed by melting snow and by the glacier at the foot of Mismi above the rock step and that the water penetrates into largely open fissures. The total length of Carhuasanta from its right source is 7 799.3 m. It has, up to the confluence with the left source, a drop of 212 m with a mean inclination of 16.59 %.

During the field work, *flow* was measured in three streams. In Río Lloqueta, it reached 535.9 l/s on June 21 at 13 o'clock above the confluence with Río Ancollagua (altitude 4721 m, the width of the riverbed was 6.2 m, water temperature 3°C). The flow of Río Apacheta was 205.9 l/s above the confluence with the Río Carhuasanta (altitude 4788 m, the width of the riverbed 2.2 m, water temperature 1°C). The flow of Río Carhuasanta was 168.6 l/s above the confluence with Río Apacheta (altitude 4799 m, width of the riverbed 2.75 m, water temperature 1 °C). The second and the third measurements were taken under stable conditions at 9, respectively 9.30 o'clock on June 24 with the help of a hydrometric propeller, C 20, produced by OTT.

5. Conclusion

When determining the main sources of a stream, hydrographic practice takes into consideration the following criteria: length of the course together with the altitude of the source, the expanse of water area, flow, levelling of lengthwise profile and the evolution age of the river bed. With a view to these criteria we can state the following:

1. The Río Carhuasanta is the main source of the Río Apurímac and thus also of the Amazon. This conclusion is verified by the results of our field and

cartometric measurements. The total length of the source segment from the left source of the Carhuasanta in the glacier Lake of Laguna down to the beginning of the Apurímac River (confluence of Río Santiago and Río Hornillos) is 59,573 km.

2. The sources of the Río Carhuasanta are situated at the highest altitudes of all the sources described by previous expeditions – 5 238 m (the right source) and, 5 233 m (the left source).
3. The largest catchment area of all the sources of the Río Lloqueta is that of the Carhuasanta (19.6 km^2, compared to Sillanque 14.1 km^2, Apacheta 14.1 km^2, Ccaccansa 8.8 km^2), see also the data given by Goicochea, Z.I.N. (1997).
4. The Río Apacheta is characterised by a greater flow (205.9 l/s than the Río Carhuasanta 168.6 l/s).
5. The artificial canal extending from the Río Challamayo and feeding Parihuana and Huarhuarco lakes elongates the source segment of the Río Apurímac by 9.1 km. The natural river bed is nevertheless the Río Hornillos.
6. The longest source segment of the Amazon has the following course: sources of the Río Carhuasanta – R. Lloqueta – R. Challamayo – R. Hornillos – at its confluence with R. Santiago begins the Río Apurímac. At its lower course, it changes its name to the R. Ene and then to the R. Tambo. At its confluence with the R. Urubamba the Ucayali begins and after its confluence with Marañon, the Amazon.

In spite of the valuable results reached by the expedition this work is really a further stage in the study of the source area of the largest stream on the Earth. We are convinced that the same methods used here in the case of the Carhuasanta must be used for measuring other source streams, mainly the Río Apacheta and the Río Ccaccansa. Only then can the discussion about the source of the Amazon be closed.

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Shrnutí

NOVÉ VYMĚŘENÍ PRAMENŮ AMAZONKY

Ve druhé polovině června 1999 se uskutečnila expedice Hatun Mayu (kečuánsky „Velká řeka"), která směřovala do pramenné oblasti řeky Apurímac na jihu Peru. Sedmičlennou výpravu vedl autor článku, který společně s dalším organizátorem akce, fotografem a kameramanem Vladimírem Šimkem, navštívil toto území již při expedici Peru 95. Ještě před cestou bylo provedeno měření délek toků jednotlivých zdrojnic řeky Apurímac na leteckých snímcích a topografických mapách v měřítku 1:100 000. U předem vytypované hlavní zdrojnice Río Carhuasanta byla pak v terénu detailně změřena její délka a stanoveny nadmořské výšky, které umožnily vynesení podélného profilu toku. Rovněž se uskutečnilo měření průtoků vody na hlavních pramenných tocích Río Apurímac.

Jedním z motivů expedice byla postava jezuity českého původu Samuela Fritze, který se především v hispánském světě proslavil jako autor první kvalitní mapy Amazonky. Fritz, narozený v Trutnově, postupně absolvoval Filosofickou fakultu Karlovy Univerzity, Svatováclavský seminář v Praze a poté vstoupil do jezuitského řádu. V roce 1683 byl spolu s J.V. Richterem a J. Burgrem vyslán do misijní služby v tehdejší Západní Indii. Po dlouhé cestě přes italský Janov, španělskou Sevillu, Cádiz, Kanárské ostrovy, ostrov Martinique, kolumbijský přístav Cartagenu a strastiplném putování proti proudu řeky Magdalena, andská města Popayán, Pasto a Quito, splutí řeky Pastaza se dostali až na hlavní tok Amazonky. Po jejím proudu se vydali k ústí Huallagy do sídla španělské misie La Laguna. V dalších letech Fritz postupně navštívil několik indiánských kmenů na dolním Marañonu a při ústí Rio Negro. Po zajetí Portugalci byl 18 měsíců vězněn v portugalské jezuitské koleji Pará při ústí Amazonky. Po propuštění v roce 1691 mapoval během 1 300 km dlouhé plavby přítoky Amazonky, říční ostrovy i jednotlivé indiánské osady. V roce 1693 navštívil španělského místokrále v Limě a na zpáteční cestě popsal prameny Amazonky v horském jezeře Lauricocha. Jako pramennou oblast největšího veletoku na Zemi udává tento region dodnes New Encyclopaedia Britannica (1998). Fritzova mapa Amazonky z r. 1707 byla v pořadí druhá na světě (po Guillermo Sansonovi), avšak mnohem dokonalejší.

Do 50. let 20. stol. byl za pramenný úsek Amazonky považován Marañon, tzn. více než 250 let platila teorie S. Fritze. Za pomoci map větších měřítek bylo zjištěno, že druhá zdrojnice Amazonky – Ucayali je výrazně delší než Marañon, a tak mnohé expedice zamířili poté do pramenné oblasti Río Apurímac, nejdelší zdrojnice Ucayali. Od roku 1953, kdy byl za pramen největší řeky světa označen vrchol Cerro Huagra v pohoří Cordillera Chila na jihu Peruánských And, se uskutečnilo několik výprav, které se snažily přesně určit místo pramene (viz tab. 1). V souvislosti s tím se také objevovaly v literatuře odlišné údaje o délce Amazonky (viz tab. 2).

Po revizi údajů všech dosavadních výprav a detailních kartometrických měřeních na topografických mapách a leteckých snímcích se autor článku vrátil k původní teorii prof. dr. Carlose Peñaherrery z roku 1969. Cílem expedice bylo tedy potvrdit na základě výsledků terénních měření, že nejdelší zdrojnicí řeky Apurímac a tedy Amazonky je Quebrada Carhuasanta v departamentu Arequipa na jihu Peru.

Součástí tohoto článku je stanovení přesné geografické lokalizace pramenů a popis přírodních podmínek regionu hlavního hřebene a severního úpatí pohoří Cordillera Chila, který je součástí pásma Cordillera Occidental jižních Peruánských And. Pozornost je přitom věnována charakteristikám georeliéfu, rozsahu zalednění, klimatickým a vegetačním poměrům.

Detailní analýze jsou podrobeny hydrografické poměry pramenné oblasti řeky Río Apurímac. V článku jsou uvedeny výsledky měření délek všech dosud uvažovaných pramenných úseků na topografických mapách (viz tab. 3), dále údaje o antropogenní transformaci říční sítě, která byla v minulosti uskutečněna v souvislosti s těžbou rud vzácných a barevných kovů.

Podstatnou částí textu jsou výsledky terénního průzkumu, který proběhl v údolí řek Río Lloqueta a Río Carhuasanta. Vzhledem ke kritériím, které se v hydrografii používají pro určení hlavního toku bylo stanoveno:

1. Río Carhuasanta je hlavním pramenem řeky Río Apurímac a tudíž i Amazonky. Celková délka pramenného úseku od levé zdrojnice Carhuasanty v ledovcovém jezeře Laguna až po vznik řeky Apurímac (soutok Río Santiago a Río Hornillos) činí 59,573 km.
2. Prameny Río Carhuasanta leží v nejvyšší nadmořské výšce ze všech zdrojnic, které byly popisovány předchozími expedicemi, tzn. 5 238 m (pravá zdrojnice), resp. 5 233 m (levá zdrojnice).
3. Ze všech zdrojnic Río Lloqueta má Carhuasanta největší plochu povodí (19,6 km^2).
4. Ve prospěch Río Apacheta hovoří pouze větší průtok vody (205,9 l/s) oproti Río Carhuasanta (168,6 l/s).
5. Umělý kanál, který se odděluje od Río Callamayo a napájí jezera Parihuana a Huarhuarco, prodlužuje pramenný tok Río Apurímac o 9,1 km. Přírodním řečištěm je však Río Hornillos.
6. Nejdelší pramenný úsek Amazonky má následující průběh:
   prameny R. Carhuasanta – R. Lloqueta – R. Callamayo – R. Hornillos – jeho soutokem s R. Santiago vzniká R. Apurímac. Ten mění na středním a dolním toku název na R. Ene a R. Tambo. Jeho soutokem s R. Urubamba vzniká R. Ucayali a po soutoku s R. Marañon vzniká Río Amazonas.

Obr. 1 – Mapa českého jezuity Samuela Fritze z roku 1707
Obr. 2 – Oblast zdrojnic Rio Apurímac

(Author is with Department of Physical Geography and Geoecology, Faculty of Science, Charles University, Albertov 6, 128 43 Praha 2, Czechia.)

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ANTONÍN VAISHAR, PAVLÍNA HLAVINKOVÁ, KAREL KIRCHNER, JAN LACINA

LONG-TERM IMPACTS OF THE 1997 FLOODS IN THE MORAVA RIVER BASIN

A. Vaishar, P. Hlavinková, K. Kirchner, J. Lacina: *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.

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1. Introduction

This contribution discusses the long-term impacts of floods, which took place in the catchment of the Morava river in July 1997. The cause of these floods is apparent: extreme precipitation occurred across a relatively large area of the Morava river basin. The primary damage was calculated and evaluated. The death tolls reached 50, the material damage was estimated at about 60 bil. Kč: 538 towns and villages were affected, 2,151 dwellings were destroyed, 16,500 dwellings were seriously damaged, just as 946 km of railways and 580 km of roads. 100,000 ha of agricultural land were flooded, with losses in crops and livestock. Water and soil were polluted since wastewater plants were flooded and oil products and various other harmful industrial substances were washed up. What is important to note is that the epidemiological situation could be kept under control.

Almost all the direct damage caused to the housing stock and infrastructure has already been restored or the restoration is drawing to an end. The damage to economy can hardly be evaluated since the time of the floods overlaps that of the beginning of economic recession in the Czech Republic. Paradoxically, the flood event also had positive aspects. These include the mobilisation of social potential, the renewal of infrastructure in a modern framework and the restoration of the historical memory of the population. Experts from

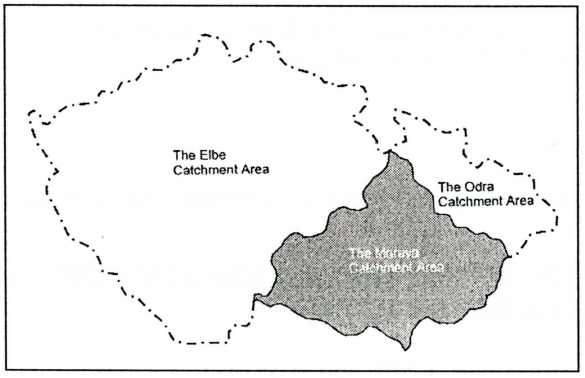

Fig. 1 – The Morava river basin in the framework of the Czech Republic

hydrometeorological and water institutions and from universities evaluated a series of partial aspects of this event. We, as geographers, are interested in the regional aspects of the problem and in the relation between natural phenomena and the social system.

After the primary evaluation of the event (Munzar, Ondráček, Táborská 1997), we have focused our attention on the long-term impacts of the floods, which started to manifest themselves roughly two years after the event. These impacts can be observed in both the landscape and the human system. Research is being undertaken in four model areas, which represent different types of affection in different parts of the Morava river basin (Vaishar 1999a). Some research is being carried out in other regions, too. The design team is composed of physical and human geographers. Also methods of behavioural geography, such as conducted interviews and inquiry surveys, have been adopted.

2. The Essence of Floods and their Impacts in the Individual Model Regions

The model region Hanušovice/Jindřichov lies in the upper reach of the Morava river at its confluence with the rivers Branná, Krupa, Hanušovický potok (Hanušovice brook) and others. The cores of the present-day settlements, together with the main roads and industrial plants, are embedded in the relatively deep and narrow valleys of the watercourses. As a result of the compulsory transfer of Germans after 1945, almost a complete exchange of population took place here, which led to disrupting the continuity of the historical memory in relation to floods. At the very beginning of the flood, the region was hit by rain torrents reaching a high speed. The velocity of the stream, together with the amount of transported materials and debris, had significant devastating power. The area was cut off from the rest of the world for a few days. The flood inflicted serious damage on the infrastructure, housing and the paper works industry in Jindřichov. Despite the extreme severity of the flood, only one direct human casualty was recorded.

The model region Mikulůvka/Bystřička/Růžďka lies in the catchment of the Bečva river and its tributaries. The settlement is rural to marginal in character, with a population largely dependent on commuting to work to the biggest centres in the Vsetín district. In 1912, a water reservoir was built on the small river Bystřička whose primary purpose was to control floods, with recreation having developed as its secondary purpose. As a result of extreme rains in July 1997, the vacant retention capacity of the water reservoir, about 2,5 million m^3 before the flood, was filled for the first time and the water

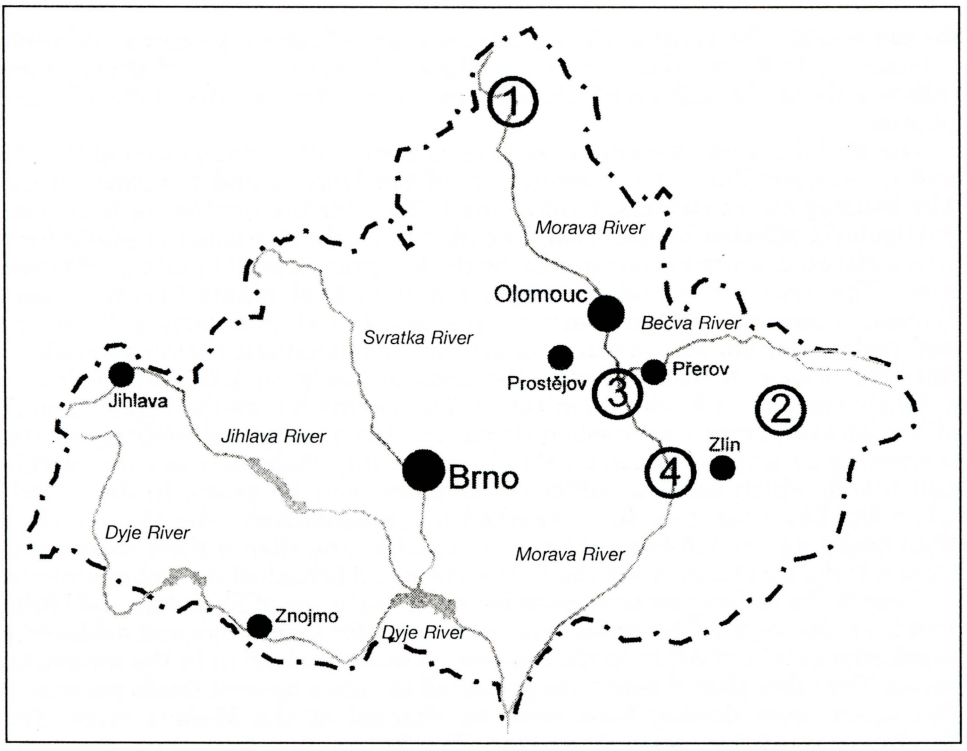

Fig. 2 – Selected Model Regions. Model areas: 1 – Hanušovice / Jindřichov, 2 – Bystřička / Mikulůvka / Růžďka, 3 – Bochoř / Troubky / Vlkoš, 4 – Otrokovice.

flowed over the dam. The extremely high flow in the Bystřice river amounted up to 170 m^3/s (with the normal flow at the estuary into the Bečva river being 1,05 m^3/s), and the flood wave reached up to 130 cm. Thanks to the fact that the water reservoir took 30 hours to fill up, the population could warned in time so that there was not high death toll. The occurrence of frequent and extensive landslides that caused serious damage to the infrastructure and housing was the specific consequence of the catastrophe.

The model region Bochoř/Troubky/Vlkoš lies in a fertile flood plain not far from the confluence of the Morava and Bečva rivers. It is a flatland area, with the maximum differences in altitude ranging from 5 to 7 meters. The settlement is of rural character, with farming still having a major share in the economic structure. A large portion of the housing stock, or at least the cores of the structures – reconstructed and extended in the course of time, was built of cob, a popular building material at the end of the 19th century and the beginning of the 20th century. The fact that the flood did not come from the direction of the Morava river, as expected, but from the more distant Bečva river, which breached its embankments downstream of the district town of Přerov, gave rise to a specific problem characteristic of the 1997 flood situation. The water masses came over the watershed divide and were running in several streams concentrated in slight terrain depressions. These streams gradually joined, thus multiplying their devastating strength. Having no significant elevation, the landscape did not provide any possibility

for protection. The cores of the structures made of cob broke down and their extensions, built of other materials, then collapsed on top of them. Nine inhabitants of the village of Troubky lost their lives in the ruins of their houses.

The model region Otrokovice includes a town with a population of 20,000 and its surroundings at the confluence of the Morava and Dřevnice rivers. The housing estate Bahňák, built in the 1930s near the combine of Baťa, was particularly affected by the flood. The idea to locate this housing estate here was motivated, among other things, by the low price of land in this inundation area. The area accommodates important industrial plants (among others Barum, a company manufacturing tyres, and the aircraft factory Moravan) and residential blocks consisting of typical functionalistic buildings made of fair-face bricks. A flood affected the area as early as 1930, which led to extensive measures having been taken. The Tresný hill on the opposite bank of the Morava river was washed down into the area of the housing estate, increasing its level by 2 meters. Furthermore, the whole area was thoroughly embanked, which seemed sufficient for more than 60 years. In July 1997, when the Dřevnice river first breached its embankments, the Morava river then broke up the left-bank dike near Kvasice, and then a flood wave came from a large flood lake after the Bečva river had breached its embankments, and lastly the railway embankment between the towns of Kroměříž and Hulín had been destroyed. The water level was rising for three days and achieved a maximum height of 3,5 m in the residential zones and 4,5 m in the industrial zones. The dikes that should have protected the town against floods prevented the water from flowing back into the channel of the Morava river. The flooding lasted for several weeks. Thanks to the fact that the local government managed to withstand pressure to accelerate the receeding flow by breaking through the dikes, no flood wave arose so that it was not necessary to break down a single residential building. However, damage to the infrastructure and industrial and private property was recorded.

The hitherto knowledge of the flood suggests that the major cause of the damage inflicted by the flood included a complex of problems associated with the changes carried out in the pattern of settlement during industrialisation and urbanisation, that being in the second half of the 19th century and the first half of the 20th century for Moravia (Vaishar 1996b). At that time, a great number of people began to settle in the flood plain areas, with flood protection having been solved by technical measures, namely by constructing water reservoirs and dikes. As a result, the historical memory of the population in relation to flood hazard began to disappear. Also the behaviour of people and firms during floods was connected with it to a great extent, as was the minimum preparedness of the people and the rescue system. The era of socialism had only intensified these problems in many respects.

Discussions are under way about the decline in the retention capability of the landscape. However, it appears that this issue is of more common concern, or less, in relation to smaller and relatively regular floods, as well as in relation to the course of time of flood waves. It is apparent that the extreme precipitation in July 1997 exceeded the theoretical maximum retention capacity of the landscape several times, which could have retarded the coming of the flood by several hours at most. In relation to the natural environment, the problem lies, more or less, in the fact that earlier, floods would be a natural, regularly recurring phenomenon, which played a major part in landscape management. The changes brought about by industrialisation and

urbanisation interrupted this process. Therefore, obtaining knowledge of the course and impacts of the floods that took place in Moravia in historical times is also significant (Munzar 1998).

3. Long-term impacts of the floods on the natural system

The extreme precipitation and the extensive floods in July 1997 had instantaneous impacts on and implications in the natural sphere of the landscape, and caused direct damage. A series of these impacts brought about changes in the natural sphere. These changes have not been amended and will have long-term effects. In many cases, the return to the original character of the relief or ground cover is no longer possible even if the implications have been removed (e.g. through levelling the ground of the flood plain, reclamation of damaged river banks etc.), and the changes will remain permanent. We will discuss those changes in the abiotic and biotic sectors of the natural sphere of the landscape that occurred immediately as a result of the floods, and may continue to exist for a long period of time. These changes will be the subject of further research.

The heavy precipitation saturated the upper layers of the soil and rock profile in mountainous parts of the upper section of the Morava river (Sudetenland) and also in the Carpathian section of the Morava river basin (the Bečva river, the Outer Western Carpathians). The high flows caused a flood situation not only in the upper sections of the catchment but also in the middle and lower sections. The saturation of mountain massifs led to the activation and rise of slope deformations. A less extensive occurrence of slope deformations was recorded in the area of Sudetenland where the geological conditions for their rise are less favourable. For example, an extensive landslide was recorded near Hanušovice (over 100 m wide). The chief causes of the rise of slope processes in this area included lateral river erosions and wetting (Vít, Aichler, Pecina 1998).

A great amount of slope processes (particularly landslides and ground streams) was activated in the area formed by the flysch complexes in the Outer Western Carpathians (the mountainous part of the catchment of the Bečva river) where the geological conditions for the development of slope deformations are very favourable. In the district of Vsetín, the activity of the slope deformations locally reached almost disastrous effects (Kirchner, Krejčí, 1998). In the catchment of the Rožnovská Bečva river, a series of landslides was activated by the lateral erosion of watercourses. Smaller watercourses were frequently under the threat of their streambed being dammed up (e.g., the Solanecký potok /Solanecký brook/). South of Rožnov p. R., the lateral erosion caused the movement of a landslide of a length of up to 20 m collided into the streambed of the Rožnovská Bečva river (Kirchner, Krejčí, 1998a). Extensive ground streams and landslides affected the valley slopes of the Bystřička water reservoir, bringing a great amount of fine-grain material into the reservoir. This material accumulated together with the flood sediments. A series of hazardous landslides has already been cleared, however the majority of slope deformations could be reactivated under favourable conditions and their activity is long-term.

The flood flows in the upper sections of the catchment of the Morava river and the Bečva rivers, its Carpathian tributary, caused an intensive erosion in riverbeds and on valley bottoms translocating and depositing a great amount

of fluvial sediments. They flooded large areas and fine-grain sediments settled in the lower flatland sections of the catchment area. An intensive erosion in riverbeds (lateral and deep erosion) occurred in the upper section of the catchment of the Morava river (Sudetenland), soil losses also took place on the flood plain surface. According to Gába (1999), the lateral erosion in this area was typically about 10 m, with a maximum of up to 90 m. Also new river beds arose in this area, while the old ones were sedimented. A significant rectification of the riverbed of the Morava river took place in Hanušovice, a relocation of streambeds occurred frequently as a result of the flood. Also the effects of erosion manifested themselves significantly (erosion rills and gullies of a depth of up to 3 m arose on mountain slopes). The effects of erosion were significant also in the rise of new streambeds in the flood plain. Through retrogressive erosion, Krupá, a small river, recessed into the flood plain sediments by 2,5 m. Also frequent sedimentation on the flood plain surface was characteristic of this area (the gravel bank locally reached a thickness of 2 to 2,5 m, Gába 1999).

A significant erosion in streambeds and valley bottoms occurred also in the mountain Carpathian section of the Morava river catchment (Bečva river). The watercourses transported a great amount of gravel sediments, which frequently filled up the existing streambeds (e.g., the Dolní Rozpitý brook in the Dolní Bečva river – Rožnovská brázda /Rožnov furrow/). The upper sections of mountain watercourses eroded down to the fresh parent rock, and significant erosion cuts formed. The strong lateral erosion of the Rožnov Bečva river in Rožnov p. R. denuded a unique geological outcrop with a specimen of a tectonic contact of flysch layers (Kirchner, Krejčí 1998a). A significant surface erosion and the removal of the top layer of flood plain

Fig. 3 – Example of a landslide in the cadaster of the Bystřička village (photo by K. Kirchner)

sediments took place in the flatter relief of the catchment in the upper and lower reaches of the Bečva river. Two levels of streambed formed, the lower – the active one, and the higher – the flood streambed. An extensive flood effusion and the transformation of the flood wave in the flood plain occurred in the middle and lower sections of the Morava river. A great amount of fine-grain sediments deposited in many places (e.g., the flood plain surface north of Olomouc). On the contrary, the erosion damaged flood protection dikes, sporadically the high buffer banks of the Morava riverbed retreated (e.g., the location Osypané břehy north of Strážnice).

Unlike the impacts on settlements and population, which are frequently almost catastrophic, the impacts on flora, fauna and biocenoses were by far not only adverse but in many cases the flood wave and the floods had positive impacts. To sum up, we can even say that the 1997 flood, whatever disastrous from the human point of view, had beneficial impacts as a natural and a very efficient revitalisation factor, particularly in the floodplains of Moravian rivers.

At the same time, it must be stressed that the close-to-nature ecosystems, or those being almost natural, particularly larger floodplain forests, had positive impacts on the course of the flood, also. So, for example, the floodplain forests in the protected landscape area Litovelské Pomoraví could significantly slow down the floodwave of the Morava river upstream of Olomouc. According to I. Machar (1997), the floodwave flowed through the local floodplain forests for a full ten hours. The large floodplain forests at the confluence of the Morava and Dyje rivers in the border area of the Czech Republic, Slovakia and Austria became a very significant retention space retaining more than 50 mil. m^3 of flood water. This significantly contributed to mitigating the devastating course of the flood.

The devastating effects of the flood manifested themselves primarily in the non-close-to-nature ecosystems, particularly in the extensive agrocenoses. In terms of the forest stand, the flood wave primarily tore away the spruce monocultures set out unsuitably in the flood plains – as was the case in several locations along the rivers in the foot hills of the Hrubý Jeseník mountains. Among the riparian stand tornaway, the Euroamerican poplars (Populus canadensis) prevailed, while the autochtonous flood plain tree species forming the riparian stands were affected substantially less. On the contrary, the landslides activated by the disastrous precipitation manifested themselves in both spruce stands and the close-to-nature mixed forest stands as well as in the rich-in-species grasslands with scattered spruces.

In the flood plain forests, the flood affected the lower storeys, i.e. the shrub and herb layers. The mortality of the shrub layer of the European elder (Sambucus nigra) occurred in locations with longer-term flooding, in some locations this was also true of the young growth European ash (Fraxinus excelsior) and other flood plain tree species. In terms of the herb layer, primarily species with well-developed vegetation organs managed to renew their above-ground biomass by the end of the 1997 growing season – of the neophytes primarily Reynoutria japonica and Helianthus tuberosus, of the native species Urtica dioica. The research conducted so far has not confirmed the assumption that the species composition of the herb synusia will substantially change as a result of the oversedimentation of the soil surface by flood sludge and, in some locations, also by wood debris. Neither does the flood seem to have made a more significant contribution to the further dissemination of expansive neophytes. The main tree layer of the flood plain

forests accepted the flood as one of the necessary conditions for its growth, that is as a positive factor.

As a matter of course, the mortality of animals occurred during the course of the flood, particularly that of the game. However, the survey in the Soutok reserve in southern Moravia suggested that most damage was inflicted to the non-original fallow deer (Dama doma). Generally, the roe deer population (Capreolus capreolus) and the brown hare population (Lepus europaeus) were affected most by the flood. The flood affected also small mammals in different ways. The common vole population (Microtus arvalis) that was originally a steppe vole decreased substantially. However, unlike this field pest, some rarer wetland species (such as Neomys anomalus and Apodemus agrarius) were not affected. The wetland survey carried out after the flood in the protected landscape area Poodří suggested that to the contrary, their populations increased.

The flood did not cause any serious threats to either aquatic ecosystems or populations and communities of aquatic organisms (Peňáz 1998). In the upper reaches, no conclusive changes in the structure of fish populations occurred, with the exception of the grayling (Thymallus thymallus). Some losses in fish population manifested themselves in lowland reaches since the water effused into field crops. However, the overall finding is that, after the flood, the aquatic ecosystems showed a high degree of regeneration. The flood extended the morphological diversity of aquatic biotops, also a prerequisite for an increase in the species diversity.

The significant negative phenomena caused by the flood include the mass outbreak of mosquitoes in southern Moravia, which occurred after the flood in depressions with a reduced run-off of effused waters. The warm summer weather also contributed to the growth of an abnormally strong mosquito population. As a result the inhabitants of Lanžhot and other villages were exposed to a mosquitoes for two or even more weeks after the flood was over (Pražák 1998).

Despite a series of direct negative effects and implications caused by the flood, it can be said that they were mostly temporary phenomena. From the long-term point of view, the impacts of the flood, particularly on the flood plain and riverine ecosystems, can be regarded as positive. The technically regulated watercourses were substantially revitalised even in long sections, with a diversified mosaic of biotops to be found in the riverbed, and a flood plain having formed in some locations. This phenomenon, which is positive from the environmental point of view, is striking particularly along the Bečva river between Valašské Meziříčí and Přerov. Some rare bird species could significantly increase their populations there (such as Alcedo athis, Riparia riparia and Charadrius dubius) as the flood created favourable biotops for their nesting. A favourable adaptive succession is taking place in the wide flood beds with denuded gravel banks. In the initial stages, some communities excluded from the flood plain landscape as a result of previous water management interventions, also appeared there, e.g., Saliceta gragilis (Lacina, Mackovčin, Kirchner, Hrádek, Řepka, 1998). With the mosaic of ecotopes newly created, or renewed respectively, by the flood, also the biodiversity, which was significantly reduced by antropogenous interventions, is again growing. Not only the six selected sections along the Bečva river, but also parts of the flood beds of other Moravian rivers should by declared protected zones and left up to natural development. These sections must be protected against attempts to bring them back into technically designed beds.

They must be preserved not only as unique scientific study areas, but also as places that would remind those living in the flood plain landscape of the enormous strength and power of the flood, a natural landscape enhancement factor, which could return here again.

4. Long-Term Flood Impacts on the Social System

As has been said, the damage done by the flood to the economy has been mostly restored or its restoration is approaching the final stage. Secondary economic losses can hardly be separated from the implications of the regressive development of the Czech economy after 1997. However, in the course of research conducted so far we have not come across a case of a larger company going bankrupt as a direct result of the 1997 floods. Paradoxically, the flood may have contributed to revitalising a company going bankrupt for other reasons or to prolonging the time of its existence as a result of the mobilisation of human potential, the payment of damages, state aid or the obtaining of an order to remove flood damage. It is particularly small businessmen who came under real threat.

The infrastructure, particularly roads, railways and technical networks, but also social facilities, were heavily damaged. Taking advantage of this, a number of communities built new facilities to meet the present-day needs. In terms of infrastructure, the situation of some communities affected by the flood visibly improved even though many of them ran into debts or allocated funds for removing the impacts of the flood from other items.

The housing stock renewal was more complicated. Not all the damage was covered by insurance. The existing state-subsidy programmes did not cover

Fig. 4 – Structures damaged by the flood in the village of Bystřička (Photo by K. Kirchner)

the new housing costs either in addition, they were based upon a strong participation of local people. The affected population divided into two basic groups. The first group was represented primarily by families at productive age who started to build new or repair old structures, as a rule with a big share of their own work and with incurring debt. Two years after the disaster, most of the structures are approaching completion. They will presumably provide a higher standard of housing than those in which these people lived before the flood.

The second group was represented primarily by elderly people who were no more able, either financially or physically and psychologically, to build or repair their homes, or it did not make sense from the economic point of view. Some communities constructed apartment houses for such people, these houses being styled as boarding houses or nursing homes. This is the case only in Troubky where 313 houses were destroyed and 386 seriously damaged. Despite the fact that the material standard of the elderly housing environment has typically improved, the change in the style of living may have adverse impacts on them.

So, we are getting to the most significant long-term social impact of the 1997 flood – the damage to humans (Vaishar, Lacina, Ondráček 1999). Death tolls or damage to health are naturally irreplaceable. Today, however there can be no doubt about the harmdone to the social and psychological health of the affected population either. These injuries can be seen at several levels. It may be a direct attack on the psychological condition of humans as a result of traumatising experiences known as post-traumatic stress disorder. They may experience depressive states caused, for example, by the loss of prospects in life, the awareness of powerlessness against nature forces or an enforced change in lifestyle. These symptoms are visibly manifested, particularly with the female and elderly population, and they combine with other negative social factors, such as unemployment. However, it seems that with elderly people loneliness is the main risk factor rather than age.

However, such changes in the social system have occurred. The behaviour of individuals facing hazard was a test of characters whose results may have significantly changed the social hierarchy and human interrelationships. As a matter of course, these changes manifested themselves in both positive and negative ways. The subsequent mobilisation of human potential has remained in citizen's memories. In reality, tendencies for population migration as a result of the flood were manifested in only exceptional cases.

In many cases, the distribution of humanitarian aid brought relatively considerable social controversies with it. People in the affected communities are still at war with one another because of their different opinions on its distribution. There are signals that in some communities citizens understood the distribution of aid as a trend to bring back state subsidies allocated according to completely different criteria than those reflecting the real affects of the flood (Premusová, 1999). The research on the social implications of floods continues by means of the methods of behavioural geography.

The historical awareness of flood hazards has returned as the basic precondition for preventing flood damage. Building authorities have adopted rules for erecting structures in flood zones, the reviews of town and country plans are in preparation, etc. However, despite this fact many citizens could not be prevented from building their houses in the flood zone again. In relation to population, the prevention is, as yet, focused on the warning system. What is most essential is the preparedness of the population. However, little

consideration is still being given to this fact. During the 1997 floods, the communities in the lower sections of watercourses were warned, in many cases, many days ahead. However, it was frequently of little use when the concrete potential risks were not known and when the activities of authorities, institutions and individuals were not clearly defined. The inhabitants of communities affected by the 1997 floods are ready to leave their houses with any heavier rain. This attitude may easily turn into panic, which could have more or less adverse impacts in the case that the floods recur. In relation to the above-mentioned problems are also the legislative and organisational steps to be made to ensure that the rescue system works as required.

5. Potential Flood Damage Protection Strategies

In our opinion, there are three basic strategies to control flood damage, and, as a rule, they fit into the real world. They can be defined as a) geographical, b) technical and c) adaptive.

The geographical method is based upon selecting such locations for residential and other structures that are situated outside the flood zone, that is locations, which are under minimum risk for natural disasters. This method had been adopted by our ancestors as is obvious by the location of the old cores of our settlements and by the fact that these cores remained mostly unaffected by the floods in those communities hit by them. The question is to what extent we can return to this method at the present time. A certain potential in this respect is hidden in the development of individual transport and in the reduction of energy- and raw material-consumption in manufacturing, which would enable to locate some buildings in less accessible locations. However, this is in contradiction with the fact that the natural environment of the majority part of these areas is relatively well-preserved, making them less suitable for mass housing construction. Therefore, this method is suitable as a specific approach to new housing construction rather than as a universal approach.

In the course of the 20th century, technical methods were applied in the territory of the Czech Republic as almost the only way of controlling floods. They primarily include the construction of dams and embankments. However, these measures have economic limitations as it is obviously of no use to build dams and embankments for such a period that exceeds the life of the particular dam, and also environmental limits as they represent a serious intervention in the landscape, some carrying potential implications of which can hardly be predicted in full. Today, these measures also include some attempts to restore a more natural landscape management since and these measures also often mean technical interventions, they require substantial financial means and bear the risks of unpredictable implications for the landscape. Thus, the application of technical methods is also limited although it is becoming more and more popular.

The third option is to reckon with flood risks. That means to construct structures that would stand the floods for a certain period of time without being seriously damaged, to manage catchment areas so that the impact of the eventual flood wave is minimised, and to design a system of prevention, warning and population preparedness so that no threats to life emerge and losses in property are minimised. This must be preceded by a series of legislative, organisational and economic measures.

The scientific research generally and the geographical research particularly have their place in the system of prevention. The issue of natural risks is also discussed in great detail in Czech geography (e.g., Hrádek 1995), and the 1997 floods have made it an issue of common concern. The human geography, in turn, will find its place in the research on the regionally-based perception of these risks, the possible impacts of flood situations on the settlement, economy, infrastructure and the social system and in the research on measures to prevent them.

6. Conclusion

We are aware of the fact that, in terms of the size of the affected area, the death tolls or the volume of material damage of the 1997 floods in Moravia cannot be compared to those hitting people elsewhere in the world. Of all of them, let us mention at least the relatively regular floods in Bangladesh or those that caused the shocking death tolls in Venezuela in late 1999. In any case for the affected population of Moravia, these experiences were as traumatising as for people elsewhere in the world.

From the point of view of research, it may, however, be an advantage that regarding the current situation in the Czech Republic, we can draw our attention to detail. Although natural and social conditions differ considerably in various parts of the world, one of the essential causes of the catastrophic impacts of floods is identical: the location of settlements in places unsuitable for housing construction from the point of view of natural risks. In this respect, we would gladly exchange experience with foreign experts.

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Shrnutí

DLOUHODOBÉ NÁSLEDKY POVODNÍ 1997 V POVODÍ ŘEKY MORAVY

V létě 1997 byla větší část povodí Moravy spolu s povodím Odry a částečně i Labe postižena extrémními dešti, které nemají co do množství srážek a rozsahu postiženého území obdoby po celou dobu klimatologických a hydrologických měření. Tyto srážky vyvolaly povodně, v jejichž přímém důsledku zahynulo 50 lidí a materiální škody dosáhly asi 60 miliard Kč. Většina přímých škod již byla nahrazena. Vynořila se ale otázka dlouhodobých následků povodní. Tuto problematiku studuje skupina geografů a sociologů na případových studiích ve čtyřech vybraných modelových oblastech.

Modelová oblast Hanušovice / Jindřichov se nachází na horním toku řeky Moravy. Dnešní sídla včetně průmyslových podniků a infrastruktury jsou lokalizována v hlubokých úzkých údolích. Oblast byla postižena na počátku povodně mohutnými přívalovými vlnami se značným ničivým účinkem a byla po několik dnů odříznuta od světa. Modelová oblast Mikulůvka / Bystřička / Růžďka se nachází v povodí Bečvy a jejího přítoku Bystřice. Na tomto toku byla vybudována přehrada, která v průběhu povodní 1997 přetekla a ohrozila sídla pod sebou. Povodeň kromě toho iniciovala četné sesuvy, které nebyly dodnes stabilizovány. Modelová oblast Bochoř / Troubky / Vlkoš se nachází v ploché krajině Hornomoravského úvalu. Byla postižena vylitím relativně vzdálené řeky Bečvy, takže povodeň přišla z nečekaného směru. Plochá krajina neposkytovala možnost útočiště. Značná část domů byla postavena z nepálených cihel, které neodolaly dlouhodobému pobytu ve vodě. Ve zřícených domech nalezlo smrt 9 obyvatel obce Troubky. Modelová oblast Otrokovice představuje středně velké město na soutoku Moravy a Dřevnice, jehož část byla postavena ve 30. letech přímo v zátopové zóně. Velkorysá protipovodňová ochrana technického charakteru neodolala náporu tří povodňových vln z obou řek a z rozlivového jezera po vylití řeky Bečvy. Město bylo zaplaveno do výše více než 3 metrů po dobu několika týdnů.

Společným jmenovatelem povodňových škod byla výstavba sídel v zátopových územích. Existující ochrana pomocí přehrad a hrází se ukázala být při extrémní hydroklimatické situaci nedostatečnou. Vedla však k zániku historické paměti, vztahující se k nebezpečí povodní. Snížení retenční schopnosti krajiny nevhodným způsobem hospodaření mohlo zřejmě pouze oddálit nástup povodňových vln. Povodněmi byla těžce poškozena infrastruktura, bytový fond, průmyslové i zemědělské podniky. Sekundární ekonomické ztráty nelze oddělit od ztrát, připadajících na vrub ekonomickým problémům Česka v roce 1997 a následujících. Část infrastruktury a obytných objektů byla rekonstruována nebo postavena znovu a přinesla tak novou kvalitu. V sociálním systému tak přetrvávají především škody na lidech, k nimž došlo ve sféře sociální i psychické. Poststressový syndrom nabývá někdy až kli-

nického charakteru. Staří a osamělí lidé, kteří již nemohli postavit nové domy a museli se uchýlit do penzionů a domů s pečovatelskou službou, se již těžce adaptují na změněný životní styl, byť se technická úroveň jejich zabezpečení zlepšila. Došlo k narušení sociální hierarchie a sociálního systému. Projevilo se narušení mezilidských vztahů v důsledku různých názorů na rozdělování humanitární pomoci, ale i závisti nad novými a opravenými domy, jejichž výstavbu nebo rekonstrukci umožnila výplata pojistného nebo státní podpora.

Navrátilo se historické vědomí nebezpečí povodní jako základní předpoklad prevence. Zbývá však učinit řadu kroků na poli legislativním, ekonomickém i organizačním. Málo pozornosti se věnuje přípravě obyvatelstva na zvládnutí krizových situací, což je zřejmě důležitější než systém včasného varování. Existují tři základní strategie ochrany před povodňovými škodami. Geografická metoda spočívá ve výběru lokalizace objektů mimo předpokládané zátopové zóny, technická metoda je založena na výstavbě přehrad, ochranných hrází a dalších zařízení, zatímco adaptační připouští postižení objektů povodněmi a snaží se minimalizovat jejich následky. V reálné situaci půjde zpravidla o kombinaci uvedených metod, z nichž každá má své bariéry a rizika.

Obr. 1 – Povodí Moravy v rámci území Česka
Obr. 2 – Vybraná modelová území: 1 – Hanušovice / Jindřichov, 2 – Bystřička / Mikulůvka / Růžďka, 3 – Bochoř / Troubky / Vlkoš, 4 – Otrokovice.
Obr. 3 – Příklad sesuvu v katastru obce Bystřička (snímek K. Kirchner)
Obr. 4 – Povodní poškozené objekty v obci Bystřička (snímek K. Kirchner)

(Authors are with Ústav geoniky AV ČR, pobočka Brno, PO Box 23, 613 00 Brno, Czechia, e-mail: geonika@geonika.cz.)

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VÁCLAV TOUŠEK, MILAN VANČURA, MILAN VITURKA

GEOGRAPHICAL ASPECTS OF INDUSTRIAL TRANSFORMATION IN THE CZECH REPUBLIC

V. Toušek, M. Vančura, M. Viturka: *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 regions 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.

1. Introduction

The article deals with regional changes in the distribution of the Czech industry and its branch restructuring in 1990s. Some industrial companies belong to a group of attenuation branches (e.g. metallurgy, heavy machinery, textile and leather industries) with great release of workers. On the other hand, new branches have been emerging. They are characterized by an increase of production and its productivity and also by creation of new job opportunities (in particular electronics and automotive industry). The difference in development of individual branches has a great influence on the situation on labour market in different regions of the Czech Republic. Direct foreign investments play an important role in creating new jobs in industry. The authors analyse the direct foreign investments in a complex of 79 towns throughout the Czech Republic. Focus is particularly put on the impact of these investments on regional development.

2. Industry before 1989

The Czech Republic has a long industrial tradition. A significant part of industrial capacities of the former Austro-Hungarian Empire was built in Bohemia and Moravia. Besides traditional branches (food processing, textile industry, wood processing and glass industry) it was especially coal mining, metallurgy, manufacturing of building materials and dynamic machinery that developed before World War I. The interwar period was characterized by increased dynamics of the industrial production as a whole and by access to world markets in a newly formed Czechoslovakia.

After World War II, great deformations in industrial production as well as in the whole economy occurred as a result of the communist coup d'état in

1948. Some deformations were already obvious during the War resulting from the necessity to meet the German war needs. The central government favoured large industrialization focusing especially on extensive development of heavy industries with extremely high demand of material and energy.

The industrial production in Czechoslovakia after 1948 was characterized by central control and directive planning and by absence of private companies. The technology failed to keep pace with the technologies of developed countries. Many enterprises suffered from overemployment, which considerably affected (together with other demotivating factors) the low productivity in general. The system of state property and central planning together with orientation to less demanding markets of the COMECON and other socialist countries did not press industrial factories to increase the efficiency and rationalize production. In the end of the 1980s the former Czechoslovakia statistically showed one of the greatest industrial potentials in the world per capita; the quality and structure of production, however, were far behind.

The industrial base in the late 1980s differed extremely in the branch structure when compared with average EU countries. It was affected by ideological preferences of those days, favouring development of heavy industry. The essential feature of the branches profiting from the socialist industrial policy was the orientation towards meeting the needs of the COMECON market less than the needs of the national economy. The high priority branches (e.g. nuclear energy production, metallurgy, machinery, heavy chemistry) were supplied by more labour force, more investments and also imports from the so-called hard currency areas. In the 1980s, the demands for capital in the priority branches restricted, to a greater degree, realization of structural changes. The industrial base was mostly represented by large companies; on the other hand there were only few small- and medium-sized enterprises.

In 1989 there were more than 2.1 million persons employed in industry, i.e. roughly 40 percent of all labour force in the Czech Republic. One third of industrial employees worked in machinery and metal industry – figure that well indicates the branch orientation of the Czech industry. Second in rank was fuel and power industry (nearly 300,000 employees); very close to this number were textile, clothing and leather industries. Around 150,000 persons worked in metallurgy, food processing and electronics. More than 100,000 persons were employed in chemical industry.

High concentrations of industrial labour force were found especially in the areas of coal mining and metallurgy. The most industrialized area (measured by the amount of industrial labour force) was the present region of Ostrava (334,700 employees) where the rate of workforce in industry exceeded 50 percent of all labour force. Similarly high figures were recorded in 13 districts; in the Karviná district (Ostrava region) the rate of industrial workforce was even 61.4 percent. On the other hand, in eight districts and in the capital city of Prague there were less than 30 percent of industrial employees. The lowest figures were recorded in Prague (24.5 percent) due to a high employment rate in a tertiary branch. A low degree of industrialization was also evident in most border districts neighbouring with former West Germany and Austria where restriction of industrial production took place as a result of expulsion of the German-speaking population after 1945 followed by the "Iron Curtain" effect. The districts located in hinterlands of big cities where many people commuted to the cores of big urban centres were characterized by a low number of industrial workforce.

3. Industrial Development after 1989

The reform strategy since 1990 aimed at transition from a centrally planned economy towards a market economy. It required a complex approach including chronology of a broad spectrum of measures focusing on liberalization of prices, liberalization of foreign exchange controls, introduction of inner convertibility of currency, and privatization. The degree of success depended, to a certain extent, on their complexity and quick succession.

The economic reform started with liberalization of prices and foreign exchange controls in January 1991. In the same year a sharp fall of GNP was recorded (by 11.5 percent in total); the industrial production went down even by 22 percent. There were two main reasons for this fall. First, it was the loss of traditional eastern markets (COMECON was abolished) – many industrial enterprises lost an essential part of their foreign markets. Second, after the liberalization of prices in 1991 the prices escalated by 57 percent on average; the nominal incomes, however, grew only by 7 percent. The decrease of real incomes resulted in a great decrease of consumers' demand. After 1992, the consumption, investments and export started to grow again.

Privatization (in particular privatization of industrial enterprises) was the core of economic transformation. It consisted of three programmes: property restitution, small-scale privatization and large-scale privatization. The restitution process enabled to return the nationalized property to former owners (nationalization took place after 1948). The small-scale privatization dealt with small economic units, e.g. shops, restaurants, and small industrial workshops, which were sold in auction. The most important privatization program was the large-scale privatization the aim of which was to transform key enterprises into private subjects.

The large-scale privatization combined several privatization techniques. The small-sized enterprises were usually sold in auction or in tenders, while most medium-sized and large companies were transformed into joint stock companies. The stocks were distributed to all Czech citizens over the age of 18 in the form of vouchers (e. g. voucher privatization). It comprised nearly one half of the total number of stocks of the privatized companies. The nature of privatization and its speed differentiated the privatization in the Czech Republic from privatization processes in other transitive economies. The privatization process was different and specific even in comparison with the process that occurred in those advanced countries where governments decided to privatize selected state-owned large industrial enterprises. While in the western countries the privatization took place in a market environment, in the Czech Republic market rules were yet to be created. Another difference was the enormous inequality between the volume of the property to be privatized under the market conditions and the volume of domestic savings. Due to this fact, it would have taken dozens of years to sell the state property to Czech investors. The priority of the Czech privatization process was not to increase the efficiency of individual enterprises as it was common in market economies, but to create a structure of private owners.

The opening of the Czech market towards foreign producers and expanding exports of Czech production to advanced foreign markets provided a challenge for the Czech industrial enterprises to assert themselves in a competitive environment. To be able to survive, restructuring became inevitable. The most significant aim of industrial restructuring in the Czech Republic was to increase the competitive strength of companies.

The voucher privatization in the Czech Republic was accomplished in 1994. In comparison with the other former Communist countries, in the Czech Republic the greatest share of private property was reached. The state held the majority of stocks, later these were sold to strategic investors, in particular to foreign investors. The process of privatization in the Czech Republic was regarded rapid only in the sense that the former owner – i. e. the state – was replaced by new private owners – i.e. by millions of "voucher" shareholders and investment privatization funds which were neither able nor ambitious enough to control and restructure the companies. Most of voucher shareholders sold their stocks, as did most of the investment funds, too. Many new owners (also in firms that did not emerge in the process of voucher privatization) started to misuse imperfect laws and robbed the property of their own companies. These facts turned out to be the weakest parts of the "Czech way" of privatization.

Some privatization projects failed to succeed. The expected restructuring of the production in a number of privatized companies did not bring desired results. On the contrary, many companies that were in debt were declared bankrupt or their debts were paid by the state. According to some economists, there should have been more foreign capital participation in the privatization process.

The share of industry on GNP has been steadily declining. While in 1990 industrial production accounted for more than 41.6 percent of GNP, in 1999 it was only 36.8 percent. Czech industry in the 1990s is also characterized only by a decline of workforce. This decline differs by branches and by regions. The most recent data, however, are accessible for the year 1996 (the Czech Statistical Office). The number of industrial employees in the period of 1989 – 1996 decreased by more than 500,000 people. The largest decrease in industrial labour force was recorded at the beginning of the transformation period. In 1991 the number decreased by more than 200,000 and in 1992 by more than 100,000. Based on the labour force sample survey, less than 1.5 million people work in the Czech industry at the moment. A comparatively high decrease of labour force can be observed in mining and leather industry. In both branches worked less than one half of the workforce compared with the end of 1989. A dramatic decline (by more than one third) was recorded in machinery and metal industry. In manufacturing of building materials, textile and clothing industries, metallurgy, and manufacturing of glass, china and ceramics the number of employees decreased by one fourth. In chemical industry, the decrease was more than 10 percent. A slight increase of workforce occurred in electronics, food processing, wood and paper processing and printing industry.

The largest decrease of labour force occurred in the coal mining regions of Ústí nad Labem and Ostrava. The employment rate here compared to 1989 was less than 70 percent; the same situation was observed in the regions of Central Bohemia, Liberec, and Brno. The least important changes in the number of industrial workforce were in the region of České Budějovice (decrease by 8.7 percent only.)

More distinct differentiation can be seen on a district level. In some districts the number of people working in industry decreased by 50 percent; on the contrary in other districts even increases have been recorded (Figure 1). The latter is the case of the district Plzeň-south where a number of new (mostly German) industrial companies emerged. On the other hand, in the districts of Kladno and Příbram the labour force in industry declined by more than a half.

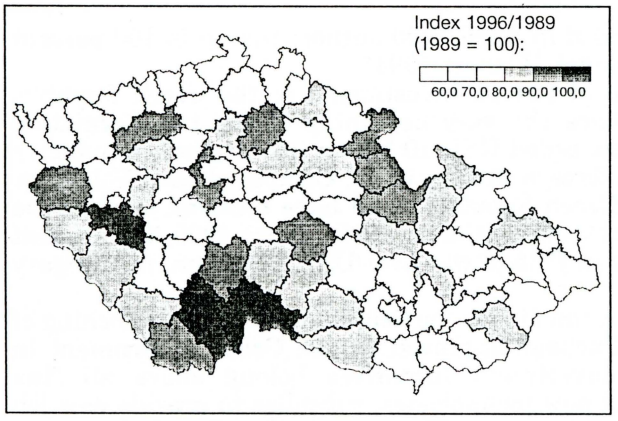

Figure 1 – Changes in industrial employment (1989 – 1996). Source: Czech Statistical Office 1990, 1997.

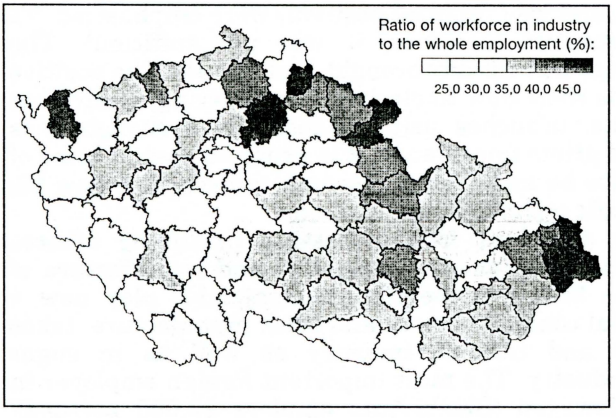

Figure 2 – Labour force in industry (December 31, 1996). Source: Czech Statistical Office 1997.

In the Kladno case it was especially due to unsuccessful privatization of the Poldi metallurgical plant; in Příbram many mines (uranium and non-ferrous metals) closed down.

The decline of labour force in industry led to an increased in number of districts (19 altogether) where the employment rate in industry was below 30 percent. In 1996 there was not a single district in the Czech Republic where more than 50 percent of labour force would be involved in industry (Figure 2). The highest number was recorded in the Mladá Boleslav district (48.3 percent) thanks to the prosperous Škoda-Auto Company; five districts exceeded 45 percent.

The changes of number and structure of industrial workforce were mostly caused by the release of workers from existing enterprises. In 1999, more workers were released due to economical problems, in particular in metallurgy and engineering. On the other hand new jobs were created – to a large extent by foreign investments, in particular on green field sites.

4. Foreign Capital in the Czech Republic

The flow of foreign direct investment (FDI) is vital for a transforming economy. Besides providing stability and enabling to finance the current deficit it also accelerates industrial restructuring, creates new jobs and increases competitiveness of the whole economy. The volume of foreign investment often serves as an indicator of the progress during the economical transition.

Foreign direct investments were proclaimed legal in the Czech Republic in 1989. Certain restrictive conditions were imposed on joint companies. The foreign capital was allowed to own not more than 49 percent of a joint company and it was due to a governmental approval. A new act on foreign-

backed companies was amended in April 1990 authorizing up to 100 percent foreign ownership (Brada, Clavel, Wienert 1994).

In 1998, the total amount of foreign investments in the Czech Republic reached USD 2.5 billion. Since the very beginning of the transformation process the flow of FDI has exceeded USD 10 billion (investment in industry was nearly 60 percent of all foreign investments). Compared with Poland or Hungary it seems that the Czech Republic could have received more of the whole volume of foreign investments. (Carter 1999). Since 1999, the amount of foreign direct investments in Poland was over USD 22 billion, in Hungary USD 17 billion.

The present growth of investment was particularly due to the launching of the Investment Incentives Package approved by the Czech government in May 1998. To important investment incentives belong above all "tax holidays", duty-free import of new technologies, subsidies to provide new job opportunities and re-training allowances. The active policy of investment was used in many countries but the Czech Republic failed to keep pace for a long time; instead, the natural advantages of the Czech Republic (highly skilled labour force, social stability, and geographical position) were emphasized. To attract more foreign investments, however, it was not sufficient. The Investment Incentives Package has already brought first results. The positive feature of new investments is their flow to electrical engineering, electronics and automotive industry, i.e. branches using hi-tech. Even though it is workers' profession that is of prime importance, it is expected that in some of the enterprises there will also be established research centres with new job opportunities requiring specific technical qualifications.

Most of FDI have been aimed at food processing (including tobacco industry), machinery (especially automotive industry) and manufacture of building materials. In some branches the foreign companies play now a dominant role. Foreign capital controls cement and brick manufacture, takes a dominant part in glass and ceramic industry as well as in sugar manufacture and brewery industry. The most important foreign employer in the Czech industry is Volkswagen (Škoda-Auto employs 22,000 persons). ABB, Siemens, Bosch, Ford, and AVX Corporation have entered the Czech territory, too. Philip Morris, Danone, Nestlé, SAB, Unilever, etc. operate in food processing and tobacco industry. In chemical industry there is the IOC consortium (Shell, Agip, Conoco), in glass industry Glaverbel and Saint-Gobain, in manufacturing of building materials – Lasselsberger, Wienerberger and Heidelberg Zement.

5. Analysis of Foreign Direct Investments and Its Consequences

The major role of foreign direct investment in the regional development is clearly manifested in the spatial analysis, which included 79 of the most important towns (with 47 percent of the total population in the Czech Republic). The analysis dealt with 3,733 foreign-backed companies operating in manufacturing, distribution and productive services with nearly 10 percent of the labour force in towns. The foreign-backed companies employed 116,000 people in Prague (first in rank), 23,000 in Mladá Boleslav, and 15,000 in Brno. More than 5,000 people worked in such companies in Plzeň and České Budějovice. 963 foreign-backed companies (i.e. 26 percent of the analysed group) were doing business in manufacturing, representing more than one

fifth of the workforce in industry. Manufacturing companies operated mostly in towns with less than 50,000 inhabitants; in bigger towns and cities there were foreign-backed companies that operated in distribution and productive services. These data correspond to the data collected by CzechInvest (agency supporting direct foreign investment to the Czech Republic) which realized a survey in industrial foreign-backed firms (Pomery 1998).

In the end of 1998 there were nearly 800 foreign industrial companies with 50 or more employees in the Czech Republic. These companies employed more than 250,000 people. The biggest concentration of these firms can be seen in Western Bohemia; on the other hand in Northern Moravia there were just a few of them. Foreign industrial companies account for at least 5 percent of the total employment not only in Prague but especially in the region of Liberec (around 9 percent) and in Central Bohemia, Plzeň, Jihlava, and České Budějovice. On the contrary, in the region of Ostrava it is only 1,7 percent. The significance of foreign companies for the total employment, however, is much greater. The foreign-backed industrial companies are in contact with 10,000 Czech-owned suppliers from the production sector, distribution and productive services. These supplier firms employ around half million people. The share of foreign-backed companies of the whole number of industrial firms with more than 5 employees is shown in Figure 3.

Foreign investments have positive impacts not only on access to the most advanced markets but also on changes in the microeconomical environment. The degree of foreign investments can be considered a basic indicator of the level of globalisation of economy from both macroeconomical and regional viewpoints. This premise can help design strategies for the regional development.

It is the polarization theory that is used as a theoretical background of the strategy in question. It emphasises positive results of the development in selected settlement centres designed as development poles. These poles comprise the so-called driving units (e. g. large industrial enterprises) or a set of driving activities (e.g. concentration of productive and other services) whose economical growth is a crucial dynamic factor of the regional development. The theory of polarized development is a link between a theory of localization and that of economic growth. The complexity of the theory of polarized development consists in analyzing and synthesizing endogenic factors of regional development as well as exogenic ones. This theory is compatible with the theory of centres, which deals with size and functional hierarchy of towns as the economical development tends to be top-down.

Practical application of the theory of polarized development starts with identification of regions that are open to an accelerated economical development, that have developed development poles and consequent development axes (dominating regions). Their opposites are regions without development poles that are not integrated with dominating regions by means of development axes. Their development is often characterized by low or even negative developmental dynamism (undeveloped regions). Between these two opposites there are regions linked to dominant regions by means of development axes (integrated subdominant regions). The evaluation methodology (see Viturka et al. 1998), applying nodal regions of selected towns of the Czech Republic as basic territorial units, emphasises the role of foreign investment in global competitiveness of individual regions. Putting the region in a corresponding type (a hypothesis was supported that the position of development pole or development center determines even the position of a corresponding nodal

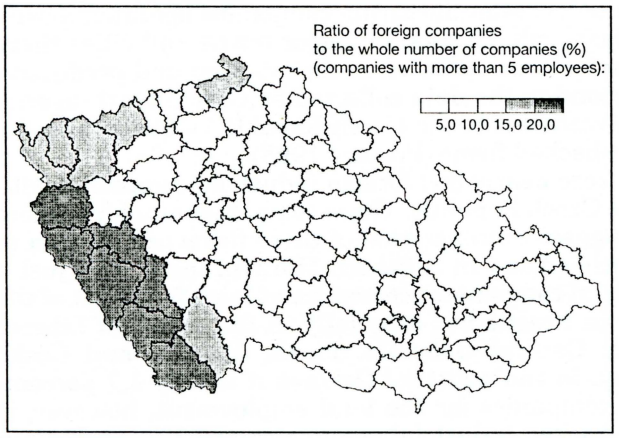

Figure 3 – Industrial companies with foreign capital (December 1998). Source: Czech Statistical Office 1998.

region) does not mean that there is an unambiguous characteristic defining a competitive position of a particular region. This position is significantly affected by location of the region with regard to development axes (spread effects are generated by development poles).

The application of this methodology focused on strategic evaluation of the position of individual nodal regions in a medium-term horizon (the period of 1997 – 2006) and resulted in the selection of optimum scenarios of their developmental strategy. The regional development is significantly determined by competitiveness of industrial activities representing "condensation cores" (with other economic activities – especially productive services).

Classification of the largest Czech cities based on evaluation of selected economic activities is shown in Figure 4.

Development poles. Types of development poles: A – development poles of international significance (Prague, Brno), B – development poles of national significance (regional centres excluding Jihlava and including Mladá Boleslav), C – perspective development poles, i. e. other regional centres that do not fit the criteria of development poles (Jihlava).

Sub-types of development poles: A1 – main development pole, A2 – secondary development pole, B1 – fully developed pole, B2 – partly developed pole, B3 – little developed pole.

Sub-dominant (and/or sub-regional) development centres: Types of sub-dominant development centres: I – the most important development centres, II – important development centres, III – smaller centres attractive for investments.

Sub-types of subdominant development centres: I: 1 – centres with most attractive location, 2 – centres with very attractive location, 3 – centres with neutral location, 4 – centres with partly unattractive location (only within the framework of one branch, i.e. either in manufacturing – M, distribution – D, or productive service – S); II: 1 centres with partly attractive location (again three sub-types: M, D, S), 2 centres with neutral location, 3 centres with partly unattractive location, 4 centres with very unattractive location; III: 1 – smaller centres with more than 1,000 employees in foreign-backed companies, 2 – smaller centres with less than 1,000 employees competing with superior centres (i.e. district towns) in the number of employees in foreign-backed companies.

Taking into account the strategies of regional development under the conditions of economic polarization, it is necessary to formulate several developmental scenarios considering potential chances of individual regions. Three basic scenarios of regional development can be defined: acceleration, stimulation and stabilisation.

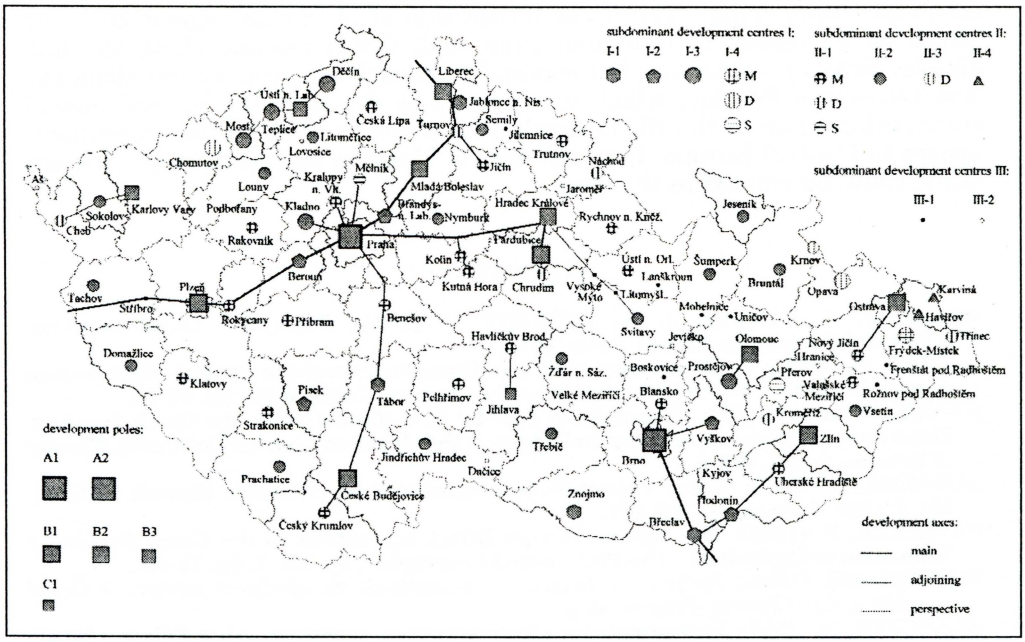

Figure 4 – Development polarization in the Czech Republic

Application of the acceleration scenario is an optimum strategy for the most important growth centres (structurally developed poles and development axes). Its characteristic feature is an offensive entrepreneurial "power politics" approach emphasising strong points of developmental opportunities. Application of a stimulation scenario appears to be a good developmental strategy, especially for economically exposed nodal regions with structurally undeveloped development poles and also for integrated regions linked to the main development axes (with a contingent structural combination with an acceleration developmental scenario) or secondary development axes, in selected cases also for unintegrated regions including centres with attractive location. The basic aspect of the stabilization scenario is the focus on reducing developmental risks by means of supporting Cupertino links with development poles where strong points are emphasized and weak ones suppressed. The application of the stabilization developmental scenario primarily aims at supporting the development of weakly integrated, economically marginal and/or structurally affected regions with centres with neutral or unattractive locations. In harmony with the long-term tendencies, such areas can be found especially in the regions of Ostrava and Ústí nad Labem, and/or in the region of Jihlava. The stabilization scenario requires a specific approach focusing on perspective supporting competitiveness by suppressing weak points and thus reducing the existing and potential developmental risks.

From the general point of view it is clear that regions in Bohemia enjoy a higher level of economic integration compared to Moravia. The key moment is the dominant position of Prague as a main development pole of international importance; consequently the regions situated along west and north-east Prague's development axes have the best future prospects as regards

economic development. The lower integration of Moravian regions could be improved by means of interconnection with Czech regions along the line Hradec Králové – Olomouc, but especially through interconnection along the line Ostrava – Břeclav, which corresponds to the so-called VI multimodal transport corridor of the EU network. One of the most attractive investment spaces in Central Europe (from Poland via Moravia and Austria to northern Italy) could be created in this way.

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Shrnutí

GEOGRAFICKÉ ASPEKTY TRANSFORMACE PRŮMYSLU V ČESKÉ REPUBLICE

Česká republika se v minulosti řadila mezi vyspělé země s rozvinutou průmyslovou výrobou. Začlenění Československa do „sovětského bloku“ v roce 1948 významně ovlivnilo odvětvovou strukturu průmyslu ve prospěch energeticky náročných odvětví a mělo v pozdějším období negativní vliv i na jeho technologickou úroveň. Průmyslová výroba vázala vysoký počet pracovníků. Přechod od centrálně řízené ekonomiky k tržnímu hospodářství mj. vyvolal nutné uvolňování pracovníků, především v málo produktivních průmyslových podnicích. Intenzita uvolňování měla z hlediska odvětvové struktury selektivní charakter. Některá odvětví byla v podmínkách otevřené konkurence postižena více a oblasti s jejich větší koncentrací jsou vystaveny daleko větším tlakům zejména na trhu práce (strukturálně postižené regiony). Na druhé straně se míra nezaměstnanosti udržuje v přijatelných hranicích v regionech, do kterých směřuje ve větším rozsahu zahraniční kapitál. Z výhodné geografické polohy těží oblasti ležící v blízkosti bývalé „železné opony“. Přímé zahraniční investice významně ovlivňují také hierarchii pólů rozvoje včetně subdominantních rozvojových center (determinujících i postavení příslušných nodálních regionů) a utváření rozvojových os na území České republiky. Investice urychlují restrukturalizaci průmyslu, vytvářejí nová pracovní místa a zvyšují konkurenceschopnost celého hospodářství. Objem zahraničních investic může sloužit i jako indikátor pokroku ekonomické transformace v jednotlivých regionech. Poznatky získané regionální analýzou investic

mohou napomoci objektivnějšímu přístupu při formulování variantních scénářů regionálního rozvoje.

Obr. 1 – Změny zaměstnanosti v průmyslu (1989 – 1996)
Obr. 2 – Pracující v průmyslu (k 31. prosinci 1996)
Obr. 3 – Podniky se zahraničním kapitálem podnikající v průmyslu (prosinec 1998)
Obr. 4 – Polarizační rozvoj na území České republiky

(V. Toušek is with Department of Geography, Faculty of Science, Masaryk University, Kotlářská 2, 611 37 Brno, Czechia. M. Vančura is with Pedagogical fakulty, Jihočeská University, Jeronýmova 16, České Budějovice, Czechia. M. Viturka is with Faculty of Economy and Administration, Masaryk University, Lipová 41a, Brno, Czechia.)

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VÍT VOŽENÍLEK, JAROMÍR DEMEK

MODELING OF SOIL EROSION HAZARDS AS A RESPONSE OF LAND USE CHANGES

V. Voženílek, J. Demek: *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.

Introduction

The Trkmanka River is the left tributary of the Dyje River, which is the right tributary of the Morava River (Danube Basin). The catchment is situated in the south-eastern part of the Czech Republic to the SE from the city of Brno in territory called Moravia.

The Trkmanka catchment is situated at the natural boundary between Outer Western Carpathians and Pannonian Basin (Vienna Basin). The NW part of the catchment (Outer Western Carpathians) is composed of deposits of outer flysh of Paleogene age. Deposits (clays, marls, claystones, sandstones, and conglomerates) form most of flysh area. A small part between villages of Velké Pavlovice and Stavěšice is built by sandstones and claystones. Flysh deposits are strongly folded and overthrusted. Those places are also divided into blocks by faults. The SE part of the catchment which belongs to Vienna Basin is part of a large tectonic depression filled by Neogene (Miocene and Pliocene) marine and lacustrine deposits (mostly sands and clays). The basin is divided into blocks by many faults. Folded and faulted flysh rocks and Neogene deposits are covered by Pleistocene loess and slope deposits.

The highest point of the catchment is a hill called U slepice (438 m a. s. l.), the lowest is at the confluence of the Trkmanka and Dyje River (158 m a. s. l.). About 16 % of the catchment in its southern part and in the central part in vicinity of the village Čejč is classified as plain (relative amplitude from 0 to 30 m). About 40 % of the catchment have the relief of flat hillyland (30 to 75 m) and about 43.8 % of undulating hillyland (75 – 150 m). Only 0.2 % (about 1 square kilometer) has relief amplitude over 150 m.

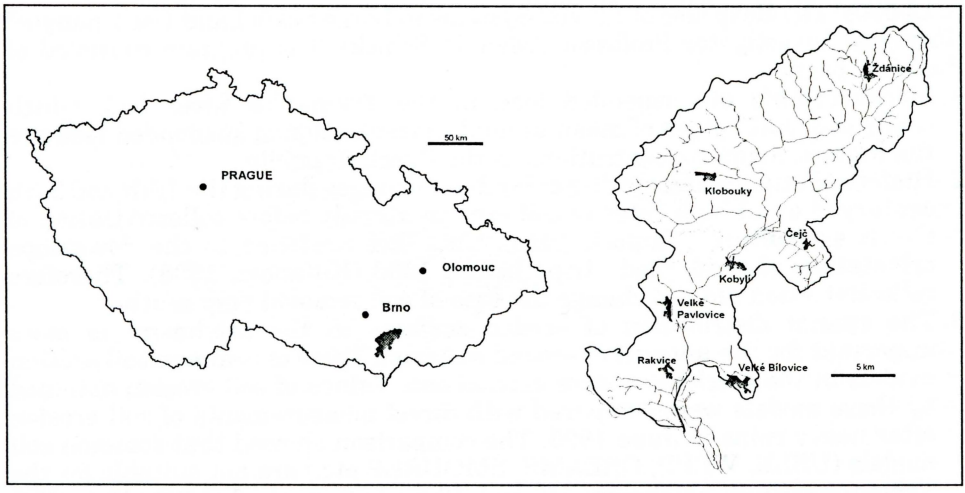

Fig. 1 – The Trkmanka catchment – area of study

The Trkmanka River spring is situated on the southern slopes of the Ždánický les Highlands NW of Ždánice at 300 meters a.s.l. It empties from the left side into the Dyje River near village of Podivín in 158 meters a.s.l. Long-term average annual discharge of the Trkmanka River at its mouth is QA 0.387 $m^3.s^{-1}$. Daily discharges have their maximums in March and minimums in August (see Figure 1).

The original vegetation cover was mixed Central European forest. Large deforestation occurred already in 12th century. Today there is only 72 sq. km of forest in the catchment (about 20 % of area). At present agroecosystems typical for cultural landscape (fields, vineyards, orchards, meadows, etc.) prevail; altogether these land use types cover 280 sq. km (about 78 % of area). Until 1953 the land use structure of studied area consisted of fragmented plots (small patches of land and ribbons oriented downslope); since 1953 most agricultural land has been transformed into large fields with monocultures.

It is generally accepted that land use changes influence fluvial regime of the land, 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 are supposed to bring many difficulties in landscape management (floods, accelerated soil erosion, silting of river beds, etc.) The earlier studies and measurements of suspended load in the Trkmanka River (Vaníček 1959) revealed that very intensive recent slope and fluvial processes are in effect in the catchment (e.g. the largest measured intensity of soil erosion in the whole Czech Republic).

Due to the dimensions of narrow ribbons these fields were tilled from water divides downslope. Under the old conditions slopes of almost the same length existed as exist today on the large co-operative fields. Balks separating ribbons were naturally also oriented downslope and represented no obstacle against accelerated soil erosion. Due to limited number of crops cultivated in the area there are no greater differences in amount of soil erosion among different types of crops either on narrow ribbons or on large fields.

The research in the Trkmanka catchment started in December 1993 in co-operation with the Czech Hydrometeorological Institute, Branch Brno in the framework of U.S. – Israel CDR Program – Grant No. HRN-5544-G-00-2060-00

(C12-090) "The Response of Fluvial Systems to Large Scale Land Use Changes" (Principal Investigator Professor Asher P. Schick). The program consisted of the basic parts:

1. Measurements of suspended load in the Trkmanka River bed, which confirmed that values of mean annual concentration of suspended load are the highest mean concentrations in the Czech Republic.
2. Historical studies and studies of land use changes during the 19th and 20th century showed high rates of soil erosion already before collectivization of Czech agriculture (Vaníček 1959). This fact conforms to the downslope orientation of most filed strips before 1956 (Kilianová 1998). Therefore collectivisation did not change the rate of soil removal very much.
3. The spatial distribution of eroded surfaces in the catchment is more important for the amount of eroded material. Tests of common soil erosion models in the catchment were carried out. Values of soil erosion obtained by these models were compared with direct measurements of soil erosion after heavy rains in June 1995. The comparison showed that common soil models (USLE, WEPP, CREAMS, SMODREP etc.) are not suitable for the Trkmanka River catchment (Knisel 1980, Laften et al. 1991, Voženílek 1999b). The following new model of soil erosion is proposed.

GIS and Models

Computer-based, mathematical models that realistically simulate and predict spatially distributed, time-dependent landscape processes in nature are increasingly recognized as fundamental requirements for reliable, quantitative assessment of complex environmental issues of local, regional and global concern (Goodchild et al. 1993). This environmental analysis and modeling are one of the strongest and most successful application areas for geographical information systems (GIS). GIS is rapidly developing technology for handling, analyzing, and modeling geographic information (Voženílek ed. 1996, Chou 1997). The spatial analysis and dynamic modeling has been used as a principal research methods. The geographical information system technology became the basic platform to solve investigated issues.

MODEL PEG – assessment of potential erodibility of georelief

The concept of the PEG model is based on a different understanding of the concepts of erosion and erodibility. Erosion is the acquisition of material by geologic agencies (running water, glaciers, wind, etc. – Fairbridge ed. 1968, p. 317). Erosion is defined as the set of processes of denudation, transport and accumulation of solid particles on the Earth surface by water, glaciers, and wind. Erosion processes are studied as a system of landscape elements and relationships among them. Erodibility is a feature of georelief representing potential conditions for erosion processes. Erodibility is studied as one of several characteristics having a wide range of expression (constant or probable). Its estimation is called potential erodibility.

The PEG model was completed to assess the potential amount of material outflowing from the Trkmanka River catchment (Voženílek 1999b). The model is based on analysing of all erosion processes that are active in the studied area using the following factors:

1. *Soil grain size:* The soil grain size factor reflects the characteristic proportion of solid particles (grains) and space among them. Erodibility rises with higher ratio of gaps in soil due to soil consistency. The classification of soil grain size for implementation in the PEG model was taken from 1:50 000 soil maps.
2. *Stability of soil particles:* The stability of soil particles factor is a complex factor involving various soil characteristics, which take part in soil consistency, stratification and depth. The factor is derived from soil types in basic pedological classification.
3. *Soil moisture regime:* Soil moisture describes the moisture content of the soil intones of underground water saturation. The greater the wetness of the soil the lower risk of erosion occurrence. Permanent saturation almost eliminates erosion on the surface.
4. *Slope angle:* This is the most relevant factor. The steeper slope the bigger outgoing energy and the higher potential erodibility on the slope. Slope angle was expressed in degrees.
5. *Surface forms:* The factor of surface forms in the project substitutes slope length which is problematic in both its definition and calculation. This substitution seemed to be very useful as the surface forms factor involves changes of slope trajectories on planar convex forms on slope which is outcome of either convergent or divergent combining of energy (Voženílek 1996). Surface forms of the Trkmanka catchment was generated from grid based DEM. Individual categories were determined by combination of planar and profile curvatures.
6. *Land use structures of 1877, 1953 and 1995:* Land use has a strong impact on the erodibility. This factor involves a surface roughness, density of vegetation, the type of cultivation (farming), the root consistency of relief, etc.

Factors 1, 2, 3, 4, and 5 are factors of outgoing energy, factor 6 is factor of surface features changes. The input parameters were weighted according to scheme that is based on field observation and experimental evidence (Figure 2).

The model was constructed by following steps:

- the input factors were classified into interval/ratio scales
- the coverages representing the factors were evaluated according to the above mentioned scales
- using the procedure of polygon overlay, the coverage of polygons ("model coverage") – each with its individual set of factors – was produced
- the model coverage was processed according to a theoretical model using equations to get the potential erodibility of relief – for each polygon
- areas with the highest potential erodibility were investigated in more detail using geomorphologic mapping, network analysis etc.
- the results of the detailed investigations of selected areas were used for the calibration of the model in the Trkmanka catchment
- the calibrated model equations were applied for the entire Trkmanka catchment to obtain the potential erodibility of relief.

The PEG model provides answers to questions such as how individual parts of the surface contribute to the sediment loss in the catchment. This contribution is only a potential one because of the elimination of real input factors from field works such as precipitation, which are highly specific for the catchment (Voženílek 1999a). The PEG model was generated as a preliminary

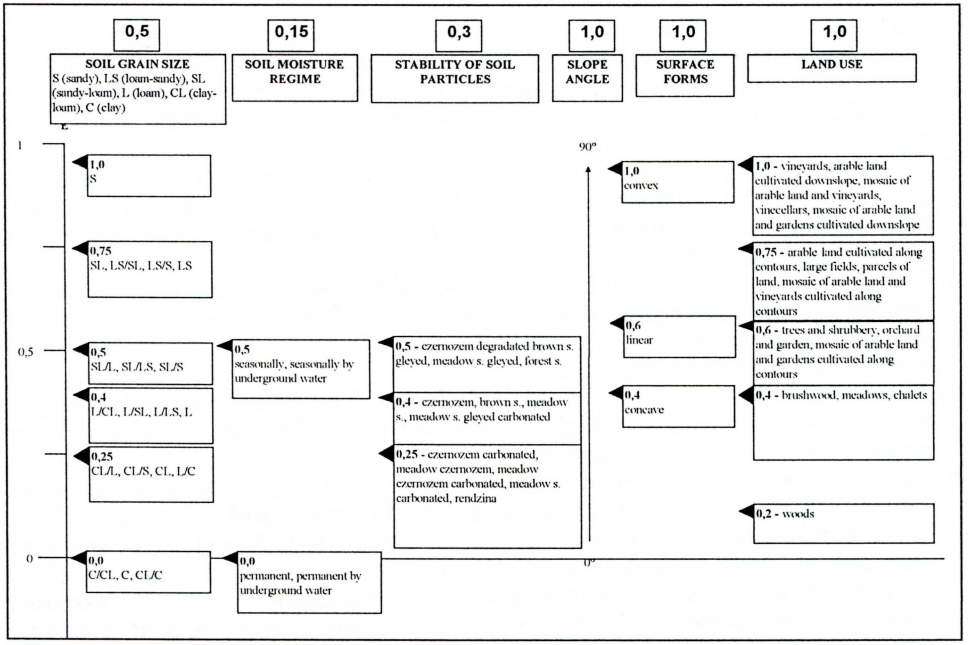

Fig. 2 – Structure and evaluating of input parameters for PEG model

step prior to dynamic modeling, giving better information for final conclusions.

The aim of PEG model generating was to estimate erodibility in the Trkmanka catchment and then to assess the amount of material outflowing from the catchment.

MODEL dPEG – dynamic modeling of georelief erodibility

The dPEG model (dynamic PEG model) introduces concepts of time and climate into the PEG model. The implementation improves the model outcomes by giving the model more in terms of real rather than potential erodibility.

There were two types of time involved in the model: annual variability (for land use categories and climatic parameters) and long-term changes (for landscape structure and climatic regime). Annual variability represents the changing conditions for soil erosion during the year. It concerns both land use distributions and climatic parameters.

Land use

Different land use categories create different conditions for erosion processes during the year. The changes take place according to a regime defined by the type of cultivation in the individual land use categories. Four different seasons were distinguished:

- spring – is typified by snow melting and intensive field work (mainly ploughing) which makes the surface rough, loose and subject to material transport

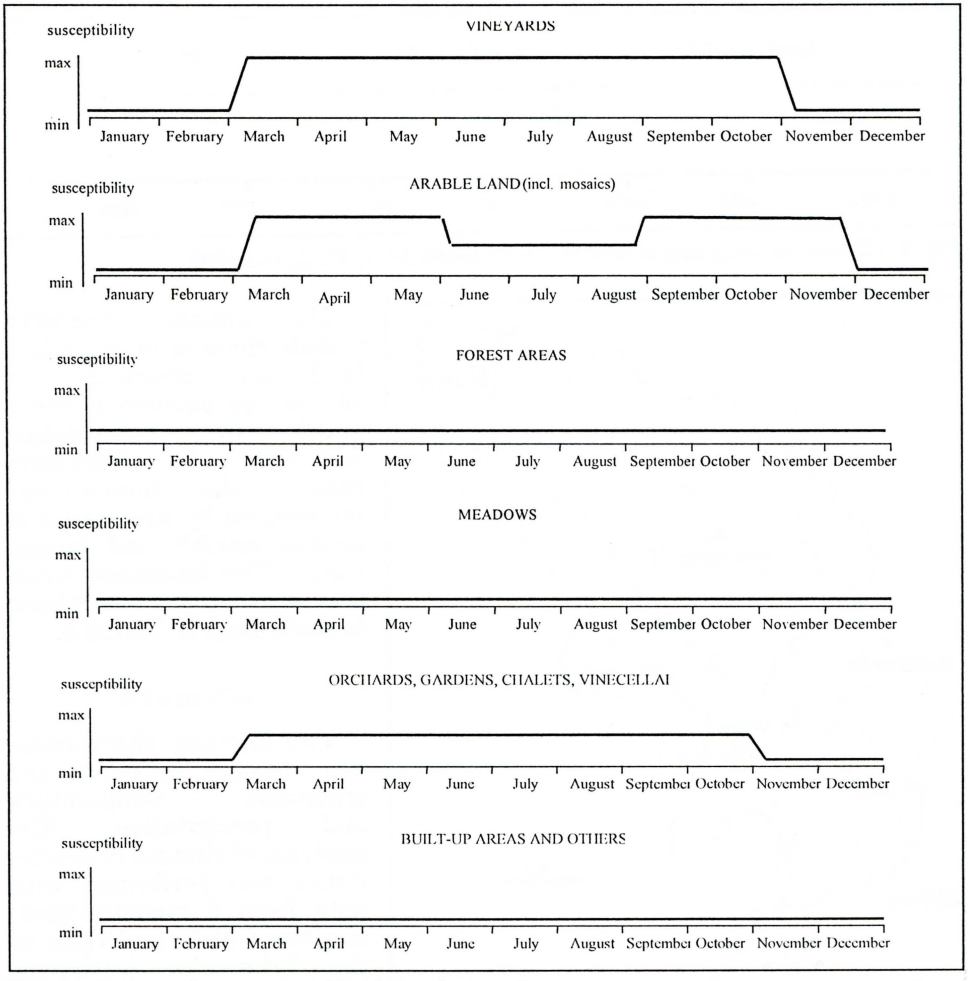

Fig. 3 – Temporal assigning of land use during the year

- summer – is mostly the period of high vegetation which stabilises the surface and saves soil particles from transport
- autumn – brings harvesting which means baring of the surface, ploughing and creation of conditions for high erosion
- winter – is cold, sometimes with frost and often covers the surface with snow which is a good protection against erosion.

The charts in Figure 3 show the distribution of susceptibility to erosion during the year. Maximal susceptibility is concentrated in months with little or no vegetation on the non-frozen surface. Minimal susceptibility occurs during the winter with snow cover or frozen soil. The quantitative expression of the charts in the model distinguish different surface conditions for erosion over the time. The vertical axis represents susceptibility of surface (from minimum to maximum) and the horizontal axis is time (months in a year). The thresholds in the charts reflect climatic seasonal changes (frozen soil vs. temperature over 0 °C) and cultivation works (ploughing, harvesting etc.).

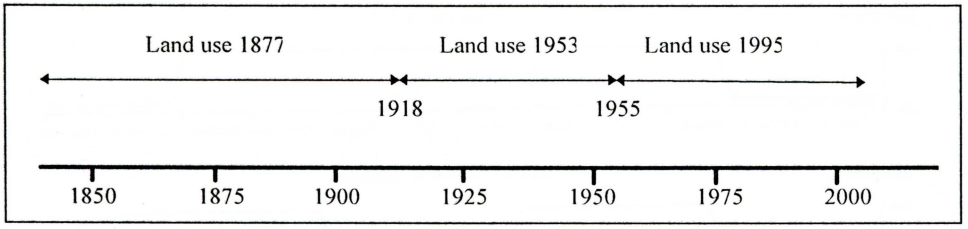

Fig. 4 – Temporal assigning of land use time levels 1877, 1953, and 1995

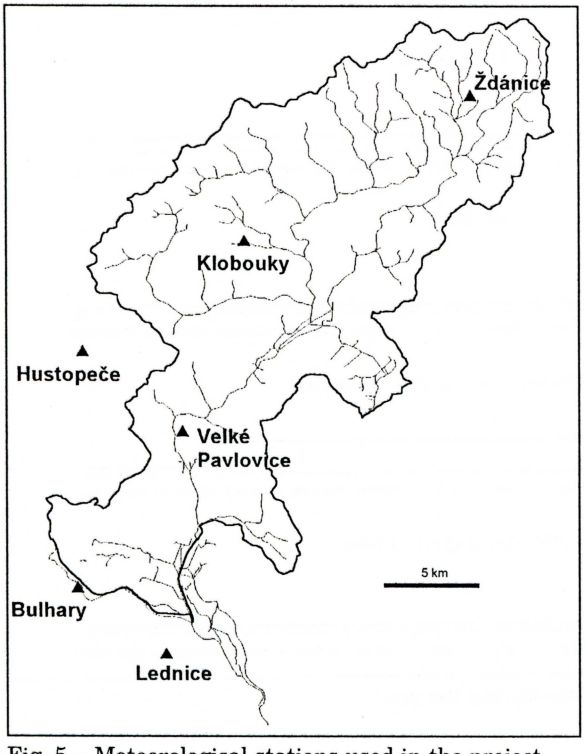

Fig. 5 – Meteorological stations used in the project

The annual variability include changes in individual land use categories and climatic parameters (investigated by interpolation methods). In long-term changes the climate was represented by time series of annual rainfall and temperature. The landscape structure was assigned according to the scheme in Figure 4.

Climate

Two climatic characteristics strongly influence the erodibility – temperature and precipitation. The analysis of climate characteristics was performed with data from 6 meteorological stations within and close to the Trkmanka catchment (Figure 5).

The regime of *temperature* is not as important as are the changes around the freezing point. Frozen soil protects the surface. Figure 6 shows long-term series of annual temperature means of two of the closest meteorological stations with continuous temperature measurement. Despite the variability in the graph the changes of temperatures around the freezing point in the catchment stay almost unchanged. The spatial distribution of temperature in the catchment shows only minimal differences, which are irrelevant to the model. That is why the changes of temperature were eliminated from the set of model factors. The only participation of temperature was involved in land use changes where the period with temperature under 0 °C (from the first half of November until the beginning of March) is included (see Figure 6).

Precipitation plays a key role in the erosion processes. It starts the processes of entrainment, transport, and accumulation. The graph in Figure 7 shows annual rainfall means at meteorological stations involved in the study. It shows how similar precipitation patterns in the catchment area are.

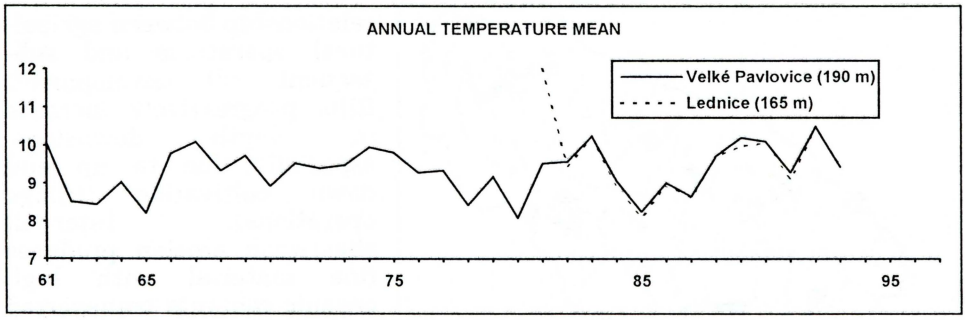

Fig. 6 – Long-term series (1961 – 1993) of annual temperature mean (°C) of Velké Pavlovice and Lednice stations

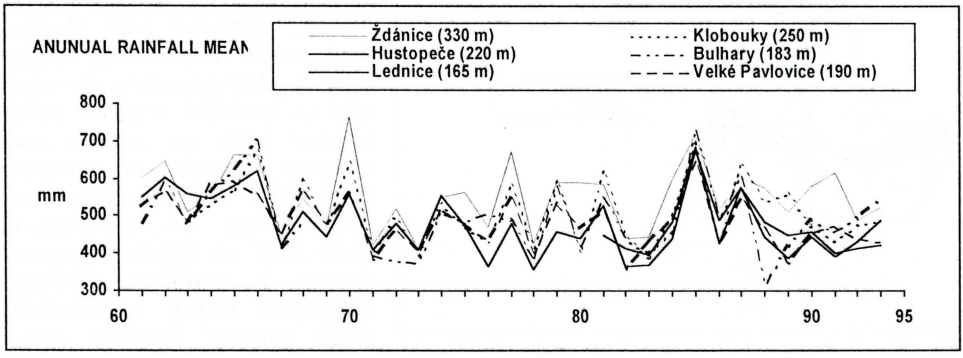

Fig. 7 – Mean annual rainfall at selected meteorological stations from 1960 to 1994

A close correlation was determined by regression analysis between annual rainfall mean and altitude. The equation of linear regression for the Trkmanka catchment calculated from datasets of 6 meteorological stations is:

$$Y = 401{,}1315 + 0{,}4207X$$

where Y is annual rainfall mean (in mm) and X altitude (in metres a. s. l.).

The dPEG model allows the assessment of the changes in erodibility over the time and its relationships to land use changes (Figure 8).

Field observations of soil erosion versus computer modeling

The computer model was compared with field soil erosion observations and measurements, especially soil erosion features after heavy rain in June 1995. On broad watersheds belt of sheet erosion were observed. On long and steep slopes developed microchannels (rills) that were small enough to be removed by normal tillage operations. Concentration of erosion in channels essential to rill development is attributed to length and inclination of slopes and to slight accidental variations in topography, which produce local increase of runoff depth and shear stress. Rills commonly occur on bottom of dells.

Observations on remnants of areas with narrow ribbons of land oriented downslope and bordered by vegetated balks revealed that ribbons concentrated runoff and limited cross-grading. Field study indicates a close

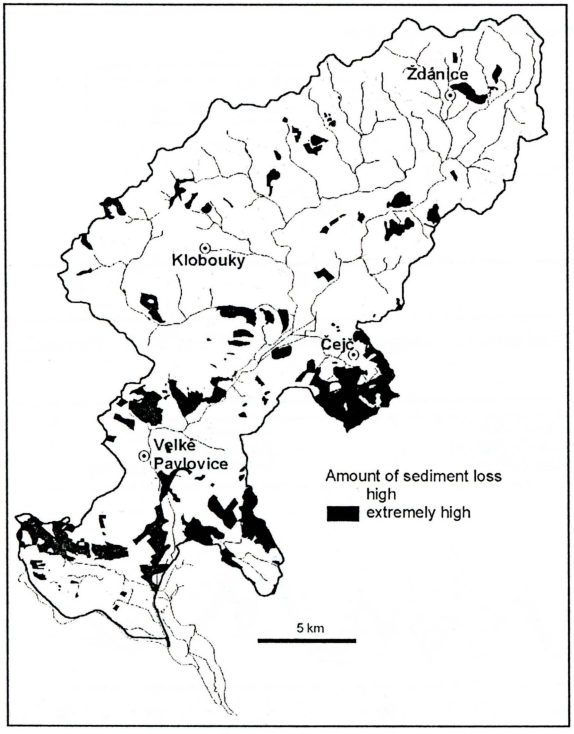

Fig. 8 – Sediment loss in the Trkmanka catchment predicted by dPEG model

relationship between agricultural operations and subsequent rill development. Rills progressively increase in depth downslope, especially due to up and down cultivation (tillage operations). Inter-rill sheetwash erosion produces fine material with high organic contents transported farther into brook channels.

In the contrary, on large co-operative fields rills become broader and shallower with increasing slope length, disappearing eventually in braided washes. Rills appear both on convex and concave parts of slopes. Especially concentrations of rill erosion on cultivation lines (e.g. on tractor passes) posses a problem. Tillage operation along horizontals rank among positive anti-erosion measures.

The spatial distribution of soil erosion features in the Trkmanka catchment well corresponds to the generated model.

Conclusion

High values of accelerated soil erosion in the Trkmanka River catchment are partly results of natural condition (slope inclination, thunderstorms) and partly of agricultural use of landscape (land use). Before 1953 the land use structure consisted of numerous small patches of land mostly oriented downslope. This land use pattern changed after 1953 into large fields managed by collective farms. Due to downslope orientation of field strips in the previous period, however, the changes in values of eroded material were only small. More important is the spatial distribution of soil erosion. Tests of common soil erosion models are not suitable for the catchment. Therefore new models based on GIS techniques have been proposed. The dPEG model developed as part of the project brought new aspects into modeling of spatial environmental phenomena by involving seasonal regimes of climate and farming. The new models of soil erodibility were compared with soil erosion features measured after heavy rain in June 1995.

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Shrnutí

MODELOVÁNÍ OHROŽENÍ EROZÍ PŮDY JAKO ODEZVA ZMĚN VYUŽITÍ ZEMĚ

Je všeobecně přijímán názor, že změny ve využití země ovlivňují odtokové poměry zemského povrchu, zvláště při vytváření povrchového odtoku, průtoku vody v korytech a půdní erozi. Narušení fluviálních systémů historických kulturních krajin způsobené změnami ve využití země přináší mnoho problémů při tvorbě, ochraně a řízení krajiny (povodně, zvýšená eroze půdy, zanášení říčních koryt atd.).

Trkmanka je levostranný přítok řeky Dyje. Povodí Trkmanky (377 km^2) se rozkládá na jihovýchodní Moravě, přibližně 40 km jihovýchodně od Brna (obr. 1). Je situováno na rozmezí Vnějších Západních Karpat a Panonské pánve. Severozápadní část povodí (Karpaty) je budována silně zvrásněnými sedimenty vnějšího flyše paleogenního stáří (jíly, slíny, jílovce, pískovce a slepence) rozdělenými zlomy do bloků. Jihovýchodní část povodí náležející do Vídeňské pánve (Panonská pánev) je součástí tektonické deprese vyplněné neogenními (miocenními a pliocenními) mořskými a jezerními sedimenty (převážně písky a jíly). Pánev je rozlámána zlomy do bloků. Pokryv tvoří pleistocenní spraše a svahoviny.

V povodí Trkmanky se skládala krajinná struktura před rokem 1953 z velkého počtu malých polí. V následujících několika málo letech došlo k výrazné změně ve struktuře krajiny – vznikla velká, rozlehlá pole pro pěstování zemědělských monoklutur. Povodí je známé nejvyššími naměřenými hodnotami eroze půdy v ČR.

Studie University Palackého v Olomouci zpracovávaná v letech 1993 až 1999 v rámci realizace mezinárodního grantu (Izrael, ČR, Slovensko) CDR "The Response of Fluvial Sys-

tems to Large Scale Land Use Changes" (odpovědný řešitel Asher P. Schick) řešila odezvu fluviálních systémů na změny využití země v povodí Trkmanky. K základním poznatkům studie patří:

Měření unášeného materiálu v korytě řeky Trkmanky potvrdilo, že hodnoty průměrné roční koncentrace unášeného materiálu jsou nejvyššími hodnotami v ČR.

Dřívější práce a studie změn využití země v 19. a 20. století ukázaly vysoké tempo eroze půdy již před kolektivizací českého zemědělství (Vaníček 1959). Šlo o důsledek orientace většiny zemědělských pozemků po spádnici již před rokem 1956 (Kilianová 1998). Kolektivizace tedy nezměnila příliš výrazně rychlost odnosu půdy.

Důležitější pro množství erodovaného materiálu je plošné rozšíření erodovaných ploch v povodí. Testování obecně používaných erozních modelů (USLE, WEPP, CREAMS, SMODERP atd.) ukázalo v povodí Trkmanky jejich nepoužitelnost. Proto byl se staven nový model pro modelování odnosu sedimentu z modelového povodí.

Modely PEG (Potential Erodibility of Georelief) a dPEG (dynamic PEG) jsou založeny na odlišném pojetí pojmů eroze a erodibilita. Eroze je chápána jako proces, zatímco erodibilita jako vlastnost (georeliéfu). Realizace obou modelů probíhala v prostředí GIS. Model PEG byl sestaven k ohodnocení potenciální erodibility georeliéfu. Je koncipován jako konceptuální model a jako vstupní proměnné využívá zrnitost půd, stabilitu půdních agregátů, vlhkostní režim půd, sklon georeliéfu, povrchové tvary a využití země. Model byl použit třikrát, a to pro tři různé časové horizonty s odlišnou strukturou krajiny – roky 1877, 1953 a 1995. Kvantifikace vstupních proměnných na úrovni poměrových digitálních dat je obsažena v obrázku 2.

Model dPEG je rozšířením modelu PEG o dynamické proměnné, a to o změny klimatických charakteristik a kategorií využití půdy. Časový aspekt byl pojat ve dvou úrovních – změny krátkodobé (roční proměnlivost) a dlouhodobé (období od 1877 do 1995). Roční změny dílčích kategorií využití půdy (podle způsobu obhospodařování zemědělských pozemků) vyjadřují schémata na obrázku 3. Prahy dlouhodobých změn jsou vyjádřeny na obrázku 4. Na základě analýzy klimatických charakteristik z 6 meteorologických stanic v povodí a nejbližším okolí (obr. 5), byl zahrnut do modelu roční chod teplot (obr. 6) a srážek (obr. 7).

Výsledky modelování erodibility georeliéfu (obr. 8) v povodí Trkmanky v modelu dPEG vykazují shodu s naměřenými hodnotami a potvrzují skutečnost, že kolektivizací nedošlo z výraznému zrychlení erozních procesů v povodí Trkmanky.

Obr. 1 – Modelové území povodí Trkmanky
Obr. 2 – Struktura a evaluace vstupních parametrů pro model PEG
Obr. 3 – Změny dílčích kategorií využití půdy v průběhu roku
Obr. 4 – Prahy dlouhodobých změn využití půdy v časových horizontech 1877, 1953, a 1995
Obr. 5 – Meteorologické stanice, jejichž měření byla v projektu využívána
Obr. 6 – Dlouhodobé řady (1961 – 1993) průměrných ročních teplot (°C) naměřených na stanicích Velké Pavlovice a Lednice
Obr. 7 – Roční úhrn srážek naměřený ve vybraných meteorologických stanicích v letech 1960 – 1994
Obr. 8 – Předpokládaný odnos sedimentu v povodí Trkmanky pomocí modelu dPEG

(V. Voženílek is with Department of Geography, Faculty of Science, Palacký University in Olomouc, třída Svobody 26, 771 46 Olomouc, Czechia; J. Demek is with Department of Geography, Teacher´s Faculty, Masaryk University of Brno, Poříčí 7, 603 00 Brno, Czechia.)

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ALOIS HYNEK

TRAINING GEOGRAPHY EDUCATORS

A. Hynek: *Training Geography Educators*. Geografie – Sborník ČGS, 105, 2, pp. 177 – 189 (2000). – Czech didactics 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

Motto (inspired by F.Zakaria): Before 1989 we lived in totalitarian 'real socialism' and the heroes were politicians, workers and soldiers. After 1989 we live in capitalism and democracy. Who are the heroes? Entrepreneurs.

1. Introduction

Czech students of geography education are prepared in 8 Czech faculties in geography departments cooperating with the departments of biology, mathematics, geology, history, physical training and others selectively. Students are recommended to study two subjects during 4 years of primary schools and 5 years of secondary schools gymnasia.

2. Brief Czech History

Since 1945 geographical education has gone through a number of changes due to the changing demographic, social, economic, political and ideological conditions. Both the contents and duration of study were changed, especially after February 1948, when the Marxist/Leninist conception – namely Communist education – prevailed.

Geographical education in the era of two superpowers, conformable to Soviet ideology, manifested idolization of the Soviet Union, eclectic criticism of highly-developed countries, and efforts to gain influence in less developed countries. The Iron Curtain helped create a deformed picture of the real World, its fall in 1989 brought winds of change which are still blowing today.

The training/preparing of geography teachers at Czech universities has gone through approximately 5 waves. The first dates back to 1918 when, after

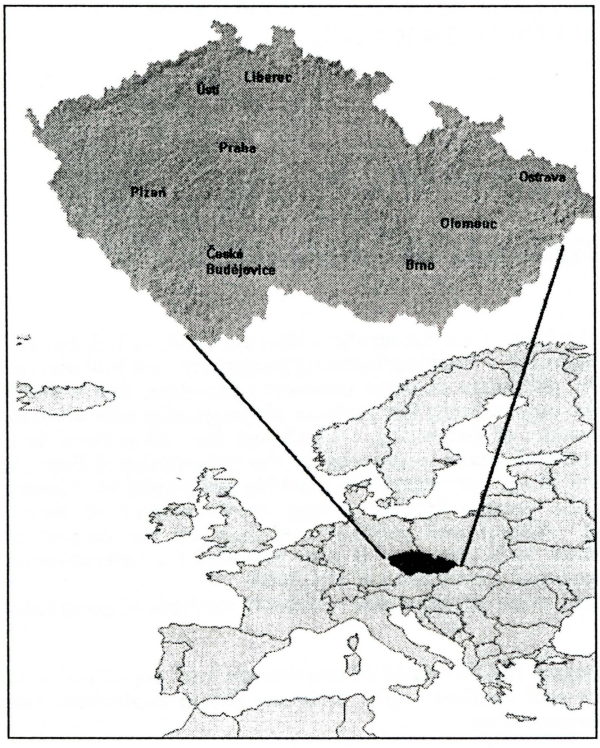

Fig. 1 – Czechia: cities with universities training geography-educators

the proclamation of Czechoslovakia's independence, the Czech teaching methodology of geography was formed. Its main protagonists were K. Spalová and F. Machát, the former being an excellent specialist in teaching methodology, the latter was renowned for the width and depth in the contents of geographical education. Their official influence on Czech geography teaching lasted till February 1948 when communists took power and Spalová and Machát were not accepted any more due to their incompatibility with communist ideology.

Then emerges the second wave then, methodologists conforming to the communist ideology but following in the foot steps of the first wave in a sophisticated approach depending on intellectual and moral qualities of the particular geography educator. The main representative was O. Tichý who managed perfectly to replace the term 'curriculum', which was criticized or even denounced, by the term 'school geography', absolutely identical with 'curriculum' . Tichý also managed to develop 'educational geography' as a branch of scientific discipline named 'theory of teaching geography' as well as the basic/applied scientific research (1958).

As early as the 60s, in Tichý's lifetime, the third wave of geographical education began to emerge under less-revolutionary conditions. It reached its peak in the mid-80s with "Fundamentals of Geography Didactics" by J. Machyček, H. Kühnlová and M. Papík, published in 1985. The didactics of geography was commonly developed through out Czechoslovakia. The most significant contribution in this wave was the works of A. Wahla sensitively reflecting scientific-technological changes (1973/4, 1980). It was H. Kühnlová, with the concept of 'the didactic transformation of the science of geography', who won decisive influence on teaching geography on a wider scale (1980, 1981).

The third wave was closed by the 'Velvet Revolution' and then came the 4th wave – 10 years of creative liberal chaos starting with the revision of geography syllabuses for primary, secondary and tertiary schools, releasing the pressure from the Communist Party Committee Centre and strengthening the teachers' role in the educational process in the context of the democratic tradition started by Spalová, Machát, and others. Geography

teachers from secondary schools had the main word in expert commissions revising syllabuses, e.g. in the case of geographical education at secondary schools the advisors were J. Herink (Pedagogical Research Institute), with I. Bičík, A. Hynek, A. Wahla, all university teachers, and in part D. Řezníčková and H. Kühnlová.

3. Changing the face of geography teaching at the study programmes

The former, before the November 1989, very tough and compulsory geographical course programme for each geography department in Czechoslovakia has been completely changed since the 1990s. Any university geographical programme in the Czechia is quite individual if accepted by the Geography' s Accredited Commission (GAC) of the Ministry of Schools, Youth and Physical Culture. On the other hand, we can recognize a weaker position for the further training of geography educators of the primary and secondary schools at the regional/district levels. They have still been feeling an aversion to the former, mainly ideological, lessons and enjoy breathing the air of freedom. They are "successful" in an over-simplification of geographical education and from their point of view there is no need for further schooling. And furthermore, geography is taught by too many geographically unqualified educators.

This formal stratification is not fully effective, therefore in the 5th wave of the evolution of Czech didactics of geography we emphasize the academic geography as a focus of changes in geographical education.

Primary and secondary school educators asserted that the focus of geographical education being in regional geography rather than the encyclopedic conception utilised by most authors of geographical textbooks took up. In the 90s appeared more than 120 geography textbooks for primary and secondary schools, each very similar to the other, their critics were J.Harmata, V.Herber, A.Hynek (1999).

Due to the prevailing encyclopedic conception it was mainly a descriptive, statement-making character that became dominant in geographical education. This concept has gradually reached its crisis and therefore, at the beginning of the year 2000, university geographers active in pedagogic geography are entering into the 5th wave, significantly influenced by the experience of European Union countries, US geography standards etc., giving more attention to pro-active learning. It is inspired by educational psychology, human resources development and foremost first of all, according to A. Hynek (1997), pedagogic geography is considered as part of applied geography, with strong relation to geographical thought and the social relevance of geography.

The winds of change are starting to blow on the national level: proposals of the standards of geographical education for a higher level of secondary schools published by the governmental Department of Schools, Youth and Physical Culture in Bulletin, vol. LII, part 4, April 1996 include terms like knowledge, thought, competence, agency, history, humanities, philosophy, science, ethics, values, beliefs, attitudes, activities, facts, concepts, symbols, signs, images, creativity, operations etc. Accepting the terminology of N. Graves (1996), in the mentioned document we can recognize:

Geographical Themes: The Earth as a cosmic body, Physical components of landscape, Physical zones of the Earth, Social components of landscape, Landscape and the environment. Skills: The Earth on the maps; Practical geography; Fieldwork, excursions, movement, observation, living. Study areas: Czech Republic; Europe; Other world regions.

The Pedagogical Research Institute, in fact operated by the government, offered a proposal of syllabuses/study programmes of subjects for primary schools and gymnasia, children 11–15, including geography offered by J. Herink (1996):

The planet Earth, the globe and maps, the physical image of Earth, the geography of the continents and oceans, a political map of the world, the social and socio-economic components of landscape, Landscape and the environment, the Czechia.

For students 16–19: Introduction to geography, the Earth as a cosmic body, the Earth on the maps, the physical image of Earth, people on Earth, landscape and environment, European regions, other world regions and the Czechia. The syllabuses also contain detailed recommendations concerning teaching methods in geography.

4. Stratified view on location of geography education in the Czechia

National level: Department/Ministry of Schools,Youth and Physical Culture, Pedagogical Research Institute, Institute for Educational Information, National programme for educational development, Challenge for 10 million, New leaving examination. Head Committee of the Czech Geographical Society, Section for Geographical Education, Syndicate of geography educators.

Regional level: University geography departments, centres for further training of geography educators, regional branches of the Czech Geographical Society, Brno Forum of Geography Educators.

District level: District School Authority, School Service, district geography teacher.

Schools: Geography departments, subjects commissions (mainly of the humanities)

5. Organization of preparing potential geography educators

In contrast to the practice of prestigious academic geographies, the Czech reality is burdened with splitted geographical courses, especially lectures. Over 30 lessons a week in the time-table means very limited time for individual self-study.

We have chosen an example from the monograph of A.Wahla, ed. (1996) by V.Herber for the Faculty of Science, Masaryk University (Brno) and there are no significant differences at other Czech universities. The Contemporary extensive research grant (FRVS 0623/2000) for the training of geography educators, carried out by pedagogists of geography, will result in a proposal of a recommended geography course programme of study with possible follow-up modifications. It should eliminate the excessive variety of subjects/items in geographical teacher-training, strengthen the self-study approach, and

Tab. 1 – Undergraduate courses for geography (V.Herber, 1996, modified) with 45-minute lessons per week per semester

Introduction to geography and geography teaching	2
Introduction to Earth studies	3
Quantitative methods in geography	2
Cartography, topography/geodesy	4
Thematic and school cartography, remote sensing	3
Geology	3
Geomorphology	3
Meteorology and climatology	3
Hydrology	3
Pedogeography	3
Biogeography	3
Geography of production	3
Population and settlement geography	4
Geography of services	3
Landscape ecology and environmental geography	4
Introduction to regional geography	2
Microregional studies - research methods	3
Geographical thought/theoretical geography	2
Global and regional problems/issues	2
The Changing world	2
Czechia	7
Slovakia	2
Europe	5
The Americas	3
Asia	3
Africa, Australia, Oceania, polar caps	3
Didactics of geography – lecture, seminar, practice	12
Thesis in geography	5
Geographical fieldwork	10 days
Geographical excursions	20 days
Pedagogy; praxis	20 days

Tab. 2 – Percentage time calculation in study programmes of students – geography educators (Wahla, Matoušek 1996)

Courses	Primary schools (8 semesters)	Secondary schools (10 semesters)
A obligatory	27	28
B facultative	10	10
C assessments	15	14
D personal study	30	32
E physical training	3	3
F holidays	12	11
Items A – D		
1st approbative subject	34	35
2nd approbative subject	34	35
Professional training	32	30

Tab. 3 – Specification of professional training (in %):

pedagogy	25	24
psychology	23	22
sociology	6	9
economy	6	8
philosophy	6	5
politology	4	6
foreign language	15	13
informatics	15	13

include geographical thought and applications instead of the thus empiricism prevailing far.

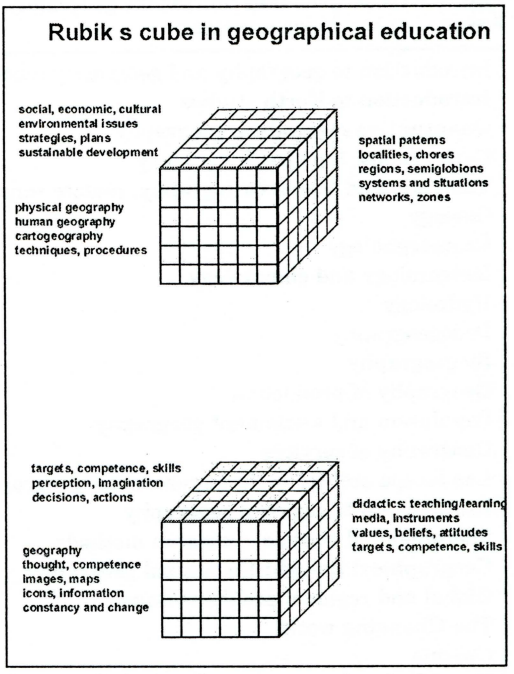

Fig. 2 – Rubic's cube in geographical education

6. Developing the curriculum

Science/art of geography integration for students of geography education: 1. Geographical disciplines on physical components and human activities. 2. Spatial patterns at local, choric/regional, semiglobions levels. 3. Social, environmental, economic, political, cultural issues, problems, tasks, projects, sustainable development.

Education at training for prospective geography educators: 1. Geography: contents, thought, images, maps. 2. Didactic methods: teaching/learning, values, facilities, projects. 3. Living life, everyday practices, strategies, perception, imagination, decisions, communication, negotiating, actions.

Rubik´s cube is used here for a representation intended to: 1. Join the component of geographical disciplines, spatial patterns, and issues in applied geography (upper cube). 2. Joint geographical education as unifying the geography, didactics, and educational attainment targets (lower cube). 3. Didactic application of geography emphasizing geographical issues, principles, ideas, models, metaphores – geographical thought with respect to social challenges. 4. Spatio-temporal structuration and situations/contingencies of physical/human geography, its integration and interaction in neo-regional geography, landscape ecology, environmental geography. 5. Social, economic, political, environmental/ecological and cultural attributes of places, chores, regions, globions, their floating relevance, constancy.

7. Case study: training prospective geography educators at the department of geography, Faculty of Science, Masaryk University, Brno

In our courses of urban and rural geography as a form of geographical synthesis we tried the change-over from a traditional regional set of components to regional thematization focused on urban and rural studies –

Tab. 4 – Professional skills for geography didactics

Teaching	Learning
lecture brainstorming debates/discussions snowballing case/pilot studies community resource person soap boxing, hot seat demonstration summary, review	cooperative learning role plays, simulation field trips, observation projects testing, evaluation creativity graphicacy critical thinking reading/writing
lessons/genre/feature themes, targets glossary, focus/zoom context, application	
Materials/media	Life, practice
retrieval charts audiovisual materials Internet maps, atlases, globe graphs, diagrams satellite images demonstration	everyday situations strategies, imagination perception values, attitudes, beliefs competence actions changing world

issues, strategies, programmes, projects – known from applied geography. Student geography educators chose themes/issues for the districts of South Moravia (NUTS 3+2) during their fieldwork in social and environmental studies. They worked them out as small projects aimed at the proposed changes.

The list of the districts in South Moravia is given here (their central cities/towns), as well as the list of issues chosen by the students for their projects. We assume that projects like these can also be done by teachers and students at primary and secondary schools. The current state of the project includes 'summer school' prepared for geography educators in the city of Brno with the main topic: the suburban rim in transition/transformation.

Education through geography in real time/space of the Greater Brno-area (see Tab. 5).

South Moravia in the Czechlands: Issues recognized by students/geography educators (Masaryk University, Fac. Sci, Dept. of Geography, 1999)

A	jobs	N	nuclear power station
B	regional policy	O	tourism
C	transport	P	enterprising
D	depopulation	Q	waste
E	biodiversity	R	urban strategies
F	forestry	S	soil erosion
G	lignite, coal	T	thermal power plant
H	sugar refinery	U	uranium/radon

I	industry	V	viniculture/viticulture
J	folklore	W	cultural herritage
K	social policy	X	water management
L	landscape revitalization	Z	rural development
M	gnats	Z	criminality

Žďár	ABDEILLOSUXY
Jihlava	ABDFIOPQRUWYZ
Třebíč	ABCDIKNOQY
Znojmo	ABCDEHILPSVXY
Břeclav	ABELMOVWXY
Hodonín	ACGILKLMTVWY
Greater Brno	ABCGIKLOPQRWYZ
Uherské Hradiště	ABCHIJKLOPRSWXY
Zlín	ABCIPQRSXYZ
Kroměříž	ABILPSWXY
Prostějov	ACHIPQSXY
Vyškov	ACELPXY
Blansko	ACILOXY

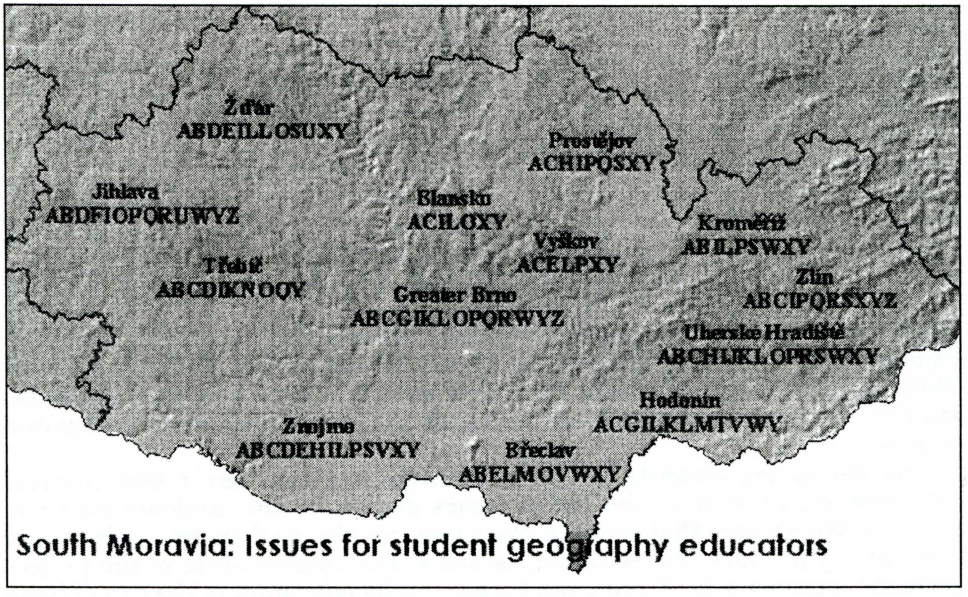

Fig. 3 – South moravia: issues for student geography educators

A sample of syllabus 'Landscape ecology and environmental geography' for prospective geography educators (A. Hynek, 1999):

A. Landscape sphere/ecosphere of the Earth : integrity of litosphere, atmosphere, biosphere, hydrosphere, pedosphere and anthroposphere/human sphere. Physical landscape processes: lithogenesis/global tectonics, morphogenesis/landforms, atmospheric processes, hydrocycle , pedogenesis/soil processes, biotic processes – productive, detritic, genofund/evolution of life. Landscape globions – terrestric, hydroterrestric, glacionival, sea ice, neritic, pelagic, ocean bottom. Semiglobions – lowlands, mountains, deserts, coasts, karst, forests, grasslands, great rivers and lakes, glaciers, seas, oceans. World's unique physical landscapes. Human landscape/ cultural landscape – rural, urban, suburban/subrural. Historical cultural

Tab. 5 – Greater Brno – study area for prospective geography educators at the Department of Geography, Faculty of Science, Masaryk University

Rural area, villages, Natural park Depopulation Climatic gradient Biocorridors and biocentres	District centre Slow growth In 1949-1989 basin with buttes Public administration	Satellite subcentre Indrustry , transport State prison Recreation	District centre Rapid growth In 1949-1989 Valleys and ridges Rocks sections	Interior periphery Recreation Fieldwork centre – study base Drainage basins
Water reservoir Water management Multiple use Pollution Transport conflicts R43 road	Suburban/ subrural transition transport	Landscape transect study area 'Beverly Hills' Environ-mental perception & imagination	Moravian Karst Landscape protected area Tourism, recreation Conflicts of interests	Limestone quarry cement works landscape diversity landscape catena natural park
Brno massif Horsts and grabens Forestry, agriculture Grand prix vs. nature protection & recreation	Neighbour-hoods Recreation, leisure Trade fair, Old Brno	Kounic Palace Masaryk Uni-versity Dept. of Geo-graphy Brno-city Monument Area Noise, air pollution CBD transformation	'brown fields' industrial decay social inequality Roma population The Bronx of Brno	Suburban/subr ural transition Satellite subcentres
Satellite subcentres Rural development Highway, agriculture Slope processes	Urban/subur-ban residential area, orchards & highway Paleogeo-graphic studies: loess	New shopping centres, leisure Transport, terraces Offices, stores, industry Growing investment	Terrace, airport gravel pits & waste satellite subcentres The view from the top	Monotonous large blocks of fields Napoleon's battlefield Tourism, development
Revitalization of industrial area Cultural herritage River confluence Biodiversity, reserves Deep valleys	Natural park forestry, agriculture river terrace Soil erosion Landforms evolution Tick calamity biocorridors	Multiple corridor floodplain/ /terrace water management subrural subcentre Rivers, underground water, biocorridors	Monotonous agricultural land Highway Rural development Fertile soils Controversial biocentre, landslides	Rural landscape diversity, folklore Soil erosion flysch formation

landscapes: from Eastern Africa to Manhattan. Land cover and land use, human activities shaping the face of the Earth : agriculture, manufacturing, mining, energy production and transmission, transport, settlement, services,

recreation/leisure. Cultural landscape as an interactive space of physical and human processes in relative constancy and change. Human environment and landscape ecosystems.

B. Landscape ecosystems: matter-force-energy flows/cascades, biogeochemical cycles, structure, processes, functions, food webs, pyramid of energy flow, primary production system, grazing-predation system, detrital system, soil system. Competition, mutualism, disturbances, thresholds, diversity, perception, imagination, use, existence values. Homeostasis vs. homeorhesis, dissipative structures, synergy and synergetics/self organization, catastrophe theory, fractals, order and chaos, holistics. Methods, procedures and techniques of landscape ecosystems study, landscape ecosystems modelling. Landscape ecosystems as natural resources. Valuing the nature, environmental economy and metaeconomy. Human interventions into landscape ecosystems, relocations of additional matter and energy. Landscape ecosystems as human environment, the tasks of sustainable development.

C. Oceans and seas: sea/ocean water and bottom as ecosystems and human environment. Bathymetry in the terms of thermohaline spatial structuration – surface, intermediate, deep and bottom levels. Circulation, currents and gyres, waves, tides. Water masses: equatorial/tropical, central and east tropical, subtropical and Mediterranean, North Atlantic and South Pacific, subpolar and polar. Air-ocean interactions, oceanic life and ecosystems, neritic/sea and pelagic/oceanic habitats and lifestyles (planktonic, nektonic and benthic – sunlit, twilight, bathypelagic, trench). The web of life – feeding, predators and prey, reproduction, locomotion, swimming. The coastal landscapes, intertidal zone, coasts and shelf seas, shorelines/coastlines, salt/brackish wetlands, mangrove swamps, estuaries/deltas, lagoons, upwelling, enclosed and semienclosed seas, islands/archipelagos. Oyster/coral reefs , sea-grass beds, kelp, deep ocean – benthic communities, hydrothermal vent communities – sulphur chemosynthesis, methane-bearing waters. Fishery and mariculture, power from the sea, mineral deposits, pollution, diseases and disturbances, changing sea level, frozen seas. Managing the oceans, protecting the commons, maritime law (1973-1994), commercial whaling, waste disposals, radioactive materials, plastic litter, destruction of coral reefs, oil spills ... (continued)

8. Conclusion

The Czech pedagogic geography developed in universities has entered into its 5th wave. The section of geographical education/Czech Geographical Society, includes all the academics interested in training geography educators. Their research grant intended to foster the skills and competence of geography educators means splendid opportunities for transition/transformation, not only for maintenance/development in geographical education close to the Western democracies, the European Union. However we are open to additional cooperation, multiculturality for understanding global processes, creating plural images of the world we live in. The Geography of our planet is a multi-facet diamond with its dark and light sides. What exactly is global, regional, local? Crossing borders, active learning, paying attention to the social challenges, accenting issues, joint applied/general/component geography in space-time dimensions, constancy

and change, cartography and informatics aided geography, projects, and classroom geography management are only some of targets of the 5th wave.

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Shrnutí

PŘÍPRAVA GEOGRAFŮ PEDAGOGŮ

V čase rostoucí kritiky geografického vzdělávání a Výzvy pro 10 milionů, Nové maturity, není možné nereagovat tvořivým společným úsilím univerzitních didaktiků geografie a navazujícími aktivitami učitelů/ek základních a středních škol. Česká geografická společnost, její sekce geografického vzdělávání, vedená A. Wahlou dokázala soustředit všechny univerzitní didaktiky z 8 fakult do společného projektu/grantu zaměřeného na stanovení žádoucího profesionálního profilu pedagoga-geografa (termín A. Wahly). Na společných jednáních se začíná prosazovat nový pohled na geografické vzdělávání a potřebné profesionální kvality geografů-pedagogů.

Výrazně se projevuje ústup od encyklopedického geografického vzdělávání ve prospěch tématicky orientovaného aktivního učení, styl preferující ´fenomény , koncepty , hlavní nit´. Ustupuje od banální vizuality ve prospěch aktivního vnímání a chápání geografické reality podporované kartografií, dálkovým průzkumem, leteckými snímky s důrazem na tematické mapy. Místopis představuje vstup do geografického vzdělávání na základní škole a postupně přechází do typologického přístupu, který více rozvíjí myšlení, tvořivost, uplatnitelnost geografie v praktickém životě.

S tím souvisí i přechod od geografického vzdělávání založeného na „didaktické transformaci vědního oboru – geografie“ k pojetí geografického vzdělávání jako aplikované geografické discipliny, která vzdělává geografií, především jejími aplikacemi, rozvíjením geografického myšlení a vybranou geografickou empirií, která dosud v geografickém vzdělávání dominuje. Právě absence jádra geografie – geografického myšlení týkajícího se celé geografie – je příčinou rozpadu geografie, převahy banalit, detailů v geografickém vzdělávání., povrchnosti vyjádřené voláním po dokonalých (zřejmě přes 130) učebnicích, méně po lepších atlasech. Univerzitní didaktici geografie pracují s dvěma extrémy fyzickogeografické, humánněgeografické a regionálněgeografické průpravy v učitelském studiu: přemírou empirie a „podmírou“ teorie a aplikací. Navíc převaha přednášení vede k napodobování na základních a středních školách, v pokleslé úrovni pak k diktování a proslulému „nestíhání“. Jen málo kartografů provozuje v učitelském studiu aktivní kartografii, kartografii podporující geografii, o počítačové se většinou jen mluví, mapování je nahrazováno geodézií.

Předložená případová studie ukazuje na příkladu města Brna tematickou orientaci pro geografické vzdělávání i v jiných městech, obcích. Studenti/ky procházejí terénním studiem krajinných ekosystémů města Brna a jeho okolí, studiem využití země vstupují do poznávání prostorové organizace lidských činností a rozpoznávají přes studium percepce a imaginace sociální, ekonomická, environmentální, kulturní, politická témata. Pokračují studiem Jižní Moravy – složkami přírody, lidskými činnostmi a hlavně směřují do tematizace jako v případě Brna. Těžiště je však v promýšlení činností jejich budoucích žáků/studentů, orientace je pedocentrická s důrazem na učení a promýšlení managementu vzdělávacího procesu – výuky. Rubikovou kostkou jsou vyjádřeny vztahy, souvislosti v geografii a v geografickém vzdělávání v realitě geografické učebny.

Ocitli jsme se v krizi geografického vzdělávání a obtížně argumentujeme o relevanci geografie ve vzdělávání. Náš postup by měl být orientován jako vzdělávání geografií, která integruje přírodovědné a společenskovědní poznatky, dovednosti, způsobilosti v prostorové organizaci, její stálosti i proměně, trvalé udržitelnosti. Geografie má potenciální sílu k této integraci a v současné debatě o nové maturitě by měla usilovat o samostatnost, není zastu-

pitelná v sociálních, ekonomických, environmentálních, politických, kulturních tématech, její potenciální kompetence je vysoká, ale realita geografického vzdělávání je nízká.

Obr. 1 – Česko – města s univerzitní výukou geografů-pedagogů
Obr. 2 – Rubikova kostka v geografickém vzdělávání
Obr. 3 – Jižní Morava – výstupy pro studenty geografického vzdělávání

(Author is with Department of Geography, Faculty of Science, Masaryk University, Kotlářská 2 , 611 37 Brno, seat: Kounic Palace, Brandlova 1, e-mail: hynek@porthos.geogr.muni.cz.)

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TADEUSZ SIWEK, JAROMÍR KAŇOK

MAPPING SILESIAN IDENTITY IN CZECHIA

T. Siwek, J. Kaňok: *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 inhabitants of the 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 the 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 now.
KEY WORDS: regional identity – perception – Silesia – Czechia.

1. Introduction: the Silesian identity

Contemporary Czechia consists of three historical lands. The two larger lands are fully integrated in the Czech state: Bohemia (52,052 square kilometres = 20,097 square miles; 66.0 % of the territory of the country) and Moravia (22,231 square kilometres = 8,583 square miles; 28.2 % of the territory). The third historical land is Silesia, a small part (only 4,423 square kilometres = 1,708 square miles; 5.6 % of the territory) of the historical province (appr. 40,000 square kilometeres = 15,400 square miles). Most of the territory of Silesia belongs now to Poland.

Silesia as a whole is a typical border region, which was in turn under the Polish, Czech, Austrian and German supremacy. The dominant ethnic group from the Middle Ages were Germans. The western part of today's Czech Silesia was until 1945 populated mainly by Germans while its eastern part was dominated by ethnic Poles. The Czech ethnic population increased significantly after the incorporation of a substantial part of the former Austrian Silesia to Czechoslovakia in 1918. The main population change was connected with the expulsion of the German Silesians to Germany after World War II (that was 35 % of the total population residing in the Czechoslovak Silesia before the war). New immigrants from the core areas of the Czech lands and Slovakia replaced the German population. The significant proportion of the present population of Czech Silesia are immigrants or immigrants' descendants. Original Silesians are a minority in Silesia not only due to the consequences of the war, but also as a result of the intensive development of heavy industry connected with massive immigration. The eastern part of Czech Silesia is the most industrialized area of the Czech Republic, full of coal mines, iron works and other branches of heavy industry.

A specific historical destiny of Silesia contributed to a strong feeling of a special identity of its original inhabitants. This was not a complex identity of the national type, but only a territorial identity, which is a component of the higher-level national identity (Smith 1991). It was difficult to impose a clear national or ethnic classification on the indigenous Silesians whose identity was mostly territorial. In various censuses they were described as Germans, Poles or Czechs, contrary to their own identification as German Silesians, Polish Silesians and Czech Silesians or simply as Silesians. Their identity – Silesianness – is not easy to define (see dificulties of defining the Germanness by Diana Forsythe, in Eriksen 1993). The Silesian territorial identity has never been supported by other identity components such as a common language and religion. A large number of Silesians speak their own dialects. The most specific Silesian dialect is typical of the Polish Silesians. Their dialect is basically Polish, but it is influenced by the Czech and partly by German language. Because Czech and German Silesians did not speak so specific "Silesian" dialects, Polish Silesians seem to be the most original component of Silesian population. For more details of Polish Silesians in the former Duchy of Teschen see Siwek 1992, 1995 and Hannan 1996. The Silesians were religiously divided into Roman Catholics and Lutheran Protestants from the sixteenth century in all three ethnic groups: German, Polish and Czech. The Silesian territorial identity of Silesian people has been based until now only on specific history and administrative status of this region.

2. Administrative status of Silesia

Silesia has never existed as an independent state. In the past it was divided into many small duchies under the reign of Polish Piast dynasty. In spite of feudal subdivisions Silesia existed as one province. From the fourteenth century it was a part of the Bohemian Kingdom. It became a part of the Austrian Habsburg Monarchy in 1526. Prussia gained almost the whole territory of the province in 1740. The Austrian Empire maintained control over a small part of Silesia as the Habsburg Crown Land named Austrian Silesia, which existed until 1918. The inhabitants of this province could still identify themselves as Silesians regardless of their language. The Austrian Silesia consisted of two different parts. The former Teschen Duchy was situated in the east, and it its dominant population was Polish. The former Opavia Duchy with fragments of counties of Krnov and Nisa was situated in the west and it was populated predominantly by Germans (for more details see Hannan 1996).

Newly established Czechoslovakia gained the Austrian Silesia and renamed it simply as Silesia (unofficial Czechoslovak Silesia) in 1918. Several years later, in 1927, the Czechoslovak government merged Silesia with Moravia and thus created the Moravian-Silesian Province. Historical borders of Silesia survived as district boundaries until 1949.

The communist government abolished provinces in Czechoslovakia in 1949. The old provinces were replaced by smaller territorial units: regions that were named after their capitals. Czech Silesia became a part of a newly established Region of Ostrava. The name of Silesia disappeared. Sub-units of those newly created regions, districts, were also changed and the old Moravian-Silesian boundaries disappeared as well. The new regions were enlarged in 1960 and

the Czech Silesia became a part of a newly established North Moravia Region with its capital in Ostrava, the most industrialised Czechoslovak city. This situation remained unchanged until the collapse of the communist government in 1989.

The first post-communist democratic government abolished the regions in 1991 but the old districts stayed in place. A discussion of new administrative division of the country started immediately after the collapse of the communist regime. The idea of the reintroduction of former historical provinces was brought to the fore. It was supported mainly by Moravians. Behind these ideas and moves lurked the conviction that the central government's administrative capacity was inefficient. The aim of adherents of decentralisation was to delegate as much power as possible to the historical lands. The Movement for Autonomous Democracy – Society for Moravia and Silesia was established in 1990. It fought for the renewal of Moravian-Silesian Province with a clear aim to reduce the power concentrated in Prague by winning as much of the state territory as possible including non-Moravian Silesia. The Moravians rejected some Silesian objections against the incorporation of Silesia into Moravia with arguments on the grounds that:

1. The territory of the region is too small, ten times smaller than Bohemia and five times smaller than Moravia. Still, because of a high density of Silesian population, the difference in terms of the size of the population is not as big in comparison with Moravia and Bohemia.
2. The original boundary between Silesia and Moravia used to be very complicated and now it has ceased to exist because of new regional structures of the industrialised area of Ostrava. Ostrava region of heavy industry has united former different historical lands. The area of the city of Ostrava is a good example of this process: its city centre is situated in the Moravian area surrounded by Silesian quarters in the west and east.
3. The sense of identity of the Silesians is weak and the new population of Silesia – immigrants and young people – are not bearers of the Silesian identity at all.

3. Silesia in the recent administrative units NUTS 3

Slovak separatism resulting in the division of Czechoslovakia in 1993 strengthened arguments against the renewal of former large provinces. The Czech Republic without Slovakia would have consisted only of two provinces: Bohemia and Moravia-Silesia. Possible Bohemian-Moravian conflicts that could emerge in such a dual state could be very similar to the Czech-Slovak conflicts that led to the division of Czechoslovakia. A new administrative structure of the Czech Republic was therefore prepared with the aim of creating a large number of smaller units – regions. The idea to divide the state into three parts by restoring Silesia was left out of consideration for the reasons mentioned above.

In October 1997 the Czech Parliament passed the Act No 347/1997 about the new administrative division of the Czech Republic that came into effect on 1st January 2000. Now the area of the country is divided into 14 regions that correspond with the level NUTS 3 in the European Union. They are paradoxically very similar to the regions of the first communist administrative structure of Czechoslovakia between 1949 and 1960. By this act a substantial part (85 %) of Czech Silesia has become the part of the Region of Ostrava,

except for the most western Silesian district of Jeseník, incorporated into the Region of Olomouc. The new Region of Ostrava now consists of 6 districts: the City of Ostrava, Bruntál, Karviná, Frýdek-Místek, Nový Jičín and Opava. 69 % of its area is originally the historical Silesian territory and 31 % of its area is on the territory of the historical land of Moravia.

Some reasons against the restoration of the historical Silesian Province such as its small area and unclear boundaries are rational and it is difficult to argue with them. Nevertheless, another very important reason against re-establishing the historical land of Silesia, a weak Silesian regional identity, demands a more rigorous scientific verification. Is the Silesian regional identity really so weak? Who are the bearers of this identity? Are the Silesians themselves really so little concerned with the restoration of their region? Last but not least, in what form does the Silesian region exist in minds of its inhabitants?

4. The Silesians in the 1991 census

The results of the last Czechoslovak census conducted in 1991 gave tentative answers to some of the above mentioned questions. For the first time this census allowed citizens to declare their Silesian identity as a nationality in the ethnic sense (the only exception in this respect was the 1939 census conducted by the German administration after the occupation of the region). The declaration of the Silesian nationality in 1991 was a consequence of political activities rather than traditions. It was a result of the campaigning of the Movement for Autonomous Democracy - Society for Moravia and Silesia, which was quite a powerful political force at that time (see Siwek 1992, 1995). However, unlike the inhabitants of the historical land of Moravia of whom almost 1.4 million declared themselves as ethnic Moravians, only by 44,000 people (0.4 % of the total Czech population and 5 % of the population of the historical Silesian territory) chose the Silesian "nationality".

The census in 1991 showed the following demographic characteristics of citizens who declared themselves as Silesians (see tables 1 – 4).

Statistical data confirm a general similarity between Silesians and the rest of the Czech population. However, there are three main differences: 1. the number of the Silesian men is higher than the number of Silesian women; 2. the education of those who declared themselves as Silesians is a little lower than the average; 3. more Silesian people are religious, most of them Roman Catholics, in comparison with the average share of the religious people in the Czech Republic.

5. Results of the Silesian identity investigation in 1998

The same statistical data characterise only a small group of Silesian population, considering themselves as a "nation". This group of population is undoubtedly the core of the whole population of the historic Silesian territory. Yet we need a better knowledge of the identity of the whole population of this area. In order to receive the representative data comparable with the census data we carried out a series of interviews with people who were selected as a representative sample of population living in the historic area of Czech

Tab. 1 – Czech Silesians by age compared with total population of the Czech Republic by age

	The Silesians				Total Czech population	
Age	Men	Women	% of men	% of women	% of men	% of women
0 – 14	4 597	4 429	10.33	9.97	10.76	10.25
15 – 19	2 124	1 767	4.78	3.98	4.32	4.13
20 – 24	1 711	1 282	3.85	2.88	3.40	3.25
25 – 29	1 634	1 449	3.68	3.26	3.41	3.27
30 – 34	1 626	1 349	3.66	3.04	3.35	3.25
35 – 39	1 824	1 700	4.17	3.82	3.94	3.88
40 – 44	2 026	1 721	4.56	3.87	4.11	4.08
45 – 49	1 465	1 277	3.30	2.87	3.29	3.35
50 – 54	1 255	1 126	2.83	2.53	2.49	2.62
50 – 59	1 028	1 103	2.31	2.48	2.37	2.64
60 – 64	1 095	1 276	2.46	2.87	2.34	2.85
65 – 69	1 081	1 326	2.43	2.98	2.05	2.85
70 – 74	527	659	1.19	1.48	1.02	1.56
75 – 79	391	695	0.88	1.56	0.95	1.70
80+	258	612	0.58	1.38	0.73	1.76
Unknown	2	1	0.00	0.00	0.00	0.00
Total	22674	21772	51.02	48.99	48.53	51.47

Source: Czechoslovak census 1991

Tab. 2 – The Silesians over 15 years by education compared with the total population

	The Silesians						Total Czech population		
	Total		Men		Women		Total	Men	Women
	abs.	%	abs.	%	abs.	%	%	%	%
Primary	11 868	33.5	3 967	21.9	7 901	45.6	33.1	24.7	40.8
Lower secondary	12 780	36.0	8 096	44.8	4 664	26.9	35.4	39.3	28.2
Upper secondary	8179	23.1	4263	23.6	3916	22.5	2.9	21.8	24.7
Tertiary	2346	6.6	1626	9.0	720	4.2	7.2	10.7	5.1
Without education	64	0.2	30	0.2	34	0.2	0.3	0.3	0.4
Unknown	203	0.6	95	0.6	108	0.6	1.1	1.1	1.0
Total	35 420	100.0	18 077	100.0	17 343	100.0	100.0	99.9	100.2

Source: Czechoslovak census 1991

Silesia. 920 inhabitants of the Czech Silesia were interviewed in November and December 1998. As the historic area of the Czech Silesia was considered the area of former Land of Silesia (administrative unit of the Austrian Habsburg Monarchy that integrated in Czechoslovakia after World War I including the district of Hlučín, until 1920 part of Germany). This area consists of 241 municipalities and it is populated by 938,000 inhabitants.

As a general rule, only people who were older than 15 years were interviewed. The respondents were selected by mixed, multilevel method. The first step was the selection of municipalities. Silesian municipalities were divided into categories according to the size of population. Individual municipalities were then selected by random sampling. The second step was sampling of respondents. They were selected by purposive quota sampling according to sex, age and the level of education.

Tab. 3 – The Silesians by religious denomination compared with the total population

Church	The Silesians		Total Czech population
	abs.	%	%
Roman Catholic Church	23 976	53.9	39.1
Silesian Evangelical Church	1 371	3.1	0.3
Evangelical Church of Czech Brethren	986	2.2	2.0
Czechoslovak Hussite Church	345	0.8	1.7
Other Churches	345	0.8	0.7
Non-religious people	11 786	26.5	39.9
Unknown	637	12.7	16.1
Total	44 446	100.0	100.0

Source: Czechoslovak census 1991

Tab. 4 – The Silesians by economic activity

Category	The Silesians		Total Czech population
	abs.	%	%
Economically active persons	22 658	51.0	52.6
including: women on maternity leave	1 282	2.8	3.1
working pensioners	895	2.0	2.9
job seekers	512	1.2	1.2
Economically inactive persons with their own income	9 091	20.5	19.3
Dependants, including:	12 697	28.6	28.1
apprentices	1 327	3.0	2.9
children, pupils, students	10 604	23.9	24.2
housewives	758	1.7	0.8
Total	44 446	100.0	100.0

Source: Czechoslovak census 1991

There are two major results of this investigation: statistical characteristics of the residents in the historic territory of Silesia and the cognitive map of their own region. For the theoretical aspects of mental maps see Gould, White 1974; in the Czech geographical literature see Drbohlav 1991. The mental map of the Czech Silesia does not show the environmental perception as maps of preference (Drbohlav, Blažek 1990, Bartnicka 1989), but as a map of respondents' image of their region (Drbohlav 1991).

Apart from inviting the respondents to draw a map of Silesia the respondents were also asked about the character of their connection with the territory of historic Silesia and about their identity in terms of their nationality (their identity was compared with their identity declared during the census in 1991). They were also asked about their attitude to the supposed form, name and capital of the new administrative unit which would contain most of the territory of the Czech Silesia. They were also asked if they thought that their own town was on the territory of Silesia. Finally, they were asked to draw the map of Silesia.

Tab. 5 – The sample: 920 people, 441 men and 479 women. Origin of the respondents and their parents.

	Respondents	Respondents' fathers	Respondents' mothers
born in Silesia	76.7 %	58.3 %	61.2 %
born in Moravia	17.1 %	23.6 %	23.0 %
born in Bohemia	2.5 %	4.4 %	3.7 %
born in Slovakia		7.4 %	6.5 %
born in other countries	3.7 %	3.2 %	3.0 %
living in other places		3.3 %	2.5 %

Source: authors' research

Tab. 6 – Respondents' nationality (in %) in 1991 and 1998

	1991	1998
Czech	82.7	77.9
Moravian	5.0	8.6
Silesian	3.6	5.8
Polish	3.4	3.0
Slovak	2.5	2.2
German	0.3	1.0
Others	0.4	1.2
No answer	2.1	0.4

Source: authors' research

Tab. 7 – The attitude to administrative units prepared in 1998. Respondents were informed of the introduced administrative structure (%)

well	8.0
partly	33.7
not at all	50.3
no answer	8.0

Source: authors' research

Tab. 8 – Proposed name of a new administrative unit – Region of Ostrava

Combine Moravia and Silesia	34.2
including: Moravian-Silesian North Moravian – Silesian Silesian-Moravian	23.8 5.9 6.0
Only Silesian	9.0
Only North Moravian	27.9
Other	0.9
No answer	26.5

Source: authors' research

Tab. 9

Answer	Respondents from	
	Teschen part of Silesia	Opavian part of Silesia
My town is situated in Silesia	86.9	75.2
I do not know	3.9	7.9
My town is not situated in Silesia	9.2	16.9

Source: authors' research

Most Silesians who took part in this research had strong bonds with the territory of Silesia. 76.7 % of respondents were born in Czech Silesia and at least 58.3 % of respondents' parents were born in Czech Silesia as well. A clear majority of respondents can be considered as long-term inhabitants. It appears that the tremendous consequences of a mass migration after the World War II are now overcome (Tab. 6).

The share of common Central European nationalities in our survey is similar to the census in 1991. Nevertheless, our data differ from that census

in two significant ways. Both regional identities considered by respondents as "nationalities" – Moravian and Silesian – are increasing (Tab. 7).

It seems that people were not very well informed about the new administrative structure. The structure of respondents suggesting the name for their new administrative region is interesting. It must be explained that the new Region of Ostrava contains almost 70 % of the territory of Czech Silesia (Tab. 8).

This table shows that the Silesian identity is rather weak. It is a consequence of the long-term marginalisation of the name of Silesia during the communist period. The number of respondents preferring a geographically incorrect name North Moravian Region was three times higher than the number of respondents preferring the name of Silesia, which is geographically incorrect, too. Geographically correct names combining words Moravian and Silesian were preferred by one third of respondents, but the majority of them put the name Moravian (or North Moravian) in the first place. Approximately one fourth of respondents did not answer this question – it is an evidence of their lack of interest.

One of the main questions of our questionnaire was aimed at the identification of respondents' place of living: whether or not it was situated in their view on the historical territory of Silesia. Former Austrian or Czechoslovak Silesia that was determined by district boundaries valid at least from 1850 (first Austrian district structure) to 1949 (when historical lands were abolished by communists) was considered as the historical Silesia. All respondents were residents of this historical area of Czech Silesia. 81.4 % of them considered their own town as a part of historical Silesia. 12.8 % of the respondents did not consider their own town as a part of Silesia and 5.8 % of the respondents did not answer this question.

We tried to analyse the structure of the respondents. Their age was not found to be important. Only 78.2 % of the youngest respondents classified their own town as a Silesian town, contrary to 90.8 % of the respondents between 60 – 64 years. Surprisingly, only 83.6 % of the oldest respondents called their place of living as Silesian. Respondents' education was not significant either. Only 76.1 % of the most educated people with a university degree situated their own town in the territory of Silesia, fewer than the other, less educated respondents who did it in 81 – 83 % of cases. It means that for educated people the question of localisation of their town is not so important. Job situation is not significant in this case either: surprisingly, the unemployed people's identification of their place of living as Silesian was highest (85,9 %). The scores for university students and university graduates were lowest (73,2 % and 73,9 %).

The respondents' territorial origin was more important. The best results were achieved by people born in Silesia as well as by respondents with Silesian parents and, strangely enough, by respondents born in relatively distant Bohemia as well as by respondents whose parents came from Bohemia. The worst results were related to Moravians and to the respondents who had Moravian and Slovak parents. It means that Moravians either do not differentiate Silesia from Moravia or that they consider Silesia as a Moravian sub-region. The relatively correct localisation of Silesia by the Czechs coming from Bohemia could be a result of their subconscious tendency to limit the influence of their possible rivals – the Moravians.

Inner Silesian regions are significant as well. The Teschen Silesians localised better their area than the Opava Silesians. It is an evidence, that population of Teschen Silesia is more original in this area than Opavian

population in their region. It is evident that the Opavian Silesia is still affected by forced migration after the World War II. See table 9.

This table is significantly different from the results of the 1991 census, because the census shows the stronger Silesian identity of the inhabitants of Opavian Silesia. This phenomenon may be explained by the fact that most Poles living in Teschen Silesia can be regarded as a people with a strong Silesian identity (Siwek 1997).

6. The mental map of Czech Silesia

The last part of our research was to establish how respondents imagined the map of the Czech Silesia. Each respondent was asked to draw his or her own map of the Silesian region. On the basis of individual respondents' maps the general mental map was drawn. Each municipality in the Czech Silesia and surroundings was classified according to the frequency with which it appeared as a part of Silesia in individual respondents' maps. The municipalities were then divided into intervals according the theory of scales (Kaňok 1999a). The final map was drawn by the programmes ARC/INFO and ArcView. The mental map of Silesia is presented below (see Fig. 1).

In the respondents' views the core of Silesian region consists primarily of the districts of Opava and Karviná and partly also the city of Ostrava and the district of Frýdek-Místek. The district of Bruntál, a part of the district of Nový Jičín and quite a peripheral district of Jeseník were only exceptionally considered to be part of Silesia. The map shows both the core and peripheral areas of the Czech Silesia as they are perceived by its inhabitants.

The analysis of the respondents' sample did not reveal any significant differences. The older respondents drew a Silesian area with a slightly higher precision than the younger ones. The educated respondents did not draw a Silesian area better than uneducated people. Similarly, neither respondents' job nor gender was significant in determining the accuracy of their maps. Territorial origin of respondents could be more important. The results of our research showed also that there was no significant distinction in the ability of the respondents from Teschen and Opavian part of Silesia to draw a map of Silesia. However, to determine the types of errors that these respondents made when drawing the map was left out from our analysis.

7. Conclusions

The Czech Silesia exists in its inhabitants' minds only to a limited extent. Historic Silesia is not usually associated by the inhabitants of Silesia with a newly established administrative structure of the Czech Republic. Restoration of Silesia is not a pressing problem for the majority of its population. This problem is significant only for the minority of old residents – for those who declared themselves as Silesians in the west and for the Poles in the east of the region. The growth of the tendency to declare Silesian identity as "nationality" (as well as Moravian "nationality") is interesting but seems to be a consequence of political processes rather than of the growth of the regional identity. The adherents to Silesian identity are predominantly elderly people. The educated people and students from the region consider the problem of the restoration of historical Silesia as marginal. The change of

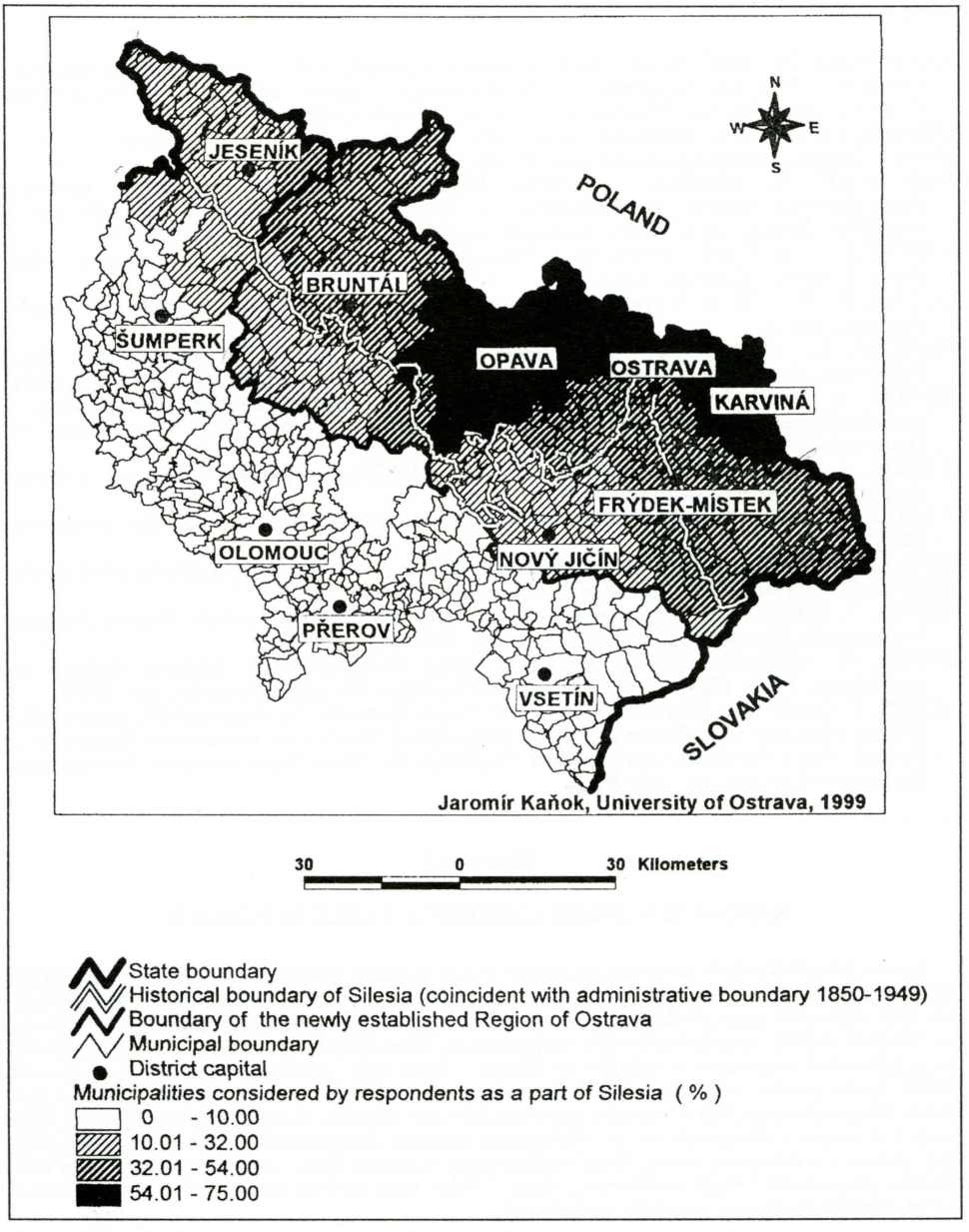

Fig. 1 – The mental map of Silesia in the area of former North Moravian Region.

social and cultural climate in Czechia after the fall of communism could increase the interest of the Silesians in their own region but at present the prospect of the strengthening of the Silesian identity is quite grim. It is not without any chance in the future but it is exposed to the forces of globalization as all other regional identities in the world.

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Shrnutí

MAPOVÁNÍ SLEZSKÉ IDENTITY V ČESKÉ REPUBLICE

Cílem příspěvku bylo sestrojit mentální mapu českého Slezska, které bylo v posledních 50 letech vymazáno z administrativních map. 920 respondentů z této oblasti bylo požádáno, aby zakreslili svou představu polohy svého regionu. Celková mapa pak byla sestavena na základě dílčích map jednotlivých respondentů. Obce byly hodnoceny podle toho, jak často je jednotliví respondenti zařadili do Slezska. Obce byly rozděleny do stupnice intervalů podle teorie tvorby stupnic a mapa byla sestrojena s využitím programů ARC/INFO a ArcView. Mapa ukazuje jádro, území a periferii českého Slezska ve vědomí jeho obyvatel. Sběr map byl spojen s dotazováním na regionlální identitu dotazovaných. Potvrdilo se, že slezská identita je relativně slabá. Nejsilnější je mezi staršími lidmi, naopak slabá je mezi mladými a překvapivě i mezi vzdělanými lidmi. I když není do budoucna bez šancí, jako všechny regionalismy musí i ona čelit globalizaci.

Obr. 1 – Mentální mapa Slezska v bývalém Severomoravském kraji. 1 – Státní hranice, 2 – historická hranice Slezska (administrativní hranice z let 1850 – 1949), 3 – hranice nově vytvořeného Ostravského kraje, 4 – hranice obcí, 5 – okresní město, 6 – obce, které respondenti považují za součást Slezska (podíl v %).

(T. Siwek is with Ústav pro výzkum polského etnika Philosophic Faculty of Ostrava University, Dvořákova 7, 701 03 Ostrava, Czechia. J. Kaňok is with Department of Geography, Faculty of Science, Masaryk University, Kotlářská 2, 611 37 Brno, Czechia.)

Arrived to the editor's office on January 15, 2000

Geographical Departments in Czechia

Department of Social Geography and Regional Development, Faculty of Science, Charles University, Prague

Address: Albertov 6, 128 43 Praha 2
E-mail address: ksgrr@natur.cuni.cz
Phone number: 420-2-21952226
Web site(s): http://www.natur.cuni.cz/prfdec/ksgrr
Head of Department: doc. RNDr. Ivan Bičík, CSc.

Chief scientific orientation:
Main social and economic geography topics, development of regional and urban structures, development of land use, (micro)regional analyses, population and migration, theory of geography, geography of transition, regional and state comparisons.

Chief pedagogical orientation:
Masters (5 years) and postgraduate (3 years) programmes in:
- social geography and regional development
- regional and political geography
- education of geography teachers (combination with second subject – biology, history, maths, physical training)
- postgraduate education for teachers of geography

Main research projects since 1996 (project name and responsible person):
Geographical Structure and the Development of the Environment and Society Integrations (P. Dostál); Theory of the Development of Regional Differentiation (M. Hampl); Land Use/Land Cover Change: State, Development, Consequences (I. Bičík); Integration of Refugees in the Czech Republic (D. Drbohlav); Globalisation, Economic and Social Restructuring and Urban Change (L. Sýkora, OSI/HESP)

Key publications published since 1996 – periodicals:
ACTA Universitatis Carolinae, Facultas Rerum Naturalium, Geographica, Published by Charles Univerisity, Praha

Books:
BIČÍK, I., GÖTZ, A. (1998): Czech Republic. In: Turnock, D. (ed.): Privatization in Rural Eastern Europe. The Process of Restitution and Restructuring. Edw. Elgar Studies of Communism in Transition, pp. 93-120.
Department of Social Geography and Regional Development, Faculty of Science, Department Profile. KSGRR, PřF UK, Praha.
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Department members:
doc. RNDr. Ivan Bičík, CSc. (regional geography, land use, agriculture)
RNDr. Jiří Blažek, Ph.D. (regional and local development)
doc. RNDr. Josef Brinke, CSc. (regional geography, transport)
RNDr. Zdeněk Čermák, CSc. (population, migration, settlement)
prof. Petr Dostál, M.A., Ph.D. (European Union, social geography, administration)
doc. RNDr. Dušan Drbohlav, CSc. (migration, behavioural geography, refugees)
RNDr. Dagmara Dzúrová, CSc. (demography, health, statistics)
Mgr. Dana Fialová (second homes, GIS)
RNDr. Václav Frajer (agriculture, regional geography, environmental issues)
prof. RNDr. Martin Hampl, DrSc. (settlement, theoretical geography, regionalisation)
Mag. Tomáš Havlíček (religion, Alpine region, regional geography)
Mgr. Pavel Chromý (historical and cultural geography)
RNDr. Vít Jančák, Ph.D. (agriculture, economic and regional geography)
RNDr. Petr Jehlička, Ph.D. (political geography, environmental issues)
RNDr. Leoš Jeleček, CSc. (historical and regional geograhy)
RNDr. Ludvík Kopačka, CSc. (economic geography, tourism)
doc. RNDr. Hana Kühnlová, CSc. (didactics of geography)
Mgr. Miroslav Marada (transport, cultural geography)
RNDr. Radim Perlín (physical planning, regional development)
RNDr. Dana Řezníčková (didactics of geography)
RNDr. Luděk Sýkora, Ph.D. (urban and social geography)
RNDr. Vít Štěpánek (tourism, cultural geography)
RNDr. Jiří Tomeš (regional geography, unemployement)
Mgr. Jiří Vágner (tourism, second homes, regional geography)
RNDr. Jana Winklerová (land use, GIS)

Cooperating institutes (organization) abroad:
Dartmouth College (New Hampshire, USA); Warszaw University (Poland), Amsterdam University (The Netherlands); Comenian University (Bratislava, Slovakia); Humboldt University (Berlin, Germany)

Department of Physical Geography and Geoecology, Faculty of Science, Prague

---

Address: Albertov 6, 128 43 Praha 2
E-mail address: kfggsekr@natur.cuni.cz
Phone number: 420-2-2195 2215
Fax number: 420-2-2195 2341
Web site(s): http://www.natur.cuni.cz/~kfggsekr/
Head of Department: prof. RNDr. Jan Kalvoda, DrSc.

Chief scientific orientation:
Dynamic geomorphology, physical geography of mountains, natural hazards and risks, regional hydrology, climatology and pedogeography, global change and protection of the environment, landscape ecology.

Chief pedagogical orientation:
Department provides bachelor, master and post-graduate studies in Physical Geography with courses on theoretical and regional physical geography, geomorphology, hydrology, climatology, pedogeography, biogeography and geoecology.

Main research projects since 1996 (project name and responsible person):
Global change in the mountains (J. Kalvoda, EU); Monitoring system for hazardous tectonic structures (J. Kalvoda, COST, EU); Mass transport in the Czech part of the Labe river basin (L. Šefrna); Dynamics of sedimentation in Western Bohemian lakes (B. Janský); Classification of climate in Prague (I. Sládek)

Key publications published since 1996 – books:

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VOTÝPKA, J., (1997): Geomorphological analysis of the development of the south-eastern Šumava granite region. Acta Universitatis Carolinae Geographica, XXXII, No. 2, UK, Praha, pp. 133-148.

Department members:
RNDr. Břetislav Balatka, CSc. (geomorphology, regional physical geography)
PaedDr. Pavel Červinka (regional physical geography, geoecology)
ing. Josef Hladný, CSc. (hydrology)
doc. RNDr. Bohumír Janský, CSc. (hydrology, oceanography, regional geography)
prof. RNDr. Jan Kalvoda, Dr.Sc. (geomorphology, physical geography, geodynamics)
RNDr. Jiří Kastner (climatology, regional physical geography)
RNDr. Zdeněk Kliment, CSc. (hydrology, fluvial geomorphology)
Mgr. Jakub Langhammer, PhD. (hydrology, geoecology, GIS)
RNDr. Zdeněk Lipský, CSc. (geoecology, landscape protection)
Mgr. Milada Matoušková (hydrology, geoecology)
doc. RNDr. Václav Přibyl, CSc. (geomorphology, regional physical geography)
RNDr. Luděk Šefrna, CSc. (pedology, pedogeography, biogeography)
RNDr. Ivan Sládek, CSc. (climatology, meteorology)
RNDr. Vít Vilímek, CSc. (regional physical geography, geomorphology)
doc. RNDr. Jan Votýpka, CSc. (geomorphology, regional physical geography)

Cooperating institutes (organization) abroad:
University of Oxford, School of Geography, Department of Earth Sciences, Evironmental Change Unit, (UK); Université Louis Pasteur, Faculty of Geography, (Strasbourg, France); Universidad Nacional Mayor de San Marcos, Facul. Geogr. (Lima, Peru); Universitäts Heidelberg, Mainz and Passau, Geographisches Institut (Germany); Universität Bern, Geographisches Institut (Switzerland)

Department of Demography and Geodemography, Faculty of Science, Charles University, Prague

---

Address: Albertov 6, 128 43 Praha 2
E-mail address: demodept@natur.cuni.cz
Phone number: 02-21952191
Web site(s): http://www.natur.cuni.cz/~demodept
Head of Department: doc. RNDr. Jitka Rychtaříková, CSc.

Chief scientific orientation:
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 (CEDN (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).

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

Books:
FIALOVÁ, L. (1996): Století demografické statistiky (Century of Demographic Statistics). In.: Fialová, L., Horská, P., Kučera, M., Maur, E., Musil, J. Stloukal J.: Dějiny obyvatelstva Českých zemí (Population History in the Czech Lands) Praha, pp.133-192.
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KOCOURKOVÁ, J., KAMARAS, MOORS: (1998): The Impact of Social Policies on Reproductive Behaviour. In: Rossella Palomba: Heinmoors (eds.: Population family and welfare, a comparative survey of European attitudes, 2, Clarendon Press Oxford, pp. 242-261.
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KUČERA, T. (1999): Internal Migration in Population Forecasts: Necessity and Predictability. Working paper No. 39. ISTAT, Rome, 9 p.
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CARLSON, E., HOEM, J., RYCHTAŘÍKOVÁ, J. (1999): Trajectories of fetal loss in the Czech Republic. Demography, 36, No. 3, Praha, pp. 327-337.
MACKENBACH, J. P., KUNST, A. E., GROENHOF, F., BORGAN, J. K., COSTA, G., FAGGIANO, F., JÓZAN P., LEINSALU, M., MARTIKAINEN, P., RYCHTARIKOVA, J., VALKONEN, T. (1999): Socioeconomic inequalities in mortality among women and among men: An International Study, American Journal of Public Health, 89,No. 12, pp.1800-1806.
RYCHTAŘÍKOVÁ, J. (1998): La république tchčque va-t-elle sortir de la crise de santé de lEurope de lEst? Espace, Populations, Sociétés, 3, pp.371-379.

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)
RNDr. Tomáš Kučera, CSc. (population forecasting, demographic analysis)
ing. Milan Kučera (demographic analysis, forecasting, population censuses)
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, natality, fertility)

Cooperating institutes (organization) abroad:
Institut de démographie, Université de Paris I, (Pantheón – Sorbonne); Université L. Pasteur (Strasbourg, France); University of Amsterdam (Netherlands); Université Catholique de Louvain-la-Neuve (Belgium); University of Tübingen (Germany).

Department of Cartography and Geoinformatics, Faculty of Science, Charles University, Prague

---

Address: Albertov 6, 128 43 Praha 2
E-mail address: karto@natur.cuni.cz
Phone number: 420-2-21952181
Web site(s): http://prfdec.natur.cuni.cz/~forstova/katedra
Head of Department: doc. ing. Dalibor Moravec, DrSc

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

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 1996 (project name and responsible person):
Climatic Regionalization, Slope Inclination, Exposition for Bonital Soil System of the Czech Republic (D. Moravec); Archaeological Potential of Bohemia – Archaeological 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).

Key publications published since 1996 – periodicals:
Kartografie a geoinformatika. Mapová sbírka Univerzity Karlovy, Praha (Cartography and Geoinformatics. Map Collection of Charles University Prague.)

Books:
MORAVEC, D., VOTÝPKA, J. (1998): Klimatická regionalizace České republiky (Climatic Regionalization of the Czech Republic). Karolinum, UK, Praha, 124 pp. + supplement.

Articles:
BERÁNEK, T. (1996): Will Expert Systems Replace Cartographers? Acta Universitatis Carolinae Geographica, XXXI, No. 1, UK, Praha, pp. 21-30.
ČAPEK, R. (1997): National Atlases of Czechoslovakia. Proceedings of the Seminars on Electronic Atlases II. Prague, The Hague: International Cartographic Association, pp. 57-58.
ČAPEK, R. (1998): Zobrazení map světa v českých atlasech (Projections of the World Maps in Czech Atlases). Geodetický a kartografický obzor, 44, No. 12, Praha, pp. 261-263.
DOUBRAVA, P. (1996): Developmental Trends in Remote Sensing of the Earth. Acta Universitatis Carolinae Geographica, XXXI, No. 1, Karolinum, UK, Praha, pp. 65-76.
DOUBRAVA, P. (1999): Possibility for Expanding of Scientific Activities of R&D Center Scanex in the Czech Republic. The case study of the Research and Development Center Scanex, Moscow, 18 pp.
MORAVEC, D. (1996): Generalizace reliéfu v kartografických modelech (Generalization of Relief in Cartografphic Models). Geodetický a kartografický obzor, 41, No. 3, Praha, pp. 178-182.
MORAVEC, D. (1996): The Present State and Future of the Map Collection of Charles University. Acta Universitatis Carolinae Geographica, XXXI, No. 1, Karolinum, UK, Praha, pp. 181-188.
MORAVEC, D. (1996): The Transformation of Cartography. Acta Universitatis Carolinae Geographica, XXXI, No. 1, Karolinum, UK, Praha, pp. 189-200.
MORAVEC, D. (1997): Klimatická regionalizace (Climatic Regionalization). Sborník 12. kartografické konference, Olomouc, pp. 73-92.
MALÁ, B. (1996): Distortion Lines in Conventional Projections. Acta Universitatis Carolinae Geographica, XXXI, No. 1, UK, Praha, pp. 139-170.

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

Cooperating institutes (organization) abroad:
Universitat politécnica de Valencia (Spain); Universiteit Gent (Belgium).

Department of Geography, Faculty of Science, Masaryk University, Brno

Address: Kotlářská 2, 611 37 Brno
E-mail address: prosek@porthos.geogr.muni.cz
Phone number: 420-5-42128301
Web site(s): http.//www.sci.muni.cz
Head of Department: prof. RNDr. Pavel Prošek, CSc.

Chief scientific orientation:
Reconstruction of climate, climatic change, microclimate, topoclimate, climate of polar regions, precipitation-runoff relation, geomorphology landscape ecology structure biogeography, social and economic transformation and regional studies in the ČR, geoinformatic andGIS management, theory of geography teaching.

Chief pedagogical orientation:
bachleor´s study of applied mathematics and geography, master´s study and PhD study of physical geography, climatology and hydrology, cartography with geoinformatics and remote sensing, regional geography and development

Main research projects since 1996 (project name and responsible person):
Climate Variability in Sixteenth-Century, Europe and Its Social Dimension (Ch. Pfister, University Bern, Central European Working Group of Historical Climatology); Ecology of the Coastal Antarctic Vegetation Oasis (P. Prošek, Scientific Program of Ministry of Education, Youth and Sports 21 (A. Hynek, European project coordinated by Organisationsberatung GmbH Wiena).

Key publications published since 1996 – periodicals:
Scripta Facultatis Scientarum Naturalium Universitatis Masarykianae Brunensis – Geography

Books:
BRÁZDIL, R., KOTYZA, O.(1996): History of Weather and Climate in the Czech Lands II. The earliest daily observations of the weather in the Czech Lands. Masaryk University, Brno, 178 p.
BRÁZDIL, R., ŠTEKL, J. et al (1999): Klimatické poměry Milešovky (Climatic Patterns of Mt. Milešovka). Academia, Praha, 433 p.
LOŽEK, V., VAŠÁTKO, J. (1997): Molluscan Fauna of National Park Podyjí (Měkýší fauna Národního parku Podyjí). Knihovna České speleologické společnosti, Vol. 31, 67 p.

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Department members:
prof. RNDr. Rudolf Brázdil, DrSc. (historical climatology, climatic change)
Mgr. Petr Daněk (political geography)
Mgr. Martin Brzák, Dr. (geomorphology)
RNDr. Petr Dobrovolný, CSc. (climatology, remote sensing)
doc. RNDr. Milan V. Drápela, CSc. (cartography, historical cartography)
RNDr. Vladimír Herber, CSc. (physical geography, education in geography)
doc. RNDr. Alois Hynek, CSc. (physical geography, education in geography)
doc. RNDr. Jaromír Karásek, CSc. (geomorphology)
RNDr. Miroslav Kolář, CSc. (hydrology)
doc. RNDr. Milan Konečný, CSc. (cartography and geoinformatics)
RNDr. Petr Kubíček, CSc. (geoinformatics, geomorphology)
Mgr. Kamil Láska (climate of polar regions)
prof. RNDr. Pavel Prošek, CSc. (micro and topoclimatology, climate of polar regions)
ing. Eva Reinöhlová (agricultural geography)
doc. RNDr. Stanislav Řehák, CSc. (social geography, geography of transport)

Mgr. Karel Staněk (geoinformatics)
RNDr. Václav Toušek, CSc. (social geography)
doc. RNDr. Jaroslav Vašátko, CSc. (biogeography)
RNDr. Antonín Věžník, CSc. (agricultural geography)

Cooperating institutes (organization) abroad:
Institute of Geography and Institute of History, University Bern (Switzerland); Dept. of Antarctic Biology PAS (Warsaw, Poland); University of Paris I, Panthéon-Sorbonne (France); GISIG (Geographical Information Systems International Group); EU – DG III, part of CEEC-EU – IS Forum (Central and Eastern European Countries – European Union – Information Society Forum)

Department of Geography, Faculty of Pedagogics, Masaryk University, Brno

Address: Poříčí 7, 603 00 Brno
E-mail address: svatonova@jumbo.ped.muni.cz
Phone number: 420-5-43129220
Web site(s): http://www.ped.muni.cz/wgeo/
Head of Department: prof. PhDr. Petr Chalupa,CSc.

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

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

Main research projects since 1996 (project name and responsible person):
Landscape Model (J. Kolejka); Landscape Model as a New Tool for Applied Geoscience (J. Kolejka).

Key publications published since 1996 – books:
NOVÁK, S., DEMEK, J. (1989): Planeta Země se představuje (Planet Earth are introducing). Učebnice zeměpisu pro základní školy. Práce, Praha, 79 p.
HORNÍK, S., CHALUPA, P.(1998): Zeměpis České republiky (Geography of Czech republic). Učebnice zeměpisu pro základní školy. SPN, Praha, 72 p., ISBN 80-7235-005-6
CHALUPA, P., DEMEK, J., RUX, J. (1998): Lidé žijí a hospodaří na Zemi (People live and economize on the Earth). Zeměpis pro 8.a 9. ročník základní školy. Praha, SPN, 64 p., ISBN 80-7235-004-8.
HOFMANN, E.a kol. (1999): Jedovnice – modelová oblast pro terénní vyučování (Jedovnice – the Model area for Terrain Teaching). Akademické nakladatelství CERM, Brno, p. 128, ISBN 80-7204-109-6.

Articles:
CHALUPA, P. (1999): Česká republika v Evropě. Czech Republic in Europe.In: Výchova k národnímu vědomí a národním hodnotám. Sborník příspěvků z konference k 80. Vzniku samostatného státu, Sborník prací 146, MU, Brno, ISBN 80-210-2164-0.
KOLEJKA, J. (1999): Geoekologické aspekty rozvoje měst po povodni. In: Sborník rozšířených abstrakt ke 3. Semináři " Niva z multidisciplinárního pohledu III., Masarykova Univerzita/Geotest, Brno, pp. 28-29
NOVÁK, S. (1998): Primární a sekundární informace v mapách. Primary and Secondary Informations in the Maps. Sborník VI. mezinárodní geografické konference UNESCO, Nitra. UKF FPV, pp. 330-335. ISBN 80-85183-98-6
CHALUPA, P. (1999): Česká republika na konci 20. století (Czech republic at the end of 20. century). In: Sborník prací, No. 144, MU, Brno pp. 110-119. ISBN 80-210-2147-0
MEČIAR, J. (1988): Specifičnost geografie a interdisciplinarizace vysokoškolské výuky (The Periculitarity of Geography and Interdisciplinarization of the Univerzity Teaching). In: Cesty ke tvořivé škole. Sborník příspěvků z konference. PdF MU, No. 140, MU, Brno, pp. 404-409. ISBN 80-210-1938-7

DEMEK, J. (1999): Krajinná ekologie a geoekologie na přelomu tisíciletí (The Landscape Ecology and Geoecology in the Break of Milenium). Geografie XI, part A, Sborník prací Pedagogické fakulty MU, 145, Brno, pp. 25-32. ISBN 80-210-1784-8.
BORECKÝ, D. (1998): Průmyslový rozvoj Moravy (The Industrial Development of Moravia). Geografie, X, Sborník katedry geografie Pedagogické fakulty MU, Brno, pp. 15-21. ISBN 80-210-1784-8.
HOFMANN, E., RYCHNOVSKÝ, B., BORECKÝ, D. (1998): Organizace a přínos terénního vyučování (The Organization and Contribution of the Terrain Teaching). Biologie – chemie – zeměpis, 7, No. 4, SPN, Praha, pp. 186-189. ISSN 1210-3349.

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 Czech Republic, economic geography)
RNDr. Jaromír Kolejka, CSc. (landscape ecology, GIS and remote sensing)
RNDr. Svatopluk Novák,CSc. (cartography, physical geography)
RNDr. Jozef Mečiar (population geography, political geography , regional geography)

Cooperating institutes (organization) abroad:
University of Constantine the Philosophe, Faculty of Science, Department of Geography (Nitra, Slovakia); Department of Geography, Kijev, Nacionalnyj pedagogiceskij universitet im. Dragomanova (the Ukraine); Department of Geography, University of Regensburg (Germany); Department of Geography, University of Leipzig (Germany)

Department of Geography Faculty of Science, Palacky University, Olomouc

---

Address: Svobody 26 771 46 Olomouc
E-mail address: geogr@prfnw.upol.cz
Phone number: 420-068-5222451
Web site(s): 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, biology – geography – environmental studies.
Bachelor's level courses: geography – geoinformatics.

Main research projects since 1996 (project name and responsible person):
Transformation of Spatial Intra-Urban Structures and their Reflection in Perception (Comparative Study: Prague, Bratislava, Olomouc and Presov (Z. Szczyrba for Olomouc, RSS/OSSF); Study of Alpinekarst and Glacier Types of Georelief in the Austria (M. Vysoudil, AKTION); Linking and Application GPS and GIS technologies for landscape mapping (V. Voženílek); Regional Information System for Environmental Hazards (V. Voženílek for Czech Republic, NATO).

Key publications published since 1996 – periodicals:
ACTA Universitatis Palackianae Olomucensis, Facultas Rerum Naturalium, Geographica, Published by Palacky Univerisity, Olomouc, ISBN 80-7067-839-9, ISSN 0231-9365

Articles:
FŇUKAL, M. (1999): European security and ex-Yugoslavia. Proceedings of 4-th International Conference "Travel trade, regional development and education". University of South Bohemia in České Budějovice, Tábor, pp. 53-59.
PLUSKAL, M. (1996): Zdokonalené metody pro měření didaktických textů. (Improving Methods of Assessing Textbooks). Pedagogika, 46, No. 1, pp. 62-76.
LÉTAL, A. (1998): Usage and building map symbols in PC ARC/INFO 3.4.2. AUPO, Fac. Rer. Nat., Geographica, 35, Olomouc, pp. 13-17.
LÉTAL, A. (1999): Generalization metods for digital geomorphological maps. In: Proceddings for Conference "Integrace prostorových dat". Olomouc, pp. 114-117.
PTÁČEK, P. (1999): Local Community Transformation after 1989 on the Example of Olomouc, Czech Republic. 2-nd Slovak – Czech – Polish Seminar, Bratislava.
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SMOLOVÁ, I., SZCZYRBA, Z., VANČURA, M., TOUŠEK, V. (1998): Procesy restruktualizacji przemyslu w Republice Czeskiej. (Processes of Industry Restructualization in the Czech Republic). In: Problemy transformacji struktur przemyslowych w procesie przechodzenia do gospodarki rynkowej. Wydawnictwo Naukowe WSP, Krakow, pp. 179-184.
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VOŽENÍLEK, V. (1999): Geoinformační aspekty modelování eroze půdy. (Geoinformatics aspects of modelling of soil erosion). In: Proceedings for Conference "Integrace prostorových dat". Olomouc, pp 208-232.
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Department members:
Mgr. Miloš Fňukal (regional and political geography)
Mgr. Renata Chmelová (hydrology, geoecology)
RNDr. Ivan Lepka,CSc. (rural geography, demography)
Mgr. Aleš Létal (biogeography, GIS , landscape ecology)
doc. RNDr. Miroslav Pluskal,CSc.(regional geography, didactics)
Mgr. Pavel Ptáček (settlement geography, regional development)
Mgr. Pavel Sedlák (cartography, GIS)
Mgr. Irena Smolová, PhD. (geomorphology, regional geography)
Mgr. Zdeněk Szczyrba (economic geography, regional development)
doc. RNDr. Vít Voženílek, CSc. (GIS, cartography)
doc. RNDr. Miroslav Vysoudil,CSc. (climatology, remote sensing)

Cooperating institutes (organization) abroad:
University of Vienna, Institute of Geography (Austria); Queen Mary College, University of London (UK); Slovak Academy of Science, Institute of Geography (Bratislava, Slovakia); City University, London (UK); UMCS Lublin (Poland)

Department of Social Geography and Regional Development, Faculty of Science University of Ostrava

---

Address: Hladnovská 9, 710 00 Ostrava
E-mail address: name@osu.cz
Phone number: 420-69-6241089
Web site(s): http://www1.osu.cz/czech/prf/prirod.htm
Head of Department: doc. RNDr. Petr Šindler, CSc.

Chief scientific orientation:
Ethno-national problems, development of the border areas, national structure of the CR, urbanization and industrial regions, European integrational processes, regional development, regional policy, city and regional marketing.

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

Main research projects since 1996 (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 Northern Moravia and Silesia (P. Šindler, A. Wahla); The position of the frontier area in the regional development of the Czech Republic with regard to the CR entry to the European structures (P. Wilam).

Key publications published since 1996 – periodicals:
ACTA Facultatis Rerum Naturalium, Facultas Rerum Naturalium, Geographia-Geologia, Published by Universitas Ostraviensis, Ostrava

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Books:
ŠINDLER, P. (1998): Regionální rozvoj a regionální politika (Regional development and regional politics). University of Ostrava, Ostrava, 94 p. ISBN 80-7042-763-9
VENCÁLEK, J. (1998): Protisměry územní identity (The Opposing Directions in the Territorial Identity). Olza, Český Těšín, 208 p. ISBN 80-86082-10-5.

Articles:
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ŠINDLER, P. (1997): Administrativní členění České republiky – historie, současnost, perspektivy (The administrative delimitation of the Czech Republic-history, present and perspectives). Acta Universitatis Mathiae Belii, Geographical Studies, No. 3, UMB, Banská Bystrica, pp. 45-49. ISBN 80-8055-093-X.
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ŠINDLER, P. (1999): Sociální důsledky urbanizace rozvojových zemí (The social consequences of the urbanity in developing countries). Acta Facultatis Rerum Naturalium Universitas Ostraviensis Geografia-Geologia, No. 7, University of Ostrava, Ostrava, pp. 91-99. ISBN 80-7042-779-5.
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VENCÁLEK, J. (1999): Vnímání hranice a pohraničí v integrujícím se evropském prostoru. Hranice a pohraničí jako geopolitický, ekonomický, historický, sociokulturní a filosofický fenomén (Border and borderland in integrating european area. Border and borderland as geopolitical, economical, historical, sociocultural and philosophical phenomenon). University of Ostrava, Ostrava, pp. 23-28. ISBN 80-7042-154-1.

Department members:
doc. RNDr. Vladimír Baar, CSc. (political, cultural and historical geography, geography of Europe)
RNDr. Jan Havrlant, CSc. (geography of the CR, environment, travel traffic)
Mgr. Petr Rumpel (political geography, city and regional development)

doc. RNDr. Petr Šindler, CSc. (political geography, urban geography, regional development).
doc. PaedDr. Jaroslav Vencálek, CSc. (population geography, social geography)
doc. RNDr. Arnošt Wahla, CSc. (didactics of geography, geography of education)
Mgr. Petr Wilam (industry and transport geography, regional geography)
Mgr. Petr Žufan (rural geography, didactics of geography, regional geography)

Cooperating institutes (organization) abroad:
University of Bonn; Austrian Institute of Vienna; Silesian University of Katowice (Poland); University of Matej Bel Banská Bystrica (Slovakia); University of Ljubljana (Slovenia).

Department of Physical Geography and Geoecology, Faculty of Science, University of Ostrava

---

Address: 30. dubna 22, 701 03 Ostrava 1
E-mail address: firstname.surname@osu.cz (e.g. vladislav.kriz@osu.cz)
Phone number: 420-69-6160211
Web site(s): http://www1.osu.cz/english/f_of_science/prirod.htm
Head of Department: prof. RNDr. ing. Vladislav Kříž, DrSc.

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.

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

Main research projects since 1996 (project name and responsible person):
Anthropogenic Changes of Water Regime of Oder River Basin Rivers (V. Kříž, J. Kaňok); Geographical and Ecological Changes of Environment and Structures of Industrial Landscape (V. Kříž, L. Buzek, J. Kaňok, J. Prášek et al.); Tendencies of Changes of Water Circulation in Upper Oder Basin (A. Jankowski, J. Kaňok, V. Kříž et al.); Regional Information System for Environmental Hazards – RISEH (J. F. Raper, V. Voženílek, J. Kaňok et al.; NATO Science Programme); Morphotectonics and Dynamics of Present Landform Processes in the Southern Part of Crimea (J. Prášek, J. Hradecký, T. Pánek).

Key publications published since 1996 – periodicals:
Sborník prací Přírodovědecké fakulty Ostravské univerzity (Faculty of Science of the Ostrava University Works). Geografie-Geologie, Acta Facultatis Rerum Naturalium Universitatis Ostraviensis. No. 4 – 7, PřF OU, Ostrava, 1996-1999.

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KŘÍŽ, V. (1997): Fyzickogeografická charakteristika povodí horního toku řeky Odry na území České republiky. (Physicogeographical Characteristics of the Upper Oder Basin on the Territory of the Czech Republic.) Sborník prací PřF OU, Geografie – Geologie, 167, 5, PřF OU, Ostrava, pp. 7-46.
KŘÍŽ, V. (1999): Malé vodní nádrže hornatin Západních Beskyd a jejich hydrologické vlastnosti (Small Water Reservoirs in the Western Beskydy Highlands and their Hydrological Properties). Sborník prací PřF OU, Geografie – Geologie, 181, 7, PřF OU, Ostrava, pp. 29-42.
MÜLLER, L. (1996): Mathematical Modelling and Prediction of the Hydrogram. In: Ecohydrological Processes in Small Basins. Universite Louis Pasteur, CNRSF, Strasbourg, France, pp. 106-112.
MÜLLER, L., MÜLLEROVÁ, M. (1996): Mathematical Modelling of the Hydrographical Processes in Small Basins. In: Ecohydrological Processes in Small Basins. Universite Louis Pasteur, CNRSF, Strasbourg, France, pp. 113-118.
PRÁŠEK, J. (1996): Přehled výzkumů oblasti Nízkého Jeseníku (The Statement of Research of the Nízký Jeseník Mountains). Sborník prací PřF OU, Geografie – Geologie, 157, No. 4, PřF OU, Ostrava, pp. 71-98.

PRÁŠEK, J. (1999): Kaly z čistíren odpadních vod – rizika a možnosti jejich využití při rekultivačních pracech. (Sludge from Water Treatment Plants – Hazards and Possibilities of its Utilities by Reclamation). Sborník prací PřF OU, Geografie – Geologie, 181, No. 7, PřF OU, Ostrava, pp. 139-143.

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)
RNDr. Jan Prášek (applied geomorphology, morphotectonics, environment)
Mgr. Tomáš Rozehnal (geology, hydrogeology)
doc. RNDr. František Rehoř, CSc. (palaeonthology, geology)

Cooperating institutes (organization) abroad:
Silesian University of Katowice (Poland); Geographical Faculty, State University of I. Franko (Lviv, the Ukraine); University of Matej Bel (Banská Bystrica, Slovakia)

Department of Geography, Pedagogical Faculty, West Bohemian University, Plzeň

Address: Veleslavínova 42, 306 19 Pilsen
E-mail address: novotnam@kge.zcu.cz
Phone number: 420-19-7237951-(5)
Web site(s): http://www.pef.zcu.cz/pef/kge
Head of Department: doc. RNDr. Stanislav Mirvald, CSc.

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.

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

Main research projects since 1996 (project name and responsible person):
History of the occupied border region – the Sudetenland 1938 – 1945 (J. Toms); 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); Municipal marketing and its application to a country in transormation. (J. Dokoupil, EU); Realisation of a West Bohemian geographical system (M. Novotná); Strategic development of the Královicko micro-region. (S. Mirvald).

Key publications published since 1996 – articles:
ČERVENÝ, P. (1998): Jak měřit vzdálenosti na mapách? (How to measure distances on maps?). In: Dokupil, J., Matušková, A. (eds.): Miscellanea geographica Universitatis Bohemiae occidentalis 6. ZČU KGE, Plzeň, pp. 201-206.
ČERVENÝ, P. (1999): Význam kartografie pro spolupráci v Euroregionu Egrensis (The importance of cartography for the cooperation in the European region Egrensis). In: Borecký, D. (ed.): Geografie XI, part A. PF MU, Brno, pp. 17-20.
DOKOUPIL, J. (1996): Der Einfluß der Grenzöffnung auf die Bewohner im tschechischbayerischen Grenzraum in der Euroregio Egrensis (The influence of the border opening on the inhabitants in the Czech-Bavarian border space in the Euroregio Egrensis). Arbeitsmaterial ARL, 231, ARL, Hannover, pp. 59-68.

DOKOUPIL, J. (1998): Funkce hranic v přeshraničním rozvoji a spolupráci regionů České republiky a Německa (The function of borders in cross-border development and regional cooperation of the Czech Republic and Germany). Geografie X, MU, Brno, pp. 26-32.
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HÁJEK, J. (2000): Výuka regionální geografie na katedře geografie Pedagogické fakulty ZČU v Plzni. Regionální geografické aplikace ve vyučování zeměpisu na základních a středních školách (Regional geography education on the Geography Department at Pedagogical faculty ZČU in Plzeň. Regional geography application in geography curriculum on elemetary and secondary schools). In: Miscellanea geographica Universitatis Bohemiae occidentalis, 7. ZČU KGE, Plzeň, pp. 119-126.
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KOPP, J., VANÍK, R. (1999): Jökulhlaup – povodně po Islandsku. Jökulhlaup – a flood Iceland-style. Vesmír, 78, No. 9, Praha, pp. 495-496.
KRAFT, J. (1998): Two new Dendroid Graptholities from the Klabava formation. (Lower ordovician of the Prague Basin, Bohemia). J. Czech geol. soc., 43, No. 4, Praha, pp. 281-285.
KRAFT, J., KRAFT, P. (1999): Graptolite Bronzes of the Bohemian Lower and Middle ordovician and their historical development. – J. Czech geol. soc., 44, ", Praha, pp. 53-62.
MATUŠKOVÁ, A. (1998): Evropská dimenze v počátečním zeměpisném vzdělání (The Europian dimesion in the initial stage of geography teaching). In: Wahla, A. (ed.): Evropská dimenze v geografickém vzdělávání. Ostravská univerzita, Ostrava, pp. 71-77.
MATUŠKOVÁ, A., VYSKOČILOVÁ, E. (1998): Výzkum učiva a učení základům zeměpisné orientace v prvouce a ve vlastivědě (Research into subject matters and teaching the basics of geographical orientation in elementary teaching and in local/national history and geography). Pedagogika, 48, No. 1, Praha, pp. 41-53.
MIRVALD, S. (1999): Integration des Tschechischen Strassennetzes im Process der Globalisation (The integration Czech road network in the Process of the Globalisation). Globalisation Regionalisation/Regionalismus. Janus Pannonius Universtät, Pécs, pp. 201-205.
MIRVALD, S. (1999): Hodnocení vlivu dopravních staveb na krajinu (Evaluation of the influence of highway construction on the landscape). Teoreticko-metodologické problémy geografie, příbuzných disciplín a ich aplikácie. Univerzita Komenského, Bratislava, pp. 210-213.
NOVOTNÁ, M. (1996): Hodnocení zemědělského využívání krajiny v regionu "Pošumaví" (Evaluation of the agricultural land use in the "Pošumaví" region). In. Kowalczyk, A. (ed.): Zmiany w przestrzeni geograficznej w warunkach transformacii spoleczno-ekonomicznej (na prykladzie obsazarów wiejskich). Uniwersytet Warszawski, Warszava, pp. 207-214.
NOVOTNÁ, M. (1999): Geografické informační systémy v regionální geografii (Geographical information system in the regional geography). In: Minár, J., Trizna, M. (ed.): Teoreticko-metodologické problémy geografia, príbuzných disciplín a ich aplikácie. Univerzita Komenského, Bratislava, pp. 229-233.
REITSPIES, Z. (1999): Regionální zvláštnosti trhu práce v okrese Plzeň-město (Regional specifics of the job market in the Plzeň City area). In: Sborník z mezinárodní konference "Regionální spolupráce 99". Karviná, pp. 224-227.
REITSPIES, Z. (2000): Analýza lidských zdrojů v okrese Plzeň-město (Analysis of human resources in the Plzeň City area). In: Novotná, M. (ed) Miscellanea geographica Universitatis Bohemiae occidentalis 7. "Jak dál v regionální geografii". Plzeň, pp. 167-175.
SUDA, J., MENTLÍK, P. (2000): Příspěvek ke geomorfologii Královského hvozdu (Contribution to the geomorphology of the Královský hvozd district). In: Miscellanea geographica Universitatis Bohemiae occidentalis 7. "Jak dál v regionální geografii". Plzeň, pp. 175-185.

Department members:
doc. RNDr. Stanislav Mirvald, CSc. (human geography)
PaedDr. Jaroslav Dokoupil, Ph.D. (regional geography, human geography)
Mgr. Pavel Červený (matematical geography a cartography)
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)
PaedDr. Alena Matušková, CSc. (population and cities geography, didactic of geography and homeland)
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)

Cooperating institutes (organization) abroad:
Universty of Bayreuth; Technical University of Chemnitz; University of Regensburg; University of Iceland; University of Limoges.

Department of Geography, Pedagogical Faculty, J. E. Purkyně University, Ústí nad Labem

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Address: České mládeže, 400 21, Ústí nad Labem
E-mail address: geograf@pf.ujep.cz
Phone number: 420-47-5214417
Web site(s): http://www.pf.ujep.cz
Head of Department: doc. RNDr. Jiří Anděl, CSc.

Chief scientific orientation:
Regional research 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 load assessment; regional development and cross-border cooperation.

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.

Main research projects since 1996 (project name and responsible person):
North-western Bohemia at the beginning of the third millennium (J. Anděl); Structure of settlement and its development in the North-western Bohemia with special focus to settlement extinction (J. Anděl); Self-studying teacher (J. Peštová); Euroregion Elbe/Labe in facts, graphs and maps (Programme Phare, M. Jeřábek); Study programmes and the international charter of geographical education IGU (J. Anděl).

Key publications published since 1996 – periodicals:
ACTA Universitatis Purkynianae, Facultas Rerum Naturalium, Studia geographica, Published by Univerisity of Ústí nad Labem

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Books:
ANDĚL, J., PEŠTOVÁ, J., SKOKAN, L. (1997): Asie a Evropa (Asia and Europe). Prospektrum, Praha, 112 pp., ISBN 80-85431-67-X.
ANDĚL, J., MAREŠ, R. (1997): Evropa (Europe). Nakladatelství Olomouc, 287 pp., ISBN 80-7182-O25-3.
ANDĚL, J., MAREŠ, R. (1999): Asie a Afrika (Asia and Africa). The Ancient World. Nakladatelství Olomouc, Olomouc, 400 pp., ISBN 80-7182-085-7.
KRÁL, V. (1999): Fyzická geografie Evropy (Physical geography of Europe). Academia, Praha, 348 pp., ISBN 80-200-0684-2.

KUNC, K. 1996): Environmentální výchova (Environmental education). Technická univerzita, Ostrava, 128 pp.

Articles:

ANDĚL, J. (1998): Methods of Estimation of the Threat to an Environment. In: Zachodniosudeckie pogranicze polsko-czeskie. Akademia Ekonomiczna we Wroclawiu. Wroclaw, pp. 65-70, ISBN 83-87320-20-X.

ANDĚL, J., POŠTOLKA, V., ŠAŠEK, M. (1998): Ecological Load Assessment and Environmental Quality – Case Study on the Czech-Polish Borderland. In: Zachodniosudeckie pogranicze polsko-czeskie. Akademia Ekonomiczna we Wroclawiu. Wroclaw, pp.65-70, ISBN 83-87320-20-X.

ANDĚL, J. (1997): Federativní státy světa (Current federal countries of the world). Geografické rozhledy, No. 4, Praha, pp. 113-115.

ANDĚL, J. (1998): Vývojové trendy sídelní struktury východního Krušnohoří (Developing trends in structure of settlement in the eastern part of Krušné hory [Ore Mountains]). A memorial volume of the international summit "Revitalisation of the problematic regions". Ústí nad Labem, pp. 97-105, ISBN 80-7044-210-7.

ANDĚL, J. (1999): Vymezení Ústeckého kraje a jeho specifika (Delimitation of the Ústí region and its specifics). In: Jeřábek M., Peštová J. (eds.): Delimitation of the regions of the Czech Republic. UJEP, Ústí nad Labem, pp.76-81, ISBN 80-7044-257-3.

BURSA, M. (1988): Forma možné spolupráce v rozvoji Euroregionu Elbe/Labe (The form of the possible cooperation in the development of Euroregion Elbe/Labe). In: European dimension in the geographical education, Ostravská univerzita, Ostrava, p. 240 - 244, ISBN 80-7042-785-2.

BURSA, M. (2000): Statistické regiony České republiky jako součást nového územního rozdělení po roce 2000 (Statistical regions of the Czech Republic as a part of the new area division after 2000). In: Jeřábek M., Peštová J. (eds.): Delimitation of the regions of the Czech republic, Ústí nad Labem, pp. 76-81, ISBN 80-7044-257-3.

FARSKÝ, I. (1999): Supplementary forms in the Science Teaching on Schools and Teacher Training in Czech Republic. Example Geography. Dabaszinatnes un skolotajo izglitiba II. Idevnieciba Varti, Riga, pp.80-83, ISBN 9984-638-30-8.

CHVÁTALOVÁ, A. (1999): Regionalizace a prostorová diferenciace na příkladu skupin typů geobiocenů Teplicka (Delimitation of regions and space differentiation on the example of some types of geobiotops in Teplice). In: Jeřábek M., Peštová J. (eds.): Delimitation of the regions of the Czech republic. UJEP, Ústí nad Labem, pp. 89-92, ISBN 80-7044-257-3.

CHVÁTALOVÁ, A. (1999): Zakřivení reliéfu Lužických hor (A curve of the Lužické mountains relief). In: Borecký, D. (ed.): Memorial volume of works PF MU, 145, period of science number 22, Geografie XI, part A. MU, Brno, pp. 90-101, ISBN 80-210-2139-X.

JEŘÁBEK, M. (1997): Analysis of Knowledge in Connection with Travel of Inhabitants of the Czech Republic to Foreign Countries. In: Acta Universitatis Carolinae Geographica XXXII, Praha 1997, pp. 307-324.

JEŘÁBEK, M. (1998): The creation of the trans-border market of the work – commuting in the Czech-German borderland. Demografie 1/98, Praha, pp. 39-42.

JEŘÁBEK, M. (1998): Some Results of a Sociological Survey Carried out as Part of Preparations for Teplice Region Development Programme. In: Czech Business and Trade, No. 6, PP Agency Praha for MPO ČR, 22 p.

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

KUNC, K. (1997): Environmentální vzdělávání a výchova (Geography and ecological education). Geography questions, 4, Praha, pp. 73-79, ISBN 80-86034-11-9.

PEŠTOVÁ, J. (1999): Jak na regionální geografii při vyučování zeměpisu? (How to teach regional geography in geography education?) In: Jeřábek M., Peoetová J. (ed.): Delimitation of the regions of the Czech republic. UJEP, Ústí nad Labem, pp. 116-118, ISBN 80-7044-257-3.

SKOKAN, L. (1999): O geografické regionalizaci a učení o zemích a regionech ve školské (ale nejen školské) geografii (Of the geographical delimitation of regions and teaching about countries and regions in school (but not only in school) geography). In: Jeřábek

M., Peštová J. (ed.): Delimitation of the regions of the Czech Republic, UJEP, Ústí n. L., pp. 24-35, ISBN 80-7044-257-3.

Department members:
doc. RNDr. Jiří Anděl, CSc. (regional geography, population geography)
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)
RNDr. Václava Křížová (introduction in the geography, regional geography)
doc.RNDr. Karel Kunc (theory of landscape, environmental geography)
PaedDr. Jana Peštová (teaching techniques in geography, mathematical methods)
doc. RNDr. Ladislav Skokan, CSc. (economical and regional geography)

Cooperating institutes (organization) abroad:
Institut fur Geographie, Technische Univesitat (Germany); Department of Geography, Faculty of Science, Vilnius University (Lithuania); Faculty of Regional Development, Akademia Ekonomiczna (Wroclav, Jelenia Gora, Poland); Geographical Faculty, Russian Free University (Russia).

Department of Geography, Pedagogical Faculty, University of South Bohemia, České Budějovice

Address: Jeronýmova 10, 371 15 České Budějovice
E-mail address: kubes@pf.jcu.cz
Phone number: 420-38-7773163
Web site(s): http://www.pf.jcu.cz
Head of Department: RNDr. Jan Kubeš, CSc.

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

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

Main research projects since 1996 (project name and responsible person):
Sustainable development of rural areas (1997 – 1999, J. Kubeš).

Key publications published since 1996 – books:
KUBEŠ, J., ed. (2000): Problémy stabilizace venkovského osídlení ČR (Problems of stabilization of rural settlement in the Czech Republic). Jihočeská univerzita v Českých Budějovicích, 163 p.

Articles:
CHÁBERA, S., HUBER, K. H. (1997): Konkavverwitterung und Polygonmuster in den Granuliten des Kleť/Schöninger-Gipfels 1 084 m im Blanský les/Blansker Wald (Südböhmen). Acta Musei Bohemiae meridionalis in České Budějovice, Scientiae naturales, 37, pp. 5-16.
CHÁBERA, S., HUBER, K. H. (1998): Pseudoschichtung (Pseudobedding) in Granitoiden des Südböhmischen Plutons. Acta Musei Bohemiae meridionalis in České Budějovice – Scientiae naturales, 38, pp. 5-17.
CHÁBERA, S., HUBER, K. H. (1999): Beispiele kryogener Verwitterungs- und Abtragungsformen im Eisgarner Granit. Acta Musei Bohemiae meridionalis in České Budějovice – Scientiae naturales, 39, pp. 5-16.
CHÁBERA, S., HUBER, K. H. (2000): Beitrag zur Flussgeschichte der Obermoldau in Jungtertiär. Jahrbuch des oberösterreichischen Musealvereines, Linz (in press).
BOHÁČ, J., KUBEŠ, J., FUCHS, R., ČURNOVÁ, A. (1995): The use of biomonitoring for ecological planning and ecological policy in agricultural settlements. In: Munawar, M.,

HANNINEN, O., ROY, S., MUNAWAR, N., KÄRENLAMPI, Z., BROWN. D. (eds): "Bioindicators of Environmental Health", SPB Academic, Amsterdam, pp. 155-163.
KUBEŠ, J. (1994): Bohemian agricultural landscape and villages, 1950 and 1990: land use, land cover and other characteristics. Ekológia (Bratislava), 13, No. 2, pp. 187-198.
KUBEŠ, J. (1996): Biocentres and corridors in cultural landscape. A critical assessment of the "territorial system of ecological stability". Landscape and Urban Planning, 35, No 3, pp. 231-240.
KUBEŠ, J., FUCHS, R. (1998): Village as a bird refuge in cultural landscape (largely agricultural landscape, the Czech Republic). Ekológia (Bratislava), 17, No. 2, pp. 208-220.

Department members:
prof. RNDr. Stanislav Chábera, CSc. (geomorphology)
Mgr. Jiří Čekal (didactics of geography)
Mgr. Irena Kokešová (cartography)
RNDr. Roman Kössl (physical geography)
RNDr. Jan Kubeš, CSc. (rural geography, landscape planning)
Jindřich Rozkopal, p. g. (mathematical geography)
Mgr. Michal Vančura (human geography, geography of industry)

Cooperating institutes (organization) abroad:
University of Plymouth; University of London, Birkbeck college; University of Irkutsk, Geographical Faculty.

Department of Environmental Geography, Institute of Geonics, Czech Academy of Sciences, Brno

Address: Drobného 28, PO Box 23, 613 00 Brno
E-mail address: geonika@geonika.cz
Phone number: 420-5-45422711
Web site(s): http://www.geonika.cz
Head of Department: RNDr. Antonín Vaishar, CSc.

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

Main research projects since 1996 (project name and responsible person):
Regional Assessment of Environment under Conditions of Transformation of the Czech Republic (O. Mikulík); Climate Fluctuations in the Czech Republic in the Pre-industrial Period: Monitoring of Historical Environmental Changes (J. Munzar); Geomorphological Development of Relief of the Podyjí National Park and the Larger Southeastern Margin of the Bohemian Massif (K. Kirchner); New Prosperity for Rural Regions (A. Vaishar, RSS OSI/HESP); Floods, Landscape and People in the Morava Catchment Area (A. Vaishar).

Key publications published since 1996 – periodicals:
Moravian Geographical Reports, Institute of Geonics, Brno (since 1993)

Books:
HLAVINKOVÁ, P., FISCHER, W. (1999): Identifacition and evaluation of old deponies in the area of Brno-East. Regiograph, Brno, 132 p.
MIKULÍK, O., MARIOT, P., eds., (1999): Specifika transformačního procesu v zázemí velkých měst (Specifities of the Transformation Process in the Surroundings of Big Cities). Regiograph, Brno, 80 p.
VAISHAR, A., ZAPLETALOVÁ, J., eds. (1999): Město Brno v širších souvislostech (The City of Brno – its Position within Large Terrotorial Units). Regiograph, Brno, 100 p.
HLAVINKOVÁ, P., MUNZAR, J., eds., (1999): Regional Prosperity and Sustainability. Regiograph, Brno, 209 p.
VAISHAR, A., ed. (1999): Povodně, krajina a lidé v povodí řeky Moravy I (Floods, Landscape and People in the Morava River Catchment Area I). Regiograph, Brno, 81 p.

Articles:
BÍL, M., MÁČKA, Z. (1999): The Influence of River Network Arrangement on Values of Geotectonic Indices (On the Example of the Oslava River Basin). Moravian Geographical Reports, 7, No. 1, pp.13-17.
HLAVINKOVÁ, P. (1999): Altlastenproblematik und heutige Abfallpolitik in der Tschechischen Republik. Österreichische geographische Gesellschaft, Graz, Heft 24, pp. 7-10.
HLAVINKOVÁ, P., VAISHAR, A. (1998): Gegenwärtiger Zustand der Abfallwirtschaft in der Tschechischen Republik. In: Kommunale Entsorgungs- und Umweltproblematik in Ost- und Mitteleuropa nach der politischen Wende. Karl-Franzens-Universität Graz, pp. 80-99.
HRADEK, M., KOLEJKA, J., ŠVEHLÍK, R. (1997): Czechia and Slovakia. In: Embleton, C.&C.: Geomorphological Hazards in Europe. Elsevier Amsterdam, Lausanne, New York, Oxford, Shannon, Tokyo, pp. 61-90.
HRADEK, M., ŠVEHLÍK, R. (1998): Geomorphologic research on the present-day processes and landforms in the western Carpathians in the Czech Republic. Studia geomorphologica Carpatho-Balcanica, 32, pp. 19-30.
IVAN, A. (1999): Geomorphological Aspects of Late Saxonian Epiplatform Orogeny of the Bohemian Massif. Part I Moravian Geographical Reports, 7, No. 1, pp.18-33, Part II, Moravian Geographical Reports, 7, No. 2, pp.12-31.
IVAN, A., KIRCHNER, K. (1998): Granite landforms in South Moravia (Czech Republic). Geografia Fisica a Dinamica Quaternaria, 21. Comitato Glaciologico Italiano, Torino, pp. 23-26.
IVAN, A., KIRCHNER, K. (1998): Relation between topography and structure in the Moravian and Silesian parts of the Western Carpathians. Studia geomorphologica Carpatho-Balcanica, 32, p. 7-17.
KIRCHNER, K., KREJČÍ, O. (1998): Slope movements in the flysch Carpathians of eastern Moravia (Vsetin district) triggered by extreme rainfalls in 1997. Moravian Geographical Reports, 6, No. 2, p. 43-52.
MIKULÍK, O. (1999): Regional Prosperity, the Environment and the Prospects of Marginal Regions. In: Špes, M. (ed): New Prosperity for Rural Regions. Institute of Geography Ljubljana, p. 95-101.
MIKULÍK, O., VAISHAR, A. (1996): Economic Revitalization in Protected Landscape Areas. In: Transformation Processes of Regional Systems in Slovak Republic and Czech Republic. Univerzita Komenského, Bratislava, pp.148-154.
MUNZAR, J. (1996): A Contribution to the Reconstruction of Weather and Environment in Central Europe in the 16th Century. Moravian Geographical Reports, 4, No. 1, pp.39-46.
MUNZAR, J., ONDRÁČEK, S., TÁBORSKÁ, J. (1997): Disastrous floods in Moravia and Silesia in July 1997 (a prelimitary report on their causes, course and losses). Moravian Geographical Reports, 5, pp. 44-59.
VAISHAR, A., ŠPES, M. et al. (1997): New Prosperity for Rural Regions. Moravian Geographical Reports, 5, No. 1, pp.18-35.
VAISHAR, A., MARIOT, P. (1998): Sozial-ökonomische Transformation des ländlichen Raums der Tschechischen Republik und der Slowakei. In: Agrarwirtschaft und ländlicher Raum Ostmitteleuropas in der Transformation. Verlag Herder-Institut Marbug, pp.123-139.
VAISHAR, A. (1998): Die Wahrnehmung der tschechisch-slowakischen und tschechisch-österreichischen Grenze durch die lokale Bevölkerung. In: Grenzen und Grenzregionen in Südosteuropa. Südosteuropa Gesellschaft München, pp. 18-32.
VAISHAR, A. (1999/2000): Verlauf und Konsequenzen der Transformation in marginalen ländlichen Regionen in der Tschechischen Republik. In: Seminarbericht 41. Gesellschaft für Regionalforschung e.V. Heidelberg, pp. 279-300.
VAISHAR, A., LACINA, J., ONDRÁČEK,S. (1999): Floods in the Morava River Basin in 1997 and their Consequences for the Social System. Moravian Geographical Reports 7, No. 2, pp. 2-11.
VAISHAR, A., ZAPLETALOVÁ, J. (1998): Jemnice: the Role of a Small Town in the Present Stage of Transformation. Moravian Geographical Reports, 6, No. 1, pp. 32-42.
ZAPLETALOVÁ, J. (1998): The Issue of Traffic Remoteness in South Moravia on the Example of the Middle Dyje River Basin. Moravian Geographical Reports, 6, No. 1, pp. 2-13.

Department members:
Mgr. Pavlína Hlavinková (physical geography, waste management)
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)
PhDr. Barbora Kolibová (sociology)
ing. Jan Lacina, CSc. (biogeography)
Mgr. Zdeněk Máčka (physical geography)
RNDr. Oldřich Mikulík, CSc. (social geography)
RNDr. Jan Munzar, CSc. (climatology)
RNDr. Stanislav Ondráček (hydrology)
RNDr. Evžen Quitt, CSc. (climatology)
Mgr. Alžběta Strachová (sociology)
Mgr. Jitka Škrabalová (environmental geography)
Mgr. Bohumír Trávníček (social geography)
RNDr. Antonín Vaishar, CSc. (social geography)
RNDr. Jana Zapletalová, CSc. (geography of transport and recreation)

Cooperating institutes (organization) abroad:
Institute of Geography, Slovak Academy of Sciences (Bratislava, Slovakia); Institute of Regional Geography (Leipzig, Germany); Institute of Geography & Department of Geography, University of Ljubljana (Slovenia); Stanislaw Leszczycki Institute of Geography and Spatial Organization, Polish Academy of Science (Warsaw, Poland); Centre for Regional Studies, Hungarian Academy of Sciences (Pécs, Hungary).

Department of Geography, Faculty of Education, Technical University, Liberec

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Address: Hálkova 6, Liberec, 461 17
E-mail address: Vaclav.postolka@vslib.cz
Phone number: 420-48-5352311
Web site(s): http://www.vslib.cz
Head of Department: RNDr. Václav Poštolka

Chief scientific and pedagogical orientation:
Department was founded in 1998 and it is still looking for its main and specific scientific and teaching focus area (e.g. transfer of cross-border co-operation on the environmental and social issues).

Main research projects since 1996 (project name and responsible person):
Reuse and Conversion Former Military Lands (G. Vest, F. Holzwarth, NATO – CCMS Pilot Study 1996 – 1998); Environmental Assessment on the Czech-Polish Borderland in the Nisa Euroregion (K. Mazurski, Grant KBN Warszawa, 1996 – 1998)

Key publications published since 1996 – articles:
POŠTOLKA, V. (1996): The Environmentally Damaged Areas in the Czech Republic and New Approach to their Assessment and Delimitation. In: Environmental Engineering and Pollution Prevention. European Network of Excellence and Partnership. NATO ASI Series. Kluwer Dordrecht, pp. 63-80. ISBN 0-7923-4206-2.
POŠTOLKA, V. (1998): Kritéria a metody pro hodnocení stavu životního prostředí (Criteria and methods for environmental assessment). In: Zachodniosudeckie pogranicze polsko-czeskie. Akad. Ekon., Wroclaw, pp. 47-64. ISBN 83-87320-20-X
ANDĚL, J., POŠTOLKA, V., ŠAŠEK, M. (1998): Hodnocení ekologické zátěže na příkladu česko-polského pohraničí (Ecological load assessment on the Czech-Polish borderland case). In: Zachodniosudeckie pogranicze polsko-czeskie. Akad. Ekon., Wroclaw, pp. 47-64. ISBN 83-87320-20-X.
POŠTOLKA, V. (1998): Conversion and Reuse of the Former Military Training Area of

Ralsko. Geografie–Sborník ČGS, 103, No. 3, ČGS, Praha, pp. 285 – 299. ISSN 1210-115X.
PECHÁČKOVÁ, I. (1998): Settlement and Population. Geografie–Sborník ČGS, 1998,103, No. 3, ČGS, Praha, pp. 367 – 381, ISSN 1210-115X.

Department members:
Mgr. ing. Tomáš Hendrych (physical geography and landscape ecology)
doc. RNDr. Jan Charvát, CSc. (teaching of geography, economic geography)
RNDr. Ivana Pecháčková (regional and social geography, tourism)
Mgr. Klára Popková (cartography and geoinformatics)
RNDr. Václav Poštolka (political geography, environmental and land-use issues)
Mgr. Jaroslav Vávra (teaching of geography, regional and applied geography)

Cooperating institutes (organization) abroad:
Akademia Ekonomiczna Wroclaw (Poland); HTWS Zittau / Görlitz (Germany); BICC (Bonn International Center for Conversion); IDA (Institute of Defense Analysis, US).

Geography - Journal of Czech Geographic society - abstracts of articles in the period 1996 - 1999

Geography - Journal of Czech Geographic society, Vol. 101, 1996

BATELKOVÁ Kateřina, KOLEJKA Jaromír, POKORNÝ Jan: *Landscape Synthesis and Geographical Information Systems as Part of Natural Landscape Assessment for Regional Planning: Case Study Horňácko.* – Geografie-Sborník ČGS, 101, No. 4, pp. 296 – 309 (1996). – The landscape synthesis concept combined with GIS technology has been applied as a method supporting the economic revitalization of the Horňácko region in White Carpathians, East Moravia. Homogenous natural landscape units (geosystems) have been examined by means of purpose oriented evaluation of nine "new" and "old" functions. Territorial reserves for each function have been identified. The best suitable function has been selected for each geosystems as well as the respective areal reserve. The proposed pattern of land-use changes serves as a forecast of the optimal landscape development.
Key words: landscape synthesis – GIS – nature assesment – land-use forecast.

BIČÍK Ivan, GÖTZ Antonín, JANČÁK Vít, JELEČEK Vít, MEJSNAROVÁ Lucie, ŠTĚPÁNEK Vít: *Land Use/Land Cover Changes in the Czech Republic 1845-1995.* – Geografie-Sborník ČGS, 101, No. 2, pp. 92 – 109 (1996). – The article presents basic information on the long-time research programme dealing with long-termed land-use changes. This research programme is based on the land-use data of 1845, 1948, 1990, and 1995. In deals with issues marked by the International Geographic Union in 1995 as important part of the interdisciplinary research. Apart from the methodological process the article also outlines the evaluation of land-use structural changes at the district level by the index of change. This is an overall index reflecting all changes in the respective region. The case-study of Semily District verifies the methodology used at the cadastral level and shows possible applications in detailed studies of the nature/society relations.
Key words: land use/land cover changes – Czech Republic.

BLAŽEK Jiří: *Inter-Regional Disparities in the Czech Republic During the Transition.* – Geografie-Sborník ČGS, 101, No. 4, pp. 265 – 277 (1996). – The article deals with the development of inter-regional disparities in the Czech Republic during the period of transition. Regional disparities are firstly set into wider context of regional development theories and consequently, disparities within the Czech Republic are compared with those in EU member states. Since the unemployment rate in the Czech Republic is unusually low, the inter-regional disparities seem small. However, the coefficient of variation reveals the contrary. Finally it is concluded that the inter-regional disparities in average incomes are still only a fraction of the disparities in economic preformance of the regions.
Key words: inter-regional disparities – differentiation – equalization – unemployment – entrepreneurial activity – wages.

BUČEK Antonín, KOLEJKA Jaromír, KOSTKA Robert: *Selected landscape forming-processes in the volcanic Putorna Plateau (Taymir, Siberia).* – Geografie-Sborník ČGS, 101, No. 3, pp. 232 – 246 (1996). – The development and products of the natural processes present in the hard rock and weak rock areas of the volcanic Putorana Plateau were studied. Intensive frost weathering causes the degradation of glacial land forms and the formation of periglacial forms. A progressive permafrost degradation occurs on valley bottoms, accompanied by alas lake origin, peat mound creation, pingo degradation and periglacial soil development.
Key words: Siberia – volcanic plateau – periglacial processes and land forms.

BUZEK Ladislav: *Factors of Accelerated Erosion in the Southern Mountain Hinterland of the Ostrava Industrial Agglomeration.* – Geografie-Sborník ČGS, 101, No.

3, pp. 211 – 224 (1996). – Erosion of soils is becoming a serious problem in forested mountain areas where the narural and even the anthropogenic influences are favourable to this process (Flysch substratum, rainfalls, declivity of slopes and tractors and other machines for forest work). The regime of the suspended matter in the basins in the central and eastern parts of the Moravskoslezské Beskydy Mts. - the Upper Ostravice R. (72,96 km^2) and in the Lomná R. (70,40 km^2) were compared. The results show that the erosional processes in the basin of the Upper Ostravice Ř. are more intensive in the basin of the Lomná R., due to the prevailance of shales in the substratum of the basin of the Ostravice R.
Key words: water erosion – suspended matter.

HAMPL Martin: *Geography of Societal Transformation: General Questions of Study.* – Geografie-Sborník ČGS, 101, No. 2, pp. 82 – 91 (1996). – The paper is devoted both to empirical generalization of contemporary transformation in the Czech Republic and to the theoretical discussion of selective problems of geographical cognition. Stress is put upon the question of geographical regularities, relation between social and geographical structures and the problem of uneven development.
Key words: Societal transformation – geographical regularities – uneven development.

HAMPL Martin: *Hierarchy of the settlement system and administrative division of the Czech Republic.* – Geografie-Sborník ČGS, 101, No. 3, pp. 201 – 210 (1996). – The article deals with geographical aspects of territorial administration. The relationship between the continual form of hierarchization of real geographical systems and the discontinual form of hierarchization of normative systems, such as territorial administration, is stressed. The general results are applied to the specific transformational problems of rerritorial administation in the Czech Republic.
Key words: hierarchy – real and normative systems – territorial administration.

HUSÁR Karol: *Areas of Land-Cover Forms and Calculation of Their Morphometric Parameters.* – Geografie-Sborník ČGS, 101, No. 1, pp. 41 – 58 (1996). – The article aims to sum up selected vector-oriented quantitative methods that evaluate spatial units (i.e. areas or regions). Calculations of spatial morphometric parametres, namely of frequency, area and circumference, shape (form), spatial orientation of a region and regional spatial interrelations, are presented. The above mentioned methods are shown on the interpretative scheme of land-cover forms in the Šurany region with help of the computer programs APTAB and DIGEDIT whitch were compiled at the Institute of Geography SAS. The article is part of the project 2/999310/92 (Analysis of Information Potential of Spacial Images) researched at the Institute of Geography SAS.
Key words: morphometric parametres of areas – regional typification.

KÜHNLOVÁ Hana, KÜHNL Karel: *Environmental Education as Part of Geographical Courses in the Czech Republic – Problems, Suggestions, and Challenges.* – Geografie-Sborník ČGS, 101, No. 2, pp. 158 – 168 (1996). – Improvement of the environment is conditioned by a systematic environmental education. The role of geography in such an educational systém is also crucial. As a results, geographical courses require changes. A sound knowledge of ones local region much contributes to the understanding of environment in the broad sense. Environmental education must include the historical development of natural and social elements as well as fucture prospects. The concept of eco-museum could bring much inspiration to this process. The article deals with the idea of eco-museum of Cental European importance which should primarily influence the environmental thinking of the population.
Key words: geographical education – social aspects of environment – eco-museum – environmental history.

MIKULÍK Oldřich, VAISHAR Antonín: *Residential Environment and Territorially Functional Structure of the Brno City in the Period of Transformation.* – Geografie-Sborník ČGS, 101, No. 2, pp. 128 – 142 (1996). – The article evaluates the residential environment of Brno according to the individual town wards. A more detailed analysis is done for the centre of the town. Parametres of housing resources, environment hostile functional clashes, extent of green areas and state of social environment have been taken into consideraton. The results show a bad residential environment in the

industialized town wards in flat relief and a good one in the town wards situated in articulated relief.
Key words: residential environment – functional structure – Brno.

POŠTOLKA Václav: *A New Approach to the Assessment and Delimitation of Environmentally Damaged Areas in the Czech Republic.* – Geografie-Sborník ČGS, 101, No. 2, pp. 143 – 157 (1996). – The paper deals with the proposal of new criteria and methodology for geograpgical delimitation and differentiation of "environmentally damaged areas" in the Czech Republic. This new approach is based on "ecological, social and gealth load assessment" on the municipalty area level by means of 27 proposed indicators. By means of this methodology more than 1200 selected muncipalities from the North-West Bohemia area included, were assessed.
Key words: Ecological, social and health load indicators – environmentally damaged areas – environmental zones delimitation and differentiation – North-West Bohemia.

PTÁČEK Jan: *Czech Agriculture in Transition.* – Geografie-Sborník ČGS, 101, No. 2, pp. 110 – 127 (1996). – The article deals with the transition and transformation of Czech agriculture. The character of post-1990 systemic changes is defined. Chief goals of the state agricultural policy are described as well as the impacts of radical economic reform on the agricultural production. The following processes are analysed: 1. Resustion – return of property to the original owners or to their heirs; 2. Transformation – property transfer from the cooperatives to private subject (individuals and companies); 3. Privatization – denationalization and privatization of the former state farms. The last chapter focuses on the privatization of Žihle State Farm (West Bohemia) as a detailed case study.
Key words: agriculture in the Czech Republic – transition – cooperative – state farm.

ŠTĚPÁNEK Vít: *Land-Use Data: Relevance and Reliability.* – Geografie-Sborník ČGS, 101, No. 1, pp. 13 – 21 (1996). – The article deals with land-use structural data available in the Czech Republic. Character of the data as well as its practical use are outlined and a brief summary of methods is given. Some problems of comparative and historical research of land-use are mentioned. Practical example from the Domažlice district shows real problems of land-use analysis and outlines possible solutions.
Key words: land-use structure – land-use data – statistical methods – cadastral unit.

TOLASZ Radim: *Mean Temperatures and Precipitation Amounts in the Geomorphological regions of Norhern Moravia and Silesia.* – Geografie-Sborník ČGS, 101, No. 3, pp. 225 – 231 (1996). – The subjekt of the paper is the method of calculating territorial means of the climatological characteristics of temperature and precipitation. Coefficients expressing the relation mean elevation of observing stations to the mean elevation of geomorfological provinces are used for the calculation, as well as coefficients expressing vertical rate of temperature and precipitation.
Key words: territorial means – method of calculating – vertical gradient.

TOMEŠ Jiří: *Specific Unemployment in the Czech Republic in Regional Comparison.* – Geografie-Sborník ČGS, 101, No. 4, pp. 278 – 295 (1996). – The paper examines the unemployment rate in the Czech Republic – a remarkable aspect of general transformation in the Czech Republic. From the structural standpoint, the unemployment remains very low. Using the method of regional comparison the author shows regional disparities and changing patterns of male and female unemployment, unemployment of young people (under 25), long-term unemployment and unemployment by educational level.
Key words: unemployment – gender – age – educational level – regional disparities – Czech Republic.

WAHLA Arnošt: *Journal of the Czech Geographic Society: Tradition of One Hundred Years.* – Geografie-Sborník ČGS, 101, No. 1, pp. 10 – 12 (1996). – The article deals with one hundred years anniversary of the earliest Czech geographic journal – Journal of Czech Geographic Society. The very first issue was published in November 1894. Title of the journal has changed over the years depending on the political and social situation. The internal structure of Journal of the Czech Geographic Society is explained and names of the

most important contributors are listed. Geographers who worked in the editorial board ten years or more are also mentioned.
Key words: Czech Geographic Society – Journal of the Czech Geographic Society.

ZBOŘIL Aleš: *Prášilské Lake.* – Geografie-Sborník, ČGS, 101, No. 1, pp. 22 – 40 (1996). – It was in 1906 when V. Švamberka made first mapping of the Prášilské Lakes profile and depth. It took 88 years, however, until more recent geomorphological and limnological research has been carried out in 1994. Glacial relicts in the lake were mapped and the results were incorporated in a geomorphological map, scale 1:10,000. 33 depth profiles were measured and a new ground plan of the lake has been created. Thermic conditions, colour and transparentness of water, as well as hydrological regime, have been researched, too.
Key words: Prášilské Lake – bathymetrical measurements – limnological research – hydrologic regime.

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ADÁMEK Hubert: *Selected Aspects of Surface Water Quality Assesment in the Lužnice Basin.* – Geografie-Sborník ČGS, 102, No. 2, pp. 139 – 146 (1997). – The article deals with territorial aspects of water quality attributes in the Lužnice Basin. Special emphasis has been put on the running water quality. The impact of human activity on the water quality has been studied. Basic field research simed at BCO_5, NO_3^-, NH_4^+, NO_2^-, and TP concentrations. The importance of phosphorus as the main factor in the process of eutrophication has been stressed. An input-output balance model of chemical elements is presented (1993).
Key words: water quality – water pollution – groundwater.

BRÁZDIL Rudolf, DOBRÝ Jaroslav, KYNCL Josef, ŠTĚPÁNKOVÁ Pavla: *Reconstruction of Air Temperature of the Summer Half-year in Krkonoše (Giant Mountains) Based on the Spruce Tree-rings in the Period 1804 – 1989.* – Geografie-Sborník ČGS, 102, No. 1, pp. 3 – 16 (1997). – The tree-ring width and the maximum wood density of Norway spruce (Picca abies (L.) Karst.) have been examined in order to reconstruct air temperature of the summer half-year during the period 1804-1989. The trees examined come from a natural spruce stand of Labský důl (Elbe Valley) in Krkonoše (Giant Mts.), North Bohemia. The results obtained by this way have been compared with a similar reconstruction made for Central Europe and with air temperature records from the Prague-Klementinum station. Both temperature series (reconstructed and measured), however, show only 36 % of commonly clarified variability. Differences may follow from the standardization of dendrochronologies as well as from other factors which may have influenced the growth of spruce. The quality of air temperature measurement may play also role.
Key words: dendroclimatology – air temperature reconstruction – tree-ring width – maximum wood density – Picea abies.

BUZEK Ladislav: *Drinking Water Reservoirs in the Moravskoslezské Beskydy Mountains: Possible Restrictions on Use.* – Geografie-Sborník ČGS, 102, No. 1, pp. 42 – 49 (1997). – As much as 80 % of drinking water for Ostrava Metropolitan Area comes from surface sources. Lack of water occurred in the post-war years when industrialization was in progress and the drinking water quality deteriorated significantly. As a results, two drinking water reservoirs have been constructed in the central part of Moravskoslezské Beskydy Mts.: Šance Reservoir on the upper course of Ostravice and Morávka Reservoir on the river of same name. Both are situated in a mountainous terrain amidst deep forests. At present, however, reservoirs are threatened by siltation due to increased soil erosion.
Key words: drinking water – siltation – solid matter.

ČESÁK Julius: *Quality of surface waters in the Ohře River catchment area in the years 1963 – 1996.* – Geografie-Sborník ČGS, 102, No. 4, pp. 270 – 278 (1997). – The evaluation concerns selected indices of oxygen regime and of basic physical and chemical indices: BSK_5,

$N\text{-}NO_3^-$, $N\text{-}NH_4^+$, $P\text{-}PO_4^{3-}$, the total phosphorus and dissolved matters. A particular attention is paid to a comparison of average levels for the whole observed period and for the last five years. The indices of quality are selected to register mainly local sources of pollution which most influence the quality of water in the Ohře river and in its affluents.
Key words: Ohře River – quality of water – local sources – index of pollution – quality profile.

DEMEK Jaromír, KOPECKÝ Jiří: *Landscape Forms and Current Geomorphological Processes in the Southern Part of Broumov Basin and in the Bohemian Part of Table Mountains (Sheet 04-34 Martínkovice).* – Geografie-Sborník ČGS, 102, No. 1, pp. 31 – 41 (1997). – Geomorphological conditions of the Broumov Basin and the Bohemia part of the Table Mountains, East Bohemia, are described in this article, Current geomorphological processes in the Martínkovický potok (Martínkovice Creek) catchment are analyzed (gully erosion, landslides). Detailed geomorphological map is included.
Key words: regional geomorphology – morphostrusture – morphosculpture – natural hazards.

HERINK Josef: *System of Geographical Education at Elementary Schools in the Czech Republic in the 1990s.* – Geografie-Sborník ČGS, 102, No. 3, pp. 175 – 180 (1997). – The paper deals with changes of geographical education at elementary schools of the Czech Republic in the 1990s. The curriculum reform is seen as the most important process. The state of geographical education in the end of the 1980s, i.e. in the end of totalitarian period, is critically evaluated. Chief aims of new elementary education curriculum, as well as problems of subject standardization and individual parts of the curriculum reform carried out by the Czech Ministry of Education, Youth and Sport, are presented. The role of geographical education within individual educational programs is discussed.
Key words: geographical education – curriculum reform – standard of elementary education – evaluation criteria.

HYNEK Alois: *Training Geography Teachers.* – Geografie-Sborník ČGS, 102, No. 3, pp. 181 – 188 (1997). – SWOT analysis (Strong, Weak, Opportunities and Threats) of training geography teachers on university level in the Czech Republic is applied with respect to transformation processes in geographical curriculum. Strong inertia, wide opportunities and serious problems are main features of training geography teachers. There is an absence of advanced studies in geography.
Key words: training – geography teachers – university – SWOT analysis.

JANSKÝ Bohumír: *Geographical Hydrology at the Faculty of Science of Charles University.* – Geografie-Sborník ČGS, 102, No. 2, pp. 81 – 88 (1997). – This article on the geographically conceived hydrology at the Faculty of Science, Charles University, Prague, describes the period since the middle 1980's till the present. During the last 20 years, the research orientation of hydrology has sensibly changed when its has got oriented at practical needs. The main attention has been aimed at the analysis of groundwater quality. The geologists of the Faculty of Science have concentrated their attention at the impact of area (diffused) sources of pollutants. A particular attention has been traditionally paid to the research on lakes and newly to the revilatization of waters.
Key words: hydrology – hydrogeography – groundwater quality – modelling of water quality – imnology – research on lakes – revitalization of waters.

JANSKÝ Bohumír: *Baikal – the lake basin development.* – Geografie-Sborník ČGS, 102, No. 2, pp. 89 – 97 (1997). – The article characterizes the formation and development of the Baikal Lake Basin, situated in the south of Eastern Siberia. Attention is also paid to processes of tectonic development of the Baikal region which have influenced the deepening of the Baikal Basin. The author studies in the same time erosional-denudational processes influencing the lake basin formation.
Key words: Baikal – rift zone – lake basin – tectonic movements – faults – volcanic activity – deepening and silting of the lake – the deepest lake in the world – cryptodepression.

KLIMENT Zdeněk, KOPP Jan: *Suspended Sediment Analysis: Case Study of Berounka Sources.* – Geografie-Sborník ČGS, 102, No. 2, pp. 130 – 138 (1997). – The article examines suspended sediment transport in Mže, Radbuza, and Úhlava Rivers over the period 1989-

95. Data on suspended sediments was collected at five observing sites. The research has been carried out in collaboration with Czech Hydrometeorological Institute, Plzeň. Apart from the suspended load characteristics also the seasonal variation of suspended sediments, siltation of Hracholusky and České Údolí Lakes, and the share of inorganic material in suspended sediments have been examined.
Key words: Berounka River – suspended sediment transport.

KOLEJKA Jaromír, SHALLAL Jásim K.: *Detection and Two-Step Classification of Erosional Damages with Help of Soil Sample Analysis and Satellite Images.* – Geografie-Sborník ČGS, 102, No. 1, pp. 17 – 30 (1997). – Surface soil data have been processed using the unsupervised classification (cluster analysis). Three soil categories with different erosional characteristics have been detected: heavily, moderately and slightly/no damaged soils. The supervised satellite image classification (MLC) was based on the data taken from case study areas in the proximity of classified soil sample sites on the vegetation free-fields.
Key words: soil erosion – sample clustering – image classification.

KŮHNLOVÁ Hana: *Concepts and Contents of Geographical Education in Future: International Trends and Their Reflection in the Czech Republic.* – Geografie-Sborník ČGS, 102, No. 3, pp. 161 – 174 (1997). – The idea, concepts, aims and contents of geographical education need a substantial transformation. New approach towards geography training should include more stress on basic orientation in the world, understanding of spatial relations, ability to environmentally sensitive decision-making and knowledge of foreign cultures. The latter should help students to coexit with members of other nations. Expert-oriented and didactical training of future teachers must be modernized. Changes of advanced studies for practising teachers should become part of the general transformation.
Key words: transformation of geographical education – environmental training – advanced studies.

LANGHAMMER Jakub: *Changing Water Quality in the Bohemian Part of Elbe River 1991 – 1995.* – Geografie-Sborník ČGS, 102, No. 2, pp. 98 – 111 (1997). – The period 1991-1995 brought important changes of water quality in the Elbe, the chief Bohemian river. Improvements of water quality came after a long period of gradual deterioration, mainly due to implementation of sewage plants at major industrial sites. However, a numbers of problems - namely communal waste management - are still beyond acceptable limits and remain challenges for future.
Key words: hydrology – water quality – mathematical modeling.

LANGHAMMER Jakub: *Assessment of Water Quality and Its Changes: the Role of Mathematical Modelling.* – Geografie-Sborník ČGS, 102, No. 4, pp. 241 – 253 (1997). – As regards the assessment of water quality and its changes (both in cross- and lengthwise-profile), mathematical modelling is a relatively recent method. It is based on simulation of water movement in the river bed and on consequent modelling of diffusion of pollutants. Mathematical modelling enables to calculate a continuous lengthwise-profile of water quality in the water course and to identify the impact of various pollution sources on water quality. It also makes possible to predict water quality changes over the time under changing external conditions.
Key words: hydrology – water quality – mathematical modelling.

ŘEZNÍČKOVÁ Dana: *Reform of School-leaving Exams in Geography as Part of new Geographical Education Strategy.* – Geografie-Sborník ČGS, 102, No. 3, pp. 189 – 200 (1997). – The article deals with changing approach, content, and form of school-leaving exams in geography. Changes will become effective in medium-close future as integral part of crucial transformation of Czech educational system. Two different approaches towards education in general and their influence on the subject of geography are discussed.
Key words: school-leaving exam – geography education strategy – educational reform.

SKOŘEPOVÁ Eva: *Changing Water Quality in the Upper Vltava Basin 1986 – 1995.* – Geografie-Sborník ČGS, 102, No. 2, pp. 112 – 117 (1997). – The article deals with water quality assessment in the upper Vltava basin, i.e. as far as Solenice. Both linear and areal investigations have been made. The Czech State Standard 757221 water quality

classification has been used. The areal results are based on the balance of specific substance load. The research has been carried out in close cooperation with Wassergutestelle Elbe Hamburg within the framework of the Elbe Project. Basic data from 23 hydro-stations on Vltava (period 1990 – 1994) was provided by the Czech Hydrometeorological Institute.
Key words: water quality – upper Vltava – chemical composition.

ŠVÁCHOVÁ Milada: *Groundwater quality in the Rakovnický potok Brook catchment area.* – Geografie-Sborník ČGS, 102, No. 2, pp. 118 – 129 (1997). – The first comprehensive research of the Rakovnický potok Brook catchment area is based on the analysis of groundwater quality. The impact of physical-geographical conditions of the catchment area and of socio-economic anthropogenous activities in the monitored region on the water component of the landscape has been evaluated.
Key words: groundwater quality – class of quality – water pollution – revitalization.

VOŽENÍLEK Vít: *Computers in Professional Training of Geography Teachers.* – Geografie-Sborník ČGS, 102, No. 3, pp. 201 – 210 (1997). – Computers have changed many human activities. They also influence professional training of specialisation in many fields. Teachers can use many advantages of computers in their activities. The paper brings a general view on possibilities of computers in implementation into professional training of geography teachers. The recommendations of hardware configurations, software selection and fields of applications are discussed.
Key words: computers – geography teachers – equipment – software – editors – spatial data.

VOŽENÍLEK Vít: *Digital Data in Modelling of Landslide Risk Using the Register of Slope Deformations of the GEOFOND CR.* – Geografie-Sborník ČGS, 102, No. 4, pp. 254 – 269 (1997). – Landslides are an important landscape problem in the Carpathian part of the Czech Republic. In order to establish which slopes are most at risk, their spatial incidence can be modelled using techniques of geographical information systems together with a database describing past landslides. Three modelling strategies – rule-based modelling, ordinal modelling and categorical data modelling – are adopted and compared. It is suggested that the categorical data modelling approach is the most general and makes the best use of the available information.
Key words: GIS – modelling – digital data – data types – landslides.

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BRÁZDIL Rudolf, ŠTĚPÁNEK Petr: *Fluctuation of Air Temperature in Brno in 1891 - 1995.* – Geografie-Sborník ČGS, 103, No. 1, pp. 13 – 30 (1997). – Air temperature series of three weather stations in Brno from different parts of the period 1891 – 1995 were homogenized with the use of Maronna-Yohai and Alexandersson tests. Temperature series of the stations Vienna-Hohe Warte and Hurbanovo were used as reference homogeneous ones. One compiled air temperature series was made for Brno in the above mentioned period from the homogenized series. Long-term changes and periodicity of monthly, seasonal, and yearly values of air temperature were examined; the former smoothed with the Gaussian filter, linear trend; the latter with the use of autocorrelation analysis and spectral analysis Blackman and Tukey. The analyses confirmed warming trends in all months ranging from 0.04 (October) to 0.15 (August) °C per 10 years.
Key words: Brno – air temperature – homogenization – fluctuation.

BRÁZDIL Rudolf, BÍL Michal: *El Nino – Southern Oscillation and its Effects on Air Pressure Fields, Air Temperature and Precipitation in Europe in the 20th Century.* – Geografie-Sborník ČGS, 103, No. 2, pp. 65 – 87 (1998). – Fields of the geopotential heights of 500 hPa (1946 – 1991) and sea level pressure (1901 – 1991) have been studied in the Atlantic-European region with respect to the warm and cold effects of El Nino. The effects of El Nino on selected series of air temperature and precipitation (1901 – 1991) in Central Europe and in the Czech Republic have been analysed. Significant differences of cold and warm events influenced by El Nino have been observed. In the case of air pressure and

temperature this happens above all in winter (0/1), as regards temperature and precipitation in summer (0), and in the case of precipitation in autumn (0).
Key words: El Nino – warm event – cold event – air pressure – air temperature – precipitation – Europe.

BRZÁK Martin: *Morphographic Analysis and Study of Fluvial Sediments in the Dyje Valley Between Vranov nad Dyjí and Znojmo.* – Geografie-Sborník ČGS, 103, No. 1, pp. 31 – 45 (1998). – Geomorphological analysis of fluvial forms has revealed several phases of erosion and accumulation among the remnants of regional planation surface and recent floodplain in the deep Dyje valley. The more distinct remnants of the Lower Pleistocene terraces were indicated by study of topographic maps (scale 1:10,000), while the less preserved accumulations were discovered only by detailed field research over the last three years. Detailed study of a short floodplain segment of the Dyje River has also been carried out.
Key words: the Dyje valley – fluvial accumulation – morphographic analysis.

ČERVINKA Pavel: *Glaciation in Columbia Mountains and Rocky Mountains in Canada.* – Geografie-Sborník ČGS, 103, No. 4, pp. 414 – 427 (1998). – The article deals with the glaciation of selected regions in Canadian Rocky Mountains and Columbia Mountains and examines in detail glacial morphological forms. It is based on author's field research and interpretation with regard to the glacial forms classification and origins. Glacial fluctuations in the area studied were influenced by climatic changes; most glacial morphological forms are supposed to be relatively recent. Frequent slope movements cause ongoing creation of talus and other accummulations.
Key words: Canadian Rocky Mountains – glaciers – glacial forms – slope movements.

DAŘÍLKOVÁ Jitka: *Contribution of Physical Planning and Regional Politics to the Revitalization and New Use of the Ralsko Area.* – GeografieSborník ČGS, 103, No. 3, pp. 200 – 215 (Czech), pp. 331 – 346 (English), 1998. – The introduction of physical planning and regional policy is inevitable in order to successfully revitalize the Ralsko region. Physical planning is perceived as an open systém that offers various methods which can help to solve the most pressing local problems. The article also discusses all relevant phisical planning documents of the Ralskou region since 1994 including crucial concepts and problems.

HAMPL Martin, MÜLLER Jan: *Are Municipalities in the Czech Republic too small?* – Geografie-Sborník ČGS, 103, No. 1, pp. 1 – 12 (1998). – The article focuses at problems of size differentiation of Czech municipalities with special regard to small municipalities. The question of "size" and regional variability of size differentiation is discussed. The difference between political and economic aspects in search for optimal size of municipalities is stressed. The concept of a two-tier organization of local administration is formulated in the conclusion.
Key words: local government – optimal size of municipalities – transformation – territorial organization.

HONCŮ Miroslav.: *Biological and landscape values of the former Ralsko military training area.* – Geografie-Sborník ČGS, 103, No. 3, pp. 171 – 189 (Czech), pp. 300 – 319 (English), 1998. – This paper gives a brief description of the recent state of the former military training area Ralsko and presents the evolution of nature conservation in this area. Moreover, it characterizes the damaging of natural conditions and gives an overview of scientific research carried out in this area. In future, the most valuable parts of the area will be protected within the National Nature Reserve Dokeské pískovce a mokřady (Doksy Sandstones and Wetlands) covering an area of 5,302 ha which will however include also some lands outside the former military training area.
Key words: former Ralsko military training area – nature protection – natural historical research.

JENÍK Jan: *Oronyms of Central European Mountains Divided by national boundaries.* – Geografie-Sborník ČGS, 103, No. 2, pp. 101 – 107 (1998). – A lot of confusion is often found in coarse-scale maps in atlases from English speaking countries as regards oronyms of the mountains situated at the edge of the Bohemian Massif. Political and administrative boundaries often cut these regions. There is no general rule: either only

transboundary oronyms spelled in randomly chosen languague are shown, or national oronyms along the political boundaries are used. The oronyms belonging to the "Bohemian Forest" take a number of different forms; in the "Ore Mountains" mostly the German name "Erzgebirge" is used. In the region along the Czech/German/Polish boundary the transboundary oronym "Sudetes" – in either of its four languague forms – is used in most cases.
Key words: transboundary mountain range – oronym – Bohemian Massif – Bohemian Forest – Ore Mountains – Sudetes.

KOLEJKA Jaromír, POKORNÝ Jan: *Econet planning with help of GIS technology.* – Geografie-Sborník ČGS, 103, No. 2, pp. 88 – 100 (1998). – Geoecological and recent land use data have been evaluated from different standpoints in order to select the existing and to allocate the missing areal and linear elements of the ecological stabilizing network (econet) in the landscape on the local level. The project discussed in this article has been based on the GIS application used for multilayer data processing and result presentation supporting the decision-making process in the econet completion.
Key words: Econet – GIS – biogeography.

KOMÁR Aleš: *The Military Training Area Ralsko and the Army.* – Geografie-Sborník ČGS, 103, No. 3, pp. 281 – 284 (Czech), pp. 320 – 330 (English), 1998. – The article in its introduction deals with the problem of the former Military Training Area at Ralsko in the Czech Republic and its recent changes – the nature and landscape protection under the auspices of the Ministry of Defence and military administrations in the MTA, and deals with the consequences of the withdrawal of corps and discusses the damage caused by military training to the nature, soil and groundwater. In the conclusion the article evaluates the topical aspects of the area re-utilisation.
Key words: military training area – environmental security – environmental damage.

MUDRYCH Pavel: *Morning Peak Hours as a Base for Geographical Studies in the Hinterland of Czech Towns.* – Geografie-Sborník ČGS, 103, No. 4, pp. 428 – 436 (1998). – The article tests the hypotesis that morning peak hours are a sufficient basis for examination of spatial interactions in the hinterland of Czech towns. Special attention is given to the end of morning peak hours, based on field investigation of public transport in fifteen towns. Morning peak hours are compared with other peak hours during the day. Fluctuations of the hinterland during morning peak hours are also described (pulsing of hinterland). The article proves that studies of morning peak hours only are insufficient if the transport influence of an urban centre on its hinterland should be thorougly explained.
Key words: morning peak hours – spatial relations – urban centre – hinterland.

POŠTOLKA Václav: *Conversion and Reuse of the Former Military Training Area of Ralsko.* – Geografie-Sborník ČGS, 103, No. 3, pp. 156 – 170 (Czech), pp. 285 – 299 (English), 1998. – Ralsko area on 250 sqkm was used as one of the largest military areas in the years 1945 – 1991 (after 1968 the largest Soviet Army Base in the country). At present it is the largest area in the country in need of conversion/reuse. The area is very interesting and unique in terms of nature, landscape, water supply and tourism. Some reuse and future use projects and ideas are being prepared and developed. The paper contains sections dealing with Site identification and characterization, History of military use, Ongoing conversion and reuse process, Planning for future use, Available and useable financial sources, Goals, expectations and visions, Projects and priorities, NATO CCMS pilot study, Recommendations and Conclusions.
Key words: former military lands – Ralsko area – conversion and reuse process – financial sources – NATO CCMS Pilot study.

PROŠEK Pavel, STŘÍTEŽSKÁ Šárka: *Foehns on the Northwestern Slopes of the White Carpathians?* – Geografie-Sborník ČGS, 103, No. 2, pp. 401 – 413 (1998). – The foehn effect on the northwestern slopes of the White Carpathians has been by many scholars explained as the result of south and souteastern winds. No quantitative-based proofs, however, have so far acknowledged the existence of pseudoadiabatic processes in this region. This article analyses conditions for the rise and movement of foehn-type winds in the Moravian (northwestern) part of the White Carpathians. Data on air temperature and humidity from

the period July 1987 – October 1988, recorded at 5 meteorological stations between the Váh and Morava Rivers, have been used.
Key words: White Carpathians – south-southeast wind – foehn.

Geography – Journal of Czech Geographic society, Vol. 104, 1999

AZZANI Abdulla Ahmed: *Geological and Geomorphological Characteristics of Great Aden.* – Geografie-Sborník ČGS, 104, No. 1, pp. 35 – 45 (1999). – The paper deals a geological construction and geomorphological development on territory of Great Aden. Geological prospectings were already initiated in time English supremacy and they were intensified mainly in periods, when petroleum was detected in neighbouring countries. Geological and geomorphological processes are adherented to conditions and development these characteristic whole the Arabian peninsula.
Key words: geology – geomorphology – Great Aden.

BALATKA Břetislav, PŘIBYL Václav, VILÍMEK Vít: *Geomorphological analysis of relief at the contact of Křemešnická, Křižanovská and Javořická Highlands.* – Geografie-Sborník ČGS, 104, No. 1, pp. 24 – 34 (1999). – The morphostructural analysis was carried out in the upper Jihlava region in Bohemian/Moravian Highland. The existence of recent tectonic activity, indicated by some older geomorphological researchers, was proved. Relatively high structural control was marked by geological research. The geomorphological analysis was based on geomorphological mapping, longitudinal and cross profiles.
Key words: geomorfology – morphostructural analysis – Bohemian/Moravian Highland.

BARTOŇOVÁ Dagmar: *Regional Inequalities of Age Structure in the Light of Different Demographic Behaviour in the Czech Republic.* – Geografie-Sborník ČGS, 104, No. 1, pp. 13 – 23 (1999). – The article deals with the influence of regionally different women's fertility on the changing age structure of Czech districts in 1990s. Long term regional differences of the age structure and their consequences are analysed as well as differences of reproductive behaviour and new demographic trends under the recently changed social and economic conditions. The changing nature of some other demographic phenomena as induced abortions or illegitimate births is also discussed. As fertility rate and abortion rate have dramatically dropped since 1992, Czech Republic can now be treated as a developed European country in this respect; the share of children born out of wedlock remains relatively low so far. The current natality trends will soon result in ageing of population in all Czech regions.
Key words: age structure – total fertility rate – reproduction – regional differences.

BLAŽEK Jiří: *Regional Development Theories: A Vicious Circle?* – Geografie-Sborník ČGS, 104, No. 3, pp. 141 – 160 (1999). – The recent upsurge of interest in regional development issues in the Czech Republic is hindered by lack of understanding of the recent progress in regional development theories. This article provides a comparative analysis of the main theories. Several basic parameters are identified in each theory by means of which the regional development theories are classified into several groups and briefly discussed.
Key words: regional development theories – classification – critique.

ČAPEK Richard, FORSTOVÁ Jana: *Analysis of the Distortion Characterization Q on the Basis of Eckert's Projections.* – Geografie-Sborník ČGS, 104, No. 4, pp. 243 – 256 (1999). – Distortion characterization Q is calculated as a ratio of the area with acceptable distortion in the map to the Earth surface. The sequence of 100 projections arranged by Q where area distortion limit is $Kmax$ = 1,5 – $Kmin$ and angular distortion limit $2ůmax$ = 40°, was published by Čapek (1997). In this paper 25 different combinations of distortion limits are used for deriving Q. New 25 sequences of Eckert's projections are analysed afterwards.
Key words: distortion – projection evaluation – Eckert's projections.

ČERMÁK Zdeněk: *Migrational Aspects of the Long-Term Development of Prague with Special Regard to the Transition Period in the 1990s.* – Geografie-Sborník ČGS, 104, No. 2, pp. 122 – 131 (1999). – The article overviews the role of internal migration in the

development of Prague with special regard to the period of transition in the 1990s. At the beginning, the general development trends of urban agglomerations and its new features in developed countries after World War II are outlined. The recent structure of Prague's migration and its territorial aspects are analysed. The reasons why Prague's migration balance has changed in 1990s are also discussed.
Key words: internal migration – Prague – settlement system – urban agglomeration.

DRBOHLAV Dušan: *Geographical Aspects in the Framework of Interdisciplinary Research on Migration.* – Geografie-Sborník ČGS, 104, No. 2, pp. 73 – 88 (1999). – This contribution deals with the basic concepts of migration. It focuses on how geographical aspects may be understood within an interdisciplinary research of migration. The following points are discussed: conditionality of the migration process, migration definition within a broader concept of a spatial mobility, data sources and their "organization", principal dimensions of study of migration processes and related important theoretical frameworks and approaches.
Key words: population migration – concepts – theories.

DUŠEK Radek: *Loxodrome in mathematical cartography.* – Geografie-Sborník ČGS, 104, No. 4, pp. 257 – 267 (1999). – The history of loxodrome is described in detail. The inaccuracies and errors related to loxodrome including its definition and significance are shown and clarified with the help of examples from the present cartographic literature. Facts usually omitted in cartography are presented, i.e. uncertainty of definition using two points and real picture in the Mercator projection. Problems related to the length of loxodrome and its parts are numerically solved and graphically presented. Loxodrome offers unsolved issues even in present days.
Key words: mathematical cartography – loxodrome – Mercator projection – navigation.

JANSKÁ Eva, DRBOHLAV Dušan: *Reemigration of the Volhynian Czechs.* – Geografie-Sborník ČGS, 104, No. 2, pp. 106 – 121 (1999). – The article focuses on integration of resettlers – Volhynian Czechs – into the Czech society. This community of reemigrants began to return to their mother country in 1991 when also humanitarian aid programme was launched. The analysis is based on a questionnaire survey within the resettlers, experience and databases of state institutions and non-governmental organizations. How the resettlers adjust their lives to conditions in the Czech Republic and which factors influence most the migration/integration policies in the Czech Republic is formulated in the conclusion.
Key words: migration – Volhynian Czechs – integration – adaptation – multiculturalism.

KAŇOK Jaromír: *Cartogram and Cartodiagram – Determination of Objective Scale.* – Geografie-Sborník ČGS, 104, No. 4, pp. 268 – 281 (1999). – On thematic maps created on computers mistakes often appear, because specialists in informatics who lack the fundamental knowledge of thematic cartography usually make mistakes. One of the most frequent mistakes arises when creating scales of cartograms and cartodiagrams. Cartogram is a map with partial territorial units, to which statistical data (relative values) mostly of geographical character are illustrated by areaway. Cartodiagram is a map with partial territorial units, in which the statistic data (absolute values) mostly of the geographic character are demonstrated by diagrams. The following procedure should be kept: numeration of occurrence of the phenomenon in regular intervals; determination of the distribution; eventual testing; creation of scale according to the character of frequency division; choice of suitable colours, rasters; arranging of resulting cartograms or cartodiagram.
Key words: thematic cartography – cartogram – cartodiagram – scale – terminology.

KOLEJKA Jaromír, LIPSKÝ Zdeněk: *Maps of present landscape.* – Geografie-Sborník ČGS, 104, No. 3, pp. 161 – 175 (1999). – The landscape mapping and the landscape map compilation is relatively an indeveloped branch of the modern cartography. The multiparameter maps of natural and present landscapes are based on the analytic data integration and the systematic presentation. The two-layer maps of present landscape consist obligatorly both of the overlayed natural background map and land use map. Three examples of the map creation at different scales were discussed.
Key words: landscape mapping – geoecological maps – mapping methodology.

KONEČNÝ Milan, VOŽENÍLEK Vít: *Trends in Cartography.* – Geografie-Sborník ČGS, 104, No. 4, pp. 221 – 230 (1999). – The end of the 20th century is often labelled as the era of rapid development of information technologies. Nevertheless, maps still rank among chief and most important sources of land information. New technologies include the latest achievements of computer science and telecommunications and allow to link much attribute information to spatial data. New cartographical products emerge. The paper examines the main recent trends within cartography in this stage of development. All trends influence cartographical education, too.
Key words: cartography – distance mapping – GIS – cartographical education.

KŘÍŽEK Marek: *Surface and Undersurface Phenomena in the Čecher Hill in the Hostýnské vrchy Hills.* – Geografie-Sborník ČGS, 104, No. 3, pp. 201 – 208 (1999). – The author describes surface and undersurface landforms in the Čecher Hill (the Outer Western (Flysch) Carpathians) and outlines their origin and development. The main part of the article focuses on periglacial and pseudokarst (above all a pseudokarst cave in the Čecher Hill) landforms in this area. It also describes periglacial processes in the Pleistocene and the processes of humid character in the Holocene, which formed these landforms. The author takes notice of the relationship between landforms and geological conditions in the area.
Key words: the Hostýnské vrchy Hills – the Čecher Hill – frost-riven cliff – pseudokarst – pseudokarst cave.

KUPISZEWSKI Marek, DRBOHLAV Dušan, REES Philip, DURHAM Helen: *Internal Migration and Regional Population Dynamics – Czech Republic in the Context of European Trends.* – Geografie-Sborník ČGS, 104, No. 2, pp. 89 – 105 (1999). – This paper is a shortened version of the publication "Czech Case Study: Internal Migration and Regional Population Dynamics in Europe" that originated as part of a comparative research carried out in ten European countries under the umbrella of the Council of Europe in between 1995 and 1998. It concentrates on analysis of internal migration movements (by Czech districts in 1984 and 1994/1995) and on the migratory behaviour by different age groups (in different life course stages). Furthermore, the paper is focused on the relationships between migration on one side and the following independent variables on the other side: urbanisation rate, population density, functional classification, and unemployment.
Key words: internal migration – regional population dynamics –Czech Republic – districts.

ONDŘEJ Tomáš: *The Morphostructural Analysis of the Valašskobystřická vrchovina Highland and its Northern Foreland.* – Geografie-Sborník ČGS, 104, No. 3, pp. 188 – 200 (1999). – The articles deals with the application of the morphostructural analysis of the territory of the Valašskobystřická vrchovina Highland. It explains the influence of active and passive morphostructures on the appearance and development of the present landforms.
Key words: morphostructures – planation surfaces – morphostructural analysis.

SIWEK Tadeusz: *Selected aspects of the ethnic border research.* – Geografie-Sborník ČGS, 104, No. 1, pp. 1 – 12 (1999). – The article deals with the Czech/Polish ethnic border. All municipalities at the Czech/Polish transition zone have been examined in various years between 1804 and 1991. Each municipality has then been allocated to one of four categories. Results include a new delimitation of the Czech/Polish ethnic transition zone which underwent certain changes over the past 100 years in the Teschen region. It has developed from a relatively narrow strip in early 19th century into a broader area which covers almost whole of the ethnically mixed Teschen region.
Key words: ethnic border – Czech/Polish transition zone – nationality.

STEHLÍK Jiří: *Modelling the subsurface flow component in the runoff recession phase by means of a linear and non-linear reservoir model.* – Geografie-Sborník ČGS, 104, No. 3, pp. 176 – 187 (1999). – The paper deals with the time variability of the subsurface water storage depletion. The analysis was done for the small experimental basin in the Jizera Mts, Czech Republic. The research was focused on the hydrograph falling limbs – recession curves – which were selected from daily runoff series using various selection criteria. These criteria include a requirement that a curve should represent subsurface flow which is not

augmented by surface runoff. The selected measured recession curves are modelled by means of the exponential and hyperbolical law of depletion. The time variability of the recession curves is quantified by the variability of the modelled recession parameters. 22 variables representing antecedent climate and runoff conditions as well as the conditions during the recession period were defined for the examination of possible causing factors of the recession curve time variability. The correlation analysis and the multivariate statistical methods were applied.
Key words: Recession curve – water storage – correlation analysis – multivariate statistics.

VOŽENÍLEK Vít: *Cartographical Tools of Geographical Information Systems.* – Geografie-Sborník ČGS, 104, No. 4, pp. 231 – 242 (1999). – The paper examines the problems of cartographical capabilities of geographical information systems. These capabilities are assessed by several criteria. In addition the process of representation of real phenomena in digital ways is presented. The set of cartographical criteria is used to classify GIS products for their use in practical cartographical applications.
Key words: GIS – cartographical tools – digital database – data visualisation – maps.

ZPRÁVY - REPORTS

Geographical Departments in Czechia (201): Department of Social Geography and Regional Development, Faculty of Science, Charles University, Prague (202) – Department of Physical Geography and Geoecology, Faculty of Science, Prague (204) – Department of Demography and Geodemography, Faculty of Science, Charles University, Prague (206) – Department of Cartography and Geoinformatics, Faculty of Science, Charles University, Prague (208) – Department of Geography, Faculty of Science, Masaryk University, Brno (210) – Department of Geography, Faculty of Pedagogics, Masaryk University, Brno (212) – Department of Geography Faculty of Science, Palacky University, Olomouc (213) – Department of Social Geography and Regional Development, Faculty of Science University of Ostrava (215) – Department of Physical Geography and Geoecology, Faculty of Science, University of Ostrava (217) – Department of Geography, Pedagogical Faculty, West Bohemian University, Plzeň (219) – Department of Geography, Pedagogical Faculty, J. E. Purkyně University, Ústí nad Labem (221) – Department of Geography, Pedagogical Faculty, University of South Bohemia, České Budějovice (223) – Department of Environmental Geography, Institute of Geonics, Czech Academy of Sciences, Brno (224) – Department of Geography, Faculty of Education, Technical University, Liberec (226). Geography – Journal of Czech Geographic society – abstract of articles in period 1996 – 1999: Geography – Journal of Czech Geographic society, Vol. 101, 1996 (228) – Geography – Journal of Czech Geographic society, Vol. 102, 1997 (231) – Geography – Journal of Czech Geographic society, Vol. 103, 1998 (234) – Geography – Journal of Czech Geographic society, Vol. 104, 1999 (237).

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