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OBSAH — CONTENT

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PREFACE

This copy of our journal is dedicated to the 24th International Geographical Congress to be held at the end of summer 1980 in Tokyo. The Main session has twelve Sections in which meetings will take place from September 1 to September 5, but already the week before 26 Meetings of Commissions will be held at various places in Japan, organized by the IGU for the solution of specific and actual geographical problems.

Czechoslovak geographers have participated and intend also in future to take part in the meetings of the Sections and in some of the Commissions. In this copy we submit papers of Czech geographers, the topics of which correspond with the themes of the Congress and which should show in which line our geography takes part in the solution of problems dealt with in the individual Section or Commissions. By tradition, we are represented in specific branches of physical geography, geomorphology, hydrology as well as climatology; we are also enlarging our study of the landscape and its optimum exploitation for human needs.

This number, serving above all as an information for foreign Congress participants, contains also a review of some of the latest Czech books and a list of the most important geographical institutes in the Czechoslovak Socialist Republic. We enclose also a list of our main professional journals. This small „Orbis geographicus bohemoslovacus" is quite up to date to the 1/I/1980.

We are sure that the 24th International Geographical Congress in Tokyo will show not only the high level of geography of the host country, of which we are well informed, but also that of its organizational capabilities. Considering the great distance, the personal participation of our geographers will be limited, yet they will surely follow the Proceedings of the Congress with the utmost interest. We wish them much success.

For the Editorial Board
of the Journal of the Czechoslovak Geographical Society
Prof. Dr. Václav Král, CSc.
Chief Editor

PŘEDMLUVA

Toto číslo našeho časopisu věnujeme 24. Mezinárodnímu geografickému kongresu, který se bude konat koncem léta 1980 v Tokiu. Hlavní kongresová jednání proběhnou ve dvanácti odborných sekcích ve dnech 1. až 5. září, avšak již v předcházejícím týdnu bude zasedat v různých místech Japonska 26 odborných komisí, zřízených Mezinárodní geografickou unií k řešení vybraných a aktuálních geografických problémů.

Českoslovenští geografové se v minulosti účastnili a hodlají se i nadále účastnit sjezdových jednání jak v odborných sekcích, tak i v některých odborných komisích. V tomto čísle našeho Sborníku předkládáme příspěvky českých geografů, které zapadají do kongresové tématiky a mají ukázat, v kterých směrech se naše geografie podílí na řešení problematiky jednotlivých sekcí či komisí. Tradičně jsme zastoupeni zejména v jednotlivých odvětvích fyzické geografie, v geomorfologii, hydrologii i klimatologii, rozvíjíme nauku o krajině a jejím optimálním využití pro potřeby člověka.

V tomto čísle, určeném především pro informaci zahraničních návštěvníků kongresu, podáváme také informace o některých významnějších českých knižních publikacích z poslední doby. Uvádíme rovněž seznam hlavních geografických pracovišť v Československu a seznam našich hlavních odborných časopisů. Tento malý „Orbis geographicus bohemoslovacus" je podle stavu k 1. 1. 1980.

24. Mezinárodní geografický kongres v Tokiu jistě ukáže i vysokou úroveň geografické vědy i organizačních schopností hostitelské země, o nichž jsme dobře informováni. Přestože pro velkou odlehlost se asi nepodaří většímu množství našich geografů osobně se účastnit kongresových jednání, budeme všichni takto jednání sledovat s velkým zájmem a přejeme jim plného úspěchu.

Za redakční radu
Sborníku Československé geografické společnosti:
Prof. RNDr. Václav Král, CSc.,
vedoucí redaktor

SBORNÍK ČESKOSLOVENSKÉ GEOGRAFICKÉ SPOLEČNOSTI
Ročník 1980 • Číslo 1 • Svazek 85

JAROMÍR DEMEK

THE GEOGRAPHICAL PROGNOSIS IN PRESENT-DAY CZECH GEOGRAPHY

1. Preface

At the present time, during building up of a well-developed socialist society, a rapid progress in science and technical sciences is taking place in Czechoslovakia without any analogy in the past. The scientific-technical revolution results in basic qualitative changes in the present-day system of production forces in Czechoslovakia which affect all components of this system and all sides of technological relationships. The extraordinarily rapid development of science and the prompt introduction of scientific knowledge into production make of the science an immediate production force.

The changes evoked by the building up of socialism and by the scientific-technical revolution strike even the Czech geography. Geography in Czechoslovakia is subjected to changes affecting the bases proper of the said science.

But the processes mentioned above manifest themselves even in the object of geography, i. e. in the changes of the intricate system of the landscape sphere on Czechoslovakia's territory. Mainly the socialization of agriculture and the changes attached thereto by the division of land and the industrialization of agricultural production have substantially changed the character of the landscape of extensive regions in Czechoslovakia. The extension of production and the adoption of new modes of production have not only raised the standard of living of the population but manifested themselves even by some negative effects on landscape and environment (atmospheric and water pollution, cumulation of waste, etc.).

In planning Czechoslovakia's future development, a number of tasks arise therefore, several of them concerning the spatial organization of the economy and life of the society. The quality of the environment in Czechoslovakia also exhibits a distinct spatial structure, from regions with a slightly disturbed nature (e. g. national parks and protected landscape areas) up to regions devastated by mining with strongly disturbed natural conditions. This is why the simple statement of the present-day state of geographical conditions and the state of environment is not sufficient for planning but it is necessary to know the variants of the development of the spatial structure of economy as well as of the life of the society for instance in 1990, 2000 and/or 2050. Czech geographers have, therefore, in recent years paid considerable attention to the problems of geographical prognosis.

2. Contents of the geographical prognosis

Prognosticating is a systematic investigation of the future and a formulation of scientific statements concerning objectively possible alternatives and variants of the subject of prognosis in the future. The result of the investigation is a prognosis as a complex of mutually connected valuations, i. e. aims of valuation, modes of their achievement and necessary costs. It has already been mentioned above that, at the present time, Czech geography is facing two tasks, such as

a) the prognosis of the geography as a science, and
b) the prognosis of the development of the subject of geography, i. e. of the landscape sphere especially on Czechoslovakia's territory.

For the purpose of tackling the tasks mentioned, geography creates an implement — the geographical prognosis. The geographical prognosis is a systematically derived and from the viewpoint of reliability theoretically and practically verified system of possible alternative states of geography as science and of the landscape sphere as a subject of study of this science in the future. The geographical prognosis is a very complicated and responsible task. It requires not only a deep insight in the development of science but, simultaneously, a clear idea of time-spatial relationships of nature and society in the future.

The geographical prognosis belongs by its character into the group of scientific-technical prognoses. It should be stressed that the scientific-technical prognostication and the practice of scientific-technical prognosticating are still in the beginning of their development. At the present time, the active process of improvement of the methods of scientific-technical prognosticating is proceeding in Czechoslovakia. Czech geographers have the advantage of being able to base the elaboration of the methods of geographical prognosis on collective co-operation of the member countries of COMECON in the sphere of scientific-technical prognosticating.

The methodological basis of the Czech geographical prognostication are the scientific categories of materialistic dialectics and, above all, the principles of objectivity and law-controlled development, the recognizability and inexhaustibility of the real world. The geographical prognosticating is in relation to general prognostication a concrete branch of geographical research based on its specific theory resting upon general knowledge of the doctrine on science. At the present time, geographical prognosticating in Czechoslovakia is getting the character of a systematic analysis of tendencies and perspectives giving more precision to valuation. The prognoses designed by geographers are based on known objective laws, tendencies, demands and conditions of the development of both, the geography as science and the whole Czechoslovak society. The geographers are trying to formulate the possible alternatives of the development of both — the geography and the subject of its study — the landscape sphere on the whole territory of the country. Experience has shown that prognosticating is more successful if it is more connected with the practice of socialist development, with planning of the scientific-technical and socio-economic development of a well-developed socialist society.

The geographical prognostication is further based on general methods of prognostication, i. e. on the complex of general principles, modes and laws of scientific forecasting.

3. Prognosticating of the development of Czech geography

As already mentioned, the geography as science was subjected in recent years to a substantial development affecting the bases proper of this old science. Even Czech geography is quickly developing as a component of Czechoslovak geography, a component of the geography in socialist countries and, last but not least, as a component of world geography. Czech geography turned from description to the system-structural analysis of its subject, i. e. of the landscape sphere. It does not content itself only with the statement of the present-day state. Czech geographers are searching for and proposing the modes of the control of the development of the landscape sphere on Czechoslovakia's territory and within the frame of the co-operation of the COMECON member countries in the interest of its optimum utilization for the needs of further development of the socialist society. In Czechoslovakia, a rational spatial organization of life and economic activities of the socialist society is becoming a necessary component of the complex care of environment of this society.

The development of Czech geography is planned and takes place both within the scope of the preparation and execution of the different fifve-year plans of the development of Czechoslovak economy and society, and within the frame of planning for longer periods (10 up to 15 years). The task of Czech geographers is, therefore, to prognosticate the needs of the development of geography for the said periods and to give them precision on the basis of the five-year plans of the State Plan of Basic Research and the State Plan of Technical Development.

The prognoses carried out so far of the development of the Czech geography have shown that it will deal up to 1990 mainly with the problems of

a) landscape and its development (changes of spatial differentiation and spatial structure especially from the point of view of securing the optimum utilization of natural resources and of securing the optimum environment)
b) spatial geographical structures with the aim of securing the optimum spatial dislocation of population (investigation of urbanized areas), production and recreation
c) cartographical models especially with the application of modern means of automation of map compilation and the utilization of the modes of remote sensing
d) modernization of teaching geography in all types of schools.

The prognosis has shown simultaneously that to secure such a development of geography in the future it will be necessary to develop the theory of geography as well as the further development of geographical prognosis.

4. Prognosticating of the further development of the landscape sphere on Czechoslovakia's territory

Prognosticating the further development of the landscape sphere on Czechoslovakia's territory is an important task not only of theoretical significance for geography but also of immediate practical significance mainly in connection with securing the optimum environment for the further development of socialist society.

But experience has shown that the geographical prognosis of the development of the landscape sphere is a very complicated task, especially for the following reasons:

a) the prognosis must be based on reliable data and knowledge of the past and the future
b) the subject of the prognosis, i. e. the landscape sphere, is an unusually intricate system with many variables
c) the prognosis must end by a synthesis, i. e. a complex prognosis of the deve-

lopment of the landscape sphere on Czechoslovakia's territory or its parts for 15, 25, 50 or — in the last resort — even 100 years ahead.

The geographical prognosis is always a scientific foreseeing of unknown or partly unknown phenomena. This is why so heavy demands are made on the reliability of the basic data. For the prognosis of a possible development of spatial relationships between the elements and components of the landscape sphere on Czechoslovakia's territory it is necessary to know above all:

a) the trends and rate of the natural development of the different natural elements and components of the landscape sphere
b) the changes both of the individual components and the whole natural subsystem of the landscape sphere affected by the economic activities of society
c) the tendency of the development of the whole society, i. e. both the totality and the different socio-economic subsystems (industry, agriculture, transport, services, recreation, etc.).

The basic data must be related to a certain zero level. But the experience of Czech geographers has shown that in the conditions of the strongly altered nature of Czechoslovakia it is quite difficult to find the scale of the natural development of the individual elements and components of the physico-geographical sphere. In the time, when measurements of climate, waters, biota, with sufficient precision were started (e. g. climatic data from 1775 in Praha-Klementinum), the parameters already concerned a rapidly changing nature with significant and diverse effects of human activities. To acquire exact data on the landscape sphere in the past and partly even nowadays is therefore rather difficult and geographers are often obliged to use estimates and approximate data. This fact is, of course, reflected in the quality of the prognosis.

From the functional viewpoint, three types of geographical prognoses are distinguished by Czech geographers. The first type are geographical research prognoses whose aim are the discovery and formulation of new tendencies in the development of the geography as science and its subject, i. e. the landscape sphere. This type of prognoses is tackled above all in the Institutes of Geography of the Czechoslovak Academy of Sciences and the Slovak Academy of Sciences and at the geographical departments of universities. The second type are geographical program prognoses based on known tendencies and laws of the development of geography as science and its subject and also on social needs. They refer to geographical research prognoses but are more focussed on the requirements of practice. This type of prognoses is examined besides the institutions mentioned above also by geographers in departmental research institutes and institutions (e. g. Research Institute of Construction and Architecture). The third type are geographical organization prognoses based on the knowledge of general laws and tendencies of the development of geography as an organization system. They are based on information supplied by research and program prognoses, on information of human and material resources and formulate the scientifically motivated hypothesis on resources necessary for the achievement of possible and planned aims. An example of such prognoses are the different levels of territorial planning in Czechoslovakia.

At the present time, the scientific prognostication is using about 140 various methods of prognosticating. The real number of the methods applied in geographical prognosticating in Czechoslovakia is, naturally, much smaller. The applied methods can be, in substance, concentrated into three basic groups, such as extrapolation methods, expertise methods and methods of modelling.

In the geographical prognosis, its subject is considered by Czech geographers principally a system of interconnected components with respect to their hierarchy and importance. The object of the prognosis is simultaneously studied in relationships with other systems as well as an element of the system of higher order. Czech geographers understand under the term system methods in the practice of present-day geographical prognosticating the procedure of the application of different methods and approaches to prognosticating based on a united theoretical hypothesis. In this procedure, the various methods and approaches complement mutually their limited possibilities. This procedure increases, therefore, the credibility of the obtained data. The utilization of system theory in ensuring the solution of the geographical prognosis is a necessity corresponding to the new level of the problems arising before Czech geography within the frame of the scientific-technical revolution.

The geographical prognosis in Czechoslovakia has also different levels. The highest level represents the prognoses of the development of the landscape sphere on the level of the whole federation.

The second level are the prognoses on the level of both states — the Czech Socialist Republic and the Slovak Socialist Republic. An example of such a prognosis can be the prognosis of the development of the environment of the Czech Socialist Republic in the publication J. Demek et al., Životní prostředí České socialistické republiky (The Environment of the Czech Socialist Republic, Praha 1978). This geographical prognosis formulates some conceptions of the further development of the landscape sphere of the Czech Socialist Republic about to 2030. These are:

a) the conception that the atmospheric pollution of the ČSR will go on increasing until 1985 in connection with the increasing consumption of solid fuel (especially lignite of low quality) and with the development of motorism; as late as after 1985 a slight decrease in pollution by solid particles can be expected owing to the increased efficiency of fly-ash separators; but the amount of gas emmissions (above all SO_2) will increase futher, even after 1985;
b) the conception on thermal pollution of the atmosphere in settlement agglomerations and industrial centres where the additional thermal energy will reach about 2000 approximately 1/3 of the total quantity of solar energy incident upon 1 m^2 of the surface of the Czech Socialist Republic per year;
c) the conception on limited resources of surface and groundwater and on the increasing trend of water consumption by the population from the present-day 296 l. $inh.^{-1}$. day^{-1} to 552 l. $inh.^{-1}$. day^{-1} in 2000; as well as on the increasing water pollution by agriculture which may be a limiting agent of social and economic development in 2000;
d) the conception on the rearrangement of the whole landscape of the Czech Socialist Republic and the change of its function especially in the lowland and hilly land regions in connection with the concentration, mechanization and specialization of agriculture;
e) the conception on growing problems in urbanized regions, mainly as to atmospheric pollution, problems with noise, lack of drinking water, civilization diseases, etc.;
f) the conception on the spatial differentiation of the environment in the individual parts of the Republic and concentration of significant problems in some regions, such as for instance, in the North Bohemian Lignite Basin and the urban regions of Ostrava, Praha, Brno, Plzeň, Sokolov, Hradec Králové and Pardubice.

The third level is the prognosis of the development of the landscape sphere in the individual regions. A considerable progress has been attained in this level of prognosis, especially thanks to the institutes dealing with territorial planning (e. g. Terplan, Urbion, etc.).

In the geographical prognoses, the possibilities of the special geographical representation means are usually made use of — the thematic maps. But it should be mentioned that this specific geographical language is still more used even by other scientific disciplines (e. g. by territorial planning) which results in a „geographization" of these branches and their rapprochement with geography. A new higher stage of geographical prognosis will be the starting monitoring and automation of the construction of prognostic maps with the aid of computers.

Conclusions

The present-day state of geography as science and the present-day state of its subject of study — the landscape — require not only the establishment of their present-day state but even a prognosis of their development in the future. This is why Czech geographers are developing and will develop the geographical prognosis as a useful implement in fulfilling the tasks of geography in the period of the scientific-technical revolution.

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Shrnutí

GEOGRAFICKÁ PROGNÓZA V SOUČASNÉ ČESKÉ GEOGRAFII

Prognózování je systematické zkoumání budoucnosti a formulování vědeckých výpovědí o objektivně možných alternativách a variantách objektu prognózy do budoucnosti. Geografická prognóza pak je komplex navzájem souvisejících hodnocení o vývoji geografie jako vědy a vyvoji objektu této vědy tj. krajinné sféry v budoucnosti. Geografická prognóza je úkol velmi složitý a odpovědný. Svým charakterem náleží do skupiny vědeckotechnických prognóz. Je třeba zdůraznit, že vědeckotechnická prognostika a praxe vědeckotechnického prognózování se nachází ještě v počátcích svého vývoje. V současné době probíhá v Československu aktivní proces zdokonalování metod geografického prognózování. Metodologickým základem české geografické prognostiky jsou vědecké kategorie materialistické dialektiky a především principy objektivnosti a zákonitosti vývoje, poznavatelnosti a nevyčerpatelnosti reálného světa. Význam geografické prognózy spočívá v tom, že v současné době dochází v Československu k rychlému rozvoji geografie jako vědy, současně však k rozsáhlým změnám v jejím objektu, tj. v sektoru krajinné sféry na území ČSSR pod vlivem intenzívní hospodářské činnosti společnosti při budování vyspělé socialistické společnosti Zejména socializace zemědělství a industrializace zemědělské výroby podstatně změnily ráz krajiny rozsáhlých oblastí ČSSR. Rozšíření výroby a zavedení nových druhů výroby nejen zvýšilo životní úroveň obyvatelstva, ale projevilo se i některými negativními vlivy na krajinu a životní prostředí. Proto má geografická prognóza nejen teoretický, ale i bezprostředně praktický význam.

Z funkčního hlediska jsou v článku rozlišeny tři typy geografické prognózy, a to výzkumné, programové a organizační prognózy. Jsou probrány hlavní metody používané při geografické prognóze, a to zejména metody extrapolace, expertízy a modelování. Z hlediska měřítka jsou rozlišeny prognózy globální, regionální a oblastní. Jako příklad je uvedena prognóza vývoje životního prostředí ČSR.

SBORNÍK ČESKOSLOVENSKÉ GEOGRAFICKÉ SPOLEČNOSTI
Ročník 1980 • Číslo 1 • Svazek 85

TADEÁŠ CZUDEK

PLEISTOCENE THERMAL EROSION IN THE WESTERN PART OF CZECHOSLOVAKIA

I. Introduction

Although considerable progress has been done in the research of Pleistocene cryogenic hillslope processes and landforms in Czechoslovakia over the last 25 years, there is still little information available to the role of fluvial processes in periglacial environments. Our recent investigations concerning this problem are based on the valley shape, the river and slope deposits, as well as the character of the valley bottom and slope foot underlying the Pleistocene sediments; studied in numerous drill-holes, test pits and long excavations. The present report shows that linear (vertical) and lateral thermal erosion played, indeed, an important role in the evolution of Pleistocene valleys and in the modification of pre-Quaternary valleys in Bohemia and Moravia.

II. Thermal erosion

Thermal erosion results in the melting of ground ice, the removal of loosened material by flowing water and the origin of thermo-erosional features. Thus, thermal erosion is closely connected with normal mechanical erosion whose morphogenetic effects differ from place to place in permafrost areas. It can be said that it is in many regions much smaller than that of thermal erosion. Thermal erosion is acting in permafrost areas in all rivers. But its geomorphological effect controled by local conditions is variable and depends among others:

i) on the temperature of the runnig water and the temperature of the frozen ground;

ii) on the quantity, the mode of distribution and the type of frozen ground,

iii) on the composition and mechanical properties of the bedrock, notably on its jointing;

iv) on the quantity and the velocity of flowing water;

v) on the lenght of the annual period of thermal erosion;

vi) on the quantity of material supplied, not only from valleys slopes and river banks but also from the bottom of the river;

vii) on the tectonic regime of the area — uplift or subsidence — and on the rate of this tectonic movements. In many cases, the tectonics affect the type of thermal erosion as well as its share in the total activity of running water.

From the geomorphological point of view thermal erosion can be classified into two basic types: linear (vertical) thermal erosion and lateral thermal erosion. Both are interrelated and very often act together (T. Czudek — J. Demek 1973, p.

26). Under certain conditions the action of one type of thermal erosion dominates, under other conditions that of the second type. A lot of landforms created and/or conditioned by lateral thermal erosion as well as the rapid undercutting of river banks led many authors to conclusions that the thermal erosion operates predominantly laterally. In the conditions of present-day permafrost this opinion is correct especially in the case of larger lowland streams. But in many cases, mainly in areas of rapid uplift, the linear mechanical and linear thermal erosion dominate.

Both types of thermal erosion are known to be very effective. Examples from Arctic North America and Siberia in particular are startling. The frozen banks of the rivers Indigirka and Yana, for instance are in some places retreating at a rate of 10—25 m/year (S. S. Korzhuyev 1966, pp. 28—29). New gullies develop quickly, and the lenght of existing gullies may increase at a rate of several tens of metres/year. Numerous descriptions of the effect of thermal erosion in present-day permafrost areas have been presented in many papers and summarized especially by J. Dylik (1970), A. Jahn (1970, 1975), T. Czudek — J. Demek (1973) and H. M. French (1976).

III. Pleistocene thermal erosion and the evolution of valleys in the western part of Czechoslovakia

During the cold periods of the Pleistocene epoch Czechoslovakia was situated in front of the Scandinavian continental ice sheet and its western part in the proximity of Alpine glaciers. There is numerous direct and indirect evidence indicating the presence of Pleistocene permafrost on the territory of Bohemia and Moravia. The main arguments for this are:

i) post-cryogenic textures in unconsolidated fine-grained sediments;

ii) pseudomorphs of ice-wedges, the largest of them being 6,50 m deep and 11,25 m wide (Němčany near Slavkov u Brna, Central Moravian Carpathians);

iii) intensive deep frost weathering of massive rocks reaching along fissures to depths of more than 30 m;

iv) huge blocks of Tertiary and Pleistocene sediments transported in frozen state by the glacier in formerly glaciated areas of northern Moravia;

v) very frequent occurrence of climatically determined periglacial asymmetric valleys, dry valleys, dells, frost-riven cliffs and scarps, tors and cryoplanation terraces which can develop in seasonally frozen ground (where permafrost is lacking) but are —in such forms as found in Czechoslovakia— typical of zone with present-day perennially frozen ground.

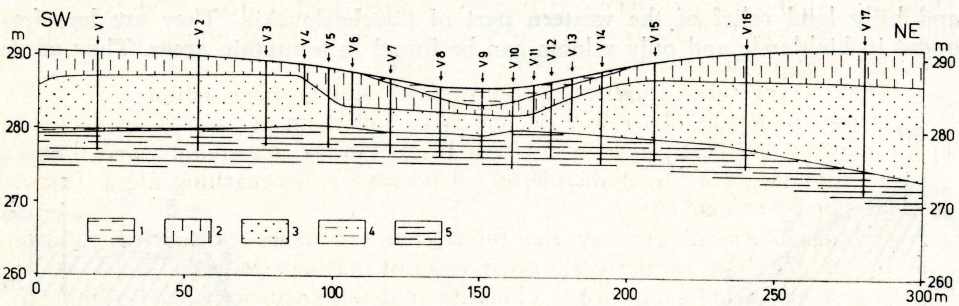
Permafrost occurred in Bohemia and Moravia not only during the Würm but also in former cold periods of the Pleistocene (J. Demek in J. Demek — J. Kukla ed., 1969, p. 39). Its thickness as well as the ice content were locally and obviously even in the individual cold periods different. Of widespread importance were here especially the relief and local geological conditions, the lithological rock properties in particular. The thickness of the Pleistocene permafrost on Czechoslovakia's territory is not sufficiently known at present. But according to recent investigations it attained at least several tens of metres. It is possible that it could attain even about 100 m under favourable conditions. Up to 60—70 per cent of permafrost by volume could consist of ice.

There are three basic morphographical valley types in the area described. These are:

1. broad open (dell-like) valleys;
2. deeply incised V-shaped valleys with a narrow bottom;
3. valleys with a broad bottom (box-like valleys).

The valleys are of different age and many of them originated in pre-Quaternary epoch. Some of them in the Bohemian Massif are even of Paleogene age. During the Quaternary an intensive modelling of older valleys and the evolution of new valleys can be observed.

In the development of the broad open valleys represented especially by dells (Dellen) and small dry valleys mainly processes of linear thermal erosion were important. These valleys are very frequent in Bohemia and Moravia and occur both in regions built of less resistant sediments and in solid rocks areas. Their sides are commonly asymmetric. The valleys mentioned form often a dense pattern in lowland and hilly land relief. During the Pleistocene the deepening and, owing to slope processes, the widening of older broad open valleys as well as the formation of small shallow dells and dry valleys in new places took place. From the character of the Pleistocene periglacial sediments on the bottom of the valleys described it follows that they were transported both by solifluction and running water. There are even cases that on the bottom of short broad open valleys occur channels filled-up with slope deposits whose cross-profile shows that they were created by linearly running water (T. Czudek 1971, p. 37, 1978, p. 72). In the Moravian Gate e. g. we established in drill-holes below the present-day broad open cross-profile of a dell a flat-bottomed box-like form (Fig. 1.) as well as knicks in the long-profile indicating fluvial action (T. Czudek 1973, pp. 10 – 12).

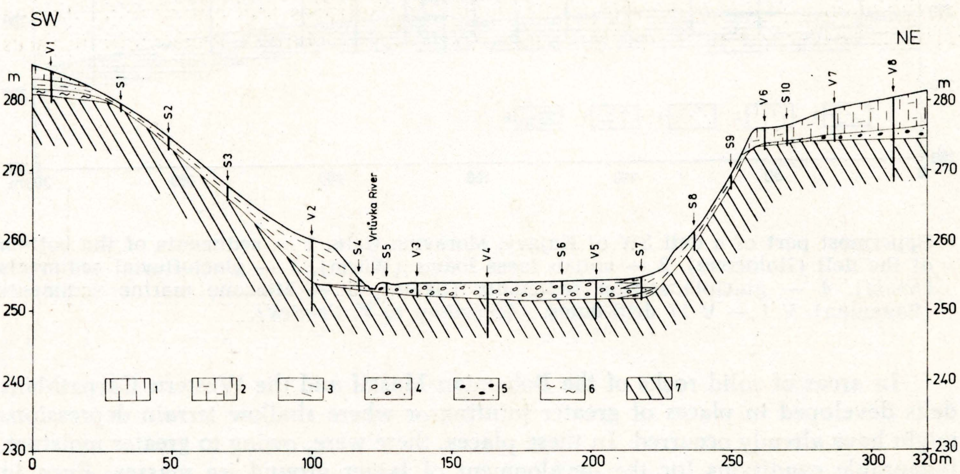


1. Uppermost part of a dell SW of Kujavy, Moravian Gate. 1 — sediments of the bottom of the dell (Holocene), 2 — eolian loess loams (Würm), 3 — glaciofluvial sediments (Saale), 4 — glaciolacustrine sediments (Saale), 5 — Miocene marine sediments (Badenian). V 1 — V 17 drill-holes. *(According to T. Czudek).*

In areas of solid rocks of the Bohemian Massif and the Western Carpathians dells developed in places of greater jointing or where shallow terrain depressions might have already occurred. In these places, there were, owing to greater moisture, favourable conditions for the development of larger ground ice masses. Even in regions consisting of soft Neogene and Quaternary sediments Pleistocene dells and dry valleys originated in former relief depressions and greater ground ice occurrences. On ice-wedges and larger ice lenses first gullies developed due to thermal erosion of linearly running water which may in many cases be considered the initial phase of the evolution of the dells. Owing to linear flowing water (mainly vertical thermal erosion) these landforms were deepened and broadened by mass wasting processes. In many cases lateral shifting of the axis due to asymmetric action of slope processes and undercutting of the sides of dells and dry valleys by thermal erosion took place. Lateral thermal erosion co-operated accordingly in the origin of valley asymmetry.

Deeply incised V-shaped valleys with a narrow bottom are widespread in the highlands and especially mountains of the Bohemian Massif and the Western Carpathians. These valleys are even several hundreds of metres deep and characterized by a lack of morphologically expressed fluvial terraces. The terraces are usually buried by slope material. In many V-shaped valleys (in mountain regions in particular) there were mostly not favourable conditions for the development of river terraces. This is connected with a very intensive uplift which could to a considerable extent obscure the climatically conditioned phases of a certain stability and activity in valley incision. Due to intensive tectonic uplifts at the end of the Tertiary and in Pleistocene the valleys described exhibit distinct features of forms created by rapid down-cutting. In the Krkonoše Mts., the Krušné hory Mts., the Hrubý Jeseník Mts. and the Moravskoslezské Beskydy Mts. for instance the intensity of the Pleistocene deepening of the valleys can be established with at least 300 and/or 400 m. The disturbance of the bedrock by frost (widening of the original fissures) in the valley bottom and lower slope parts seems to be greater than on the surrounding watershed ridges. In the development of the V-shaped valleys during the Pleistocene mainly normal mechanical erosion as well as thermal vertical erosion took share. The lateral erosion was of less importance in the general aspect of these valleys.

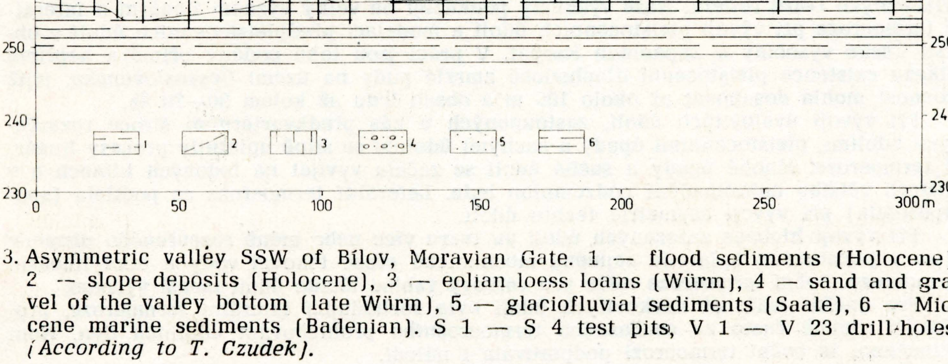
The valleys with a broad bottom (box-like valleys) are typical of the lowland and hilly land relief of the western part of Czechoslovakia. They are less frequent in highlands and only seldom can be found in mountain areas. They occur



2. Box-like valley of the Vrtůvka River near Velká Bystřice, Nízký Jeseník (Highlands). 1 — loess (Würm), 2 — loess with fragments of Lower Carboniferous rocks (Würm), 3 — slope deposits: loams and debris (Würm), 4 — sediments of the valley bottom (Holocene — Würm), 5 — terrace sediments (Young Pleistocene), 6 — fossil weathered material (caolinitic clay) redeposited in the Pleistocene, 7 — bedrock — mostly shales (Lower Carboniferous). S 1 — S 10 test pits, V 1 — V 8 drill-holes. *(According to T. Czudek and M. Hrašna).*

in various rocks and their typical feature is a flat broad bottom, the dimensions of which usually exceed the depth of the valley (Fig. 2.). The rivers are underfit, their bottoms being even more than 100 times broader than the present river channel. It follows from numerous drill-holes that the base of the fluvial deposits is on the whole fairly flat in the cross-profile. The basis of terrace gravels and sands exhibits the same character or is slightly inclined towards the valley axis. Shallow depressions (one or several) occur in the bedrock underlying the sediments of the valley floor. These former braiding channels are to be found in various places; even in close proximity of slopes and inside the gravel body, too. The character of accumulation of the Pleistocene sands and gravels point also to their removal not only down-streams but even in lateral direction. There, where no talus occurs, the Quaternary sediments of the valley bottom are directly adjacent to the bedrock of the slope, which is here considerably steep (usually more inclined than in the other slope parts). A similar situation indicating lateral erosion exist in the case of river terraces. In places where talus exists at the foot of the slope several types of relationships between the Pleistocene gravel-sand series of strata of the valley floor and the slope deposits were established. The effects of lateral erosion were accordingly strongly affected by the action of periglacial slope processes. Although box-like valleys must have existed in many areas of the western part of Czechoslovakia as early as before the Quaternary, the Pleistocene lateral erosion often occurring evidently together with the deepening of valley bottoms has been decisive for their present-day shape. It is not excluded and has not been exactly proved for the moment, that lateral erosion was supported by icings. Their presence during the cold Pleistocene periods is beyond any doubt in Central Europe.

Pleistocene lateral erosion (especially thermal erosion) is responsible not only for the development of present-day flat broad valley bottoms. In many cases, a distinct shifting of the valley (often by as much as several hundreds of metres) owing to asymmetric action of slope processes can be observed. This is indicated by the often asymmetric development of the river terraces. An example can be the Trnávka River valley in the Moravian Gate where 9 buried Pleistocene terraces



3. Asymmetric valley SSW of Bílov, Moravian Gate. 1 — flood sediments (Holocene), 2 — slope deposits (Holocene), 3 — eolian loess loams (Würm), 4 — sand and gravel of the valley bottom (late Würm), 5 — glaciofluvial sediments (Saale), 6 — Miocene marine sediments (Badenian). S 1 — S 4 test pits, V 1 — V 23 drill-holes. *(According to T. Czudek).*

were found on the left (E-facing) side at a distance of 5 km from the valley head. The lenght of the lateral shifting of the valley axis towards the steeper (W-facing) slope is about 530 m. Pleistocene lateral thermal erosion took also share in the development of asymmetric valleys (Fig. 3.) which belong to the typical features of the relief in the western part of Czechoslovakia.

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PLEISTOCENNÍ TERMOEROZE V ZÁPADNÍ ČÁSTI ČESKOSLOVENSKA

Autor pojednává o jednom z velmi významných faktorů při vývoji údolí v oblasti Čech a Moravy, tj. o pleistocenní termoerozi. Termoeroze je proces rozpouštění podzemního ledu, odnášení uvolněných hmot tekoucí vodou a s tím spojeného vzniku příznačných tvarů reliéfu. Naše výzkumy poukazují na velký význam lineární a laterální termoeroze při vývoji pleistocenních údolí a modelaci předpleistocenních údolí v oblasti České vysočiny a Západních Karpat. V práci jsou také podány přímé a nepřímé důkazy existence pleistocenní dlouhodobě zmrzlé půdy na území Československa, jejíž mocnost mohla dosahovat až okolo 100 m a obsah ledu až kolem 60—70. %.

Při vývoji úvalovitých údolí, zastoupených u nás předkvartérními široce rozevřenými údolími, pleistocenními úpady a suchými údolími se silně uplatnily procesy lineární termoeroze. Mnohé úpady a suchá údolí se začala vyvíjet na ledových klínech a v místech většího nahromadění podzemního ledu. Laterální termoeroze se podílela (spoluzpůsobila) při vývoji asymetrie těchto údolí.

Při vývoji hluboce zařezaných údolí ve tvaru více nebo méně rozevřeného písmene V se v pleistocénu uplatnila zejména mechanická eroze tekoucí vody a také lineární termoeroze. Boční termoeroze měla pro celkový vzhled těchto údolí menší význam.

Pro dnešní tvářnost neckovitých údolí byla rozhodující laterální termoeroze, probíhající zřejmě často za současného termoerozního prohlubování údolních den. Není vyloučeno, že boční termoerozi podporovala i náledí.

SBORNÍK ČESKOSLOVENSKÉ GEOGRAFICKÉ SPOLEČNOSTI
Ročník 1980 • Číslo 1 • Svazek 85

ANTONÍN IVAN

RELIEF OF THE SOUTH-EAST MORAVIA AND PROBLEMS OF GEOMORPHOLOGICAL CORRELATION OF THE WESTERN CARPATHIANS AND THE EASTERN ALPS

The significance of Moravia for correlation of continental and Alpine glaciations in Central Europe has been known for a long time and it seems to be suitable to extend the idea to the pre-Quaternary relief forms too. Particularly suitable for this purpose is the relief surrounding the Vienna Basin. This depression penetrates with its northern part into the Carpathians and with the south-west one into the Alps. Projects and constructions of geomorphological maps as the International Geomorphological Map of Europe, Geomorphological Map of the Carpathian and Balkan Regions (M. Pécsi 1977) and Map of Planation Surfaces of Carpathian and Balkan Regions (Resolution . . . 1975) demonstrate that this problem is not a matter for itself. The importance of correlation increases when the compared areas were dealt with according to different theoretical conceptions, and consequently, with different results. During the construction of geomorphological maps arises for example a danger of hardly reasonable time gaps on the contacts of geomorphological regions.

Looking at previous and present conceptions of denudation chronology of the Western Carpathians and the Eastern Alps, we can see considerable differences. The conception of three planation surfaces developed from the Upper Miocene till the Upper Pliocene is commonly accepted for the Western Carpathians (M. Klimaszewski 1965, E. Mazúr 1965). At present prevail tendencies to put the planation surfaces into still younger periods (E. Mazúr, J. Činčura 1975, L. Starkel 1975). For the Eastern Alps, on the contrary, the conception of many denudation levels is still valid. After the period influenced by the ideas of A. Winkler-Hermaden, who considered the relief of the area as very young, new investigations shift the age of summit parts of the relief to earlier periods. Generally is believed that in mountain areas, the development of present relief forms began after the Pyreneic phase (Eocene) by accumulation of a gravel cover built of allochtonous rocks of the Central Alps. This hypothetical relief termed the „Augensteinlandschaft" dated from the Oligocene till the Ottnangian was the initial form of a more complex dissected relief, the „Raxlandschaft", developed from the Oligocene to the Badenian. Preservation of surfaces from the period before thrusting of the youngest nappes can be explained partly by the slowness of movements, partly by the flatness of the overthrust plane (A. Tollmann 1968, H. Riedl 1977).

For the explanation of relations between the relief of the Western Carpathians and the Eastern Alps we can take into account in Moravia the correlative sediments building the youngest nappes, the deposits of the Carpathian Foredeep and the Vienna Basin and the remnants of planation surfaces in the Pavlovské vrchy (Hills), Vizovická vrchovina (Highland) and in the Bílé Karpaty (Mts.).

The flysch nappes of the South-East Moravia were thrusted in the Pyreneic, Savian and Styrian folding phases. The Vizovická vrchovina (Highland) and the Bílé Karpaty (Mts.) are parts of the older Magura nappe, the Pavlovské vrchy (Hills) of the younger Ždánice nappe. The nappes were formed as relief thrusts i. e. they were shifted over the subaerial erosional relief (Z. Roth 1975).

The development of the relief in the early-orogenic (pre-neotectonic) stage can be divided into two phases. In the first phase from the Eocene to the Lower Miocene after the thrusting of the Magura nappe the region, according to Z. Roth (1975), was uplifted to the altitude of 200—400 m. The local denudation relief was, according to the mentioned author, with great probability, in direct connection with the East-Alpine „Augensteinlandschaft". In our opinion there is a certain difference, as the possibility of transport of the material from the Central Carpathians across the area of the Magura nappe has not yet been proved. The correlative sediments of this phase are the Ždánice-Hustopeče beds of Oligocene to Lower Miocene age. They are now regarded as molasse rather than as previously supposed flysch type sedimentation. Also the idea has been expressed that their sedimentary basin was rather a foredeep than a geosynclinal trough. The thickness of sediments ((2 500—3 000 m) suggests the greatest denudation of the nappe just in this phase.

In the second tectonically and paleogeographically complicated phase from the Lower Miocene to the Badenian the Ždánice nappe was formed and the Magura nappe was completed by thrusting over it. The structure, especially in the area of the present Vienna Basin suffered repeating movements accompanied by marine transgressions and regressions (see V. Špička 1966, 1972) and by the formation of synorogenic planation surfaces. This is demonstrated by the erosion surface (unconformity) on the bottom of the basin cutting both the Magura flysch and Ždánice flysch. The surface is fossilized by Lower Miocene deposits. Although burried, it is the oldest form in this part of the Western Carpathians. The Lower Miocene basal clastics, few hundred metres in thickness indicate the transport from the near rugged relief.

Significant paleogeographical changes in the course of this phase took place also in the Karpatian and the Badenian (Old Styrian phase). Owing to repeated upflits, a part of the basin filling was denuded and the development of planation surfaces reached over the flysch. The deposits of Karpatian were particularly reduced and the significant Intra-Miocene surface later dislocated by fault tectonics was developed. This development is exemplified also in the present relief of the Pavlovské vrchy (Hills). After the thrusting of the Ždánice nappe over the Karpatian sediments of the Carpathian Foredeep, the denudation and development of planation surface which was, at least, in the last phase shaped by marine abrasion (A. Ivan 1973) took place. The planation surface was burried under Badenian sediments, later dislocated along the cross faults and lastly resurrected in Upper Miocene or the Lower Pliocene. The correlative sediments of this planation surface are mainly basal clastics of the Lanzendorf series of the Badenian. It may be that the sporadic dark dolomites, according to I. Krystek and J. Tejkal (1968) of unknown provenience correspond to the black dolomites that are the key rocks of the „Augensteinlandschaft".

The limestone klippes of the Pavlovské vrchy (Hills) provide a significant point for the correlation with the Alpine region too. The continuation of the hills in Austria are the Leiser Berge, where H. Riedl (1960, 1977) found two planation surfaces on the limestone. The higher one (500 m)is a subaerial surface, formed in the Lower Miocene and it may be correlated to a certain extent, with the „Raxlandschaft". The lower level (450 m) is the Badenian abrasion surface already mentioned. In the Pavlovské vrchy (Hills) due to analogous structural and paleogeographical conditions the Lower Miocene surface could develop, but its remnants have not been preserved. This results from the sandwiching of the Lower Miocene deposits between slices of the Jurassic limestone (Z. Stráník 1963) and from the great inclination of the thrust plane of the Ždánice nappe (Z. Stráník, E. Benešová, F. Pícha 1968, profile p. 98). The movements on the post-Badenien cross faults are also important. They throw doubt upon all conclusions inferred from the analysis of height of the surfaces. The basic changes in paleogeography and geomorphological development occured in the Badenian during the young Styrian phase which initiated the late-orogenic (neotectonic) stage. The Vienna Basin has assumed its present ground plan (except the Hradiště Graben), bordered by distinct radial faults. The forming orographical units, the Pavlovské vrchy (Hills), Vizovická vrchovina (Highland) and the Bílé Karpaty (Mts.) have appeared, in comparison with it, as horsts. Generally however the anticlinal type of movements has prevailed.

The remnants of the Lower Miocene, the Badenian and the Pannonian deposits on cut folded structures suggest that the amount of denudation of the flysch was not great in the neotectonic stage. Most probably, due to repeated transgressions the denudation took place mainly in the Neogene sediments. The geomorphological reconstruction therefore should consider also the repeated burrying and exhumation of the older relief. Particularly at the basin margins there are some resurrected surfaces on the narrow fault blocks in altitude close to younger planations.

Problematic is also the interpretation of correlative sediments in the Vienna Basin. Except the material from neighbourhood, sediments from the Bohemian Massif, great parts of the Alps and their northern forefield were brought here. Important is also fact that on the planation surfaces, owing to intensive modellation in Quaternary we do not find fossile weathering products and paleosoils. Nevertheless, especially the many-coloured layers in the Vienna Basin constitute the possibility how to precise the geomorphological development.

The planation surfaces of the investigated area are well preserved in the Pavlovské vrchy (Hills) and the lower southern part of the Vizovická vrchovina (Highland). Striking is especially the regional planation surface of 350 m, situated 160—190 m above the flood plains of the main water courses. In the Pavlovské vrchy (Hills) the surface cuts the faults disturbing the Badenian sediments. In the Vizovická vrchovina (Highland) deposits of the Pannonian age are preserved on it. H. Riedl (1960) in Leiser Berge ranged this surface into Upper Pliocene. According to H. Nowak (1969), in the Austrian part of the Carpathian Foredeep the surface has developed from the Pannonien till the Upper Pliocene. This conclusion is valid for our territory too, but here it is a complicated polygenetic surface in which also the pre-Pliocene exhumend elements could participate. This relief form is the most important from the viewpoint of the correlation of planation surfaces.

The remnants of surface of 270 m, which have already certain relations to the valley pattern, can be found in places under the level of 350 m. Somewhere they have the features of pediments. The position closely above the highest river terraces suggests Upper Pliocene age. The smaller extent is due to extensive development of Pleistocene cryopediments. They form mostly the bottom of basins connected with short water gaps or pediment passes. In places the destruction of the older relief was so intensive, that we may speak about cryoplain accompanied by residual hills quite analogic with inselbergs. The development of cryopediments was expressively controlled by lithology. They can be found mostly on weak Neogene deposits or moderately consolidated flysch claystones. This dependence somewhere resulted in relief inversion of the same type as that developed in the Bílé Karpaty (Mts.) in the Tertiary.

Substantially more complicated problems are met with in highland and mountainous relief. The state of their research in our country was described by J. Demek et all (1965), T. Czudek, J. Demek and O. Stehlík (1965) and J. Demek (1976). As a rule it is difficult to determine even the number of planations. Dating, when it is proposed, rests mostly on analogy with other regions. Except the idea of Miocene abrasion, all previous conceptions have their starting point — regardless whether they come to the conclusion of single dislocated planation surface (J. Krejčí 1944) or of number of levels — exclusively in tectonic causes. For example A. Winkler-Hermaden (1957), on the basis that in the Vienna Basin the compressional tectonics is separated from the tensional one, adds to every folding phase two planation surfaces. But the basic presumption was modified by new research (V. Špička 1966). In earlier works uniform lowering of all surfaces is also tacitly anticipated. Climatic aspects of planation surfaces were not considered at all.

It is necessary to say that only little interest is devoted to the higher flysch relief at present. From the Wienerwald where the geological structure is similar to mountain areas of the flysch Carpathians in Moravia, A. Winkler-Hermaden in his comprehensive book only briefly quotes G. Götzinger, who distinguished three more distinct levels in 520 m, 560—570 m and 600—620 m and less striking planations in 760—780 m and in 800 m. The highest surface is according to A. Winkler-Hermaden of the Lower Pannonien age.

The above mentioned difficulties can be demonstrated on the Bílé Karpaty (Mts.). The structure of the Neogene deposits at the southwest termination indicates a brachyanticlinal closure, from which the height of mountains increases succesively towards NE. In the south-west part of the mountains, east of the city Strážnice, we can find two planation surfaces in the axial part which are difficult to distinguish. The lower one is accompanied by fault steps at the outer edge. On the contrary, in the highest parts, e. g. in the surrounding of fhe Velká Javořina (970 m), at least 5 levels (820—880 m, 650 m, 500—550 m, 450 m and 380—420 m) may be determined on the morphographical basis.

However, the genetic and chronologic considerations are complicated at least by three factors: 1) cross faults of NW-SE direction, reflecting movements of the deep platform basement; on the faults topographical steps are developed in some places, 2) according to P. Grecula — Z. Roth (1978) a Tertiary subduction zone passes under the Bílé Karpaty (Mts.); that might be in connection with the manifestations of young longitudinal tectonics found by J. Moschelesová (1923); 3) at present it is not possible to relate definitely any planation surface of the Bílé Karpaty (Mts.) with the surface of 350 m in the Vizovická vrchovina (Highland), which forms a part of their western forefield.

This article could not discuss all the problems, e. g. the influence of folding phase migration etc. Nevertheless our analysis shows that the forms analogic with the „Augensteinlandschaft" and „Raxlandschaft" have not been preserved in the present relief in Moravia. However, it is possible to find them in the sedimentary record of the Neogene basins. For the correlation of the relief of the Western Carpathians and the Eastern Alps only the lowest present time planation surfaces time may be considered. The research of the highland and mountain relief has not advanced sufficiently till now.

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S o u h r n

RELIÉF JIHOVÝCHODNÍ MORAVY Z HLEDISKA GEOMORFOLOGICKÉ KORELACE ZÁPADNÍCH KARPAT A VÝCHODNÍCH ALP

Současné denudační chronologie Západních Karpat a Východních Alp jsou velmi rozdílné. Pro jejich korelaci, potřebnou z hlediska tvorby přehledných geomorfologických map a z toho, že se u nás začínají objevovat termíny alpské geomorfologie (Z. Roth 1975), má význam hlavně reliéf po obvodu Vídeňské pánve. Dnešní reliéf flyšových Karpat jv. Moravy je svým založením sice starý, pro korelaci lze však uvažovat jen mladší, dobře zachované povrchy pahorkatin a některých vrchovin. V členitých vrchovinách a zejména hornatinách nedospěl výzkum ještě dostatečně daleko. Prvky analogické s tzv. „Augensteinlandschaft“ a „Raxlandschaft“ lze u nás hledat hlavně v diskordancích a korelátních sedimentech neogenních pánví.

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MILAN KONEČNÝ

ANTHROPOGENIC GEOMORPHOLOGY: QUESTIONS, PROBLEMS, TASKS

1. Preface

Geography is a scientific discipline able to explain and tackle the interrelationships of physico-geographic and socio-economic phenomena and processes in the period of the scientific-technical revolution whose attendant symptom is even the increasing pressure of the society on the natural milieu. Tackling of such an intricate complex task is accompanied with efforts of physical and socio-economic geographers for mutual understanding and application of their disciplines for the purpose of reaching their object, i. e. the identification, knowledge, explanation, suggestion of measures and prognosis of the future development of landscape transformation by human activities.

Although the problems of the effects of human activities on natural environment were paid increased attention as late as after World War II, works dealing with these problems are met in the world literature many years earlier. To the first generally appreciated authors belong the American scientist G. P. Marsh and the outstanding Russian geographer A. I. Vojejkov who contributed to knowledge of the character, extent and impacts of the uncontrolled interference of man in natural processes as early as in the second half of the 19th century.

With time, even specialists of the individual sciences on Earth, above all geographers and geologists, have begun to take notice of the specific manifestations of the pressure of human society on natural environment. The German geographer E. Fisher (1915) points out the role of man as the youngest geological factor, numerous authors pay attention to anthropogenic transformations of geomorphological processes (R. L. Sherlock, 1923; K. Bryan, 1925; G. V. Jacks and R. O. Whyte, 1939; S. Pawlowski, 1923). Great upsurge as to the number of such studies can be registered in geographical literature since the fifties of this century up to the present times. An important contribution to the knowledge of the economic influence of man on the Earth surface was the work of the German economic geographer, E. Fels (1954). W. D. Thornbury (1969) devotes in his work the chapter „Applied Geomorphology" to the utilization of geomorphological knowledge in hydrological applications, extraction of mineral raw materials, designs of technical projects, oil extraction and military application.

The geographers of socialist countries have too a significant share in this development paying their attention not only to the research within the frame of the different disciplines but even to the application of geomorphological knowledge in complex studies A. S. Devdariani, 1954; J. Dylik, 1954; L. Zapletal, 1969; I. P. Gerasimov, 1970; J. Demek, 1973; F. N. Milkov, 1973, etc.).

It can be stated that geography as a whole responds to the necessity of investigations of the diverse effects of the society on the natural environment in two ways. On one side, new complex geographical disciplines are formed, such as complex physical geography or science on landscape, on the other side new scientific branches develop within the frame of the fundamental geographical disciplines (geomorphology, soil geography, biogeography, etc.).

2. Definition and delimitation of the subject of study of anthropogenic geomorphology

Anthropogenic geomorphology belongs to the youngest geomorphological disciplines. The author of the paper considers anthropogenic geomorphology a new branch of general geomorphology. Subject of its study are in the sense:

s.l.: all direct or mediate effects of human society on the relief of continents and oceans

s.s.: the study of the aspect, genesis and age of anthropogenic relief forms, as well as the space—time aspects of the registration, evaluation and prognosis of anthropogenic relief transformations of the territory discussed.

Although anthropogenic geomorphology is a discipline generally acknowledged in literature, its definition and delimitation can only seldom be found especially in geographical and/or geomorphological dictionaries. R. W. Fairbridge (1968, p. 525) mentions for instance the term of anthropogenic geomorphology only in connection with the elucidation of the role of man as a geological agent in the Holocene. In another place (pp. 15 to 18) he pays greater attention to the description of anthropogenic geomorphological processes. S. V. Kalesnik (1968, p. 19) does not give the definition of anthropogenic geomorphology either but specifies anthropogenic factors as a group of ecological agents including various forms of the influence of man on the flora and environment. F. D. Monkhouse and J. Small (1978, p. 14) define the subject of „anthropogeomorphology" as the study of relief forms created by man (pits, quarries, dumps, lakes).

More attention is paid to problems of anthropogenic geomorphology and its different aspects in geomorphological textbooks and papers. Let us say — before a characteristic of the approaches of some authors to the problems forming in our opinion the subject of study of anthropogenic geomorphology — that some of them class a part of the problems of anthropogenic geomorphology with the discipline called „environmental geology" (Flawn P. T., 1970; Tank R. W., 1976). This fact proves even the effort of the other sciences on Earth to contribute to the solution of the effects of man on the modification of the Earth surface and the related processes. It is impossible not to see that in most cases „environmental geology" only introduces physico- and socie-economic geographical aspects of the interrelations man — environment, the complex expression of which by geographers is not always available. An important part is played even by the fact that in some Anglo-American countries geomorphology is considered a part of geology. The subject of study of „environmental geology" is therefore often integrated in that of anthropogenic geomorphology or „environmental geomorphology" which I consider synonyms. Let us prove now the statements mentioned by opinions of some authors about the role played by geomorphology in the study of reciprocal effects of man and environment.

D. G. Panov (1966, p. 6) mentions anthropogenic relief forms to human activities conditioning even the dynamics of geomorphological processes.

J. Pilawska (1968) arrives in her considerations concerning the changes of the geographical milieu by mining at the conclusion that, besides geomorphology, such transformations must be tackled even by other geographical disciplines. The investigations which had formerly only a space aspect have even a branch aspect at the present time.

I. P. Gerasimov (1970, p. 13) demands that the knowledge of anthropogenic effects on geomorphological processes results in their prognosis and, simultaneously, in measures which 1) will reduce the effects of destructive elemental processes and 2) will lead to the formation of natural-technical systems. Mapping of the consequences of anthropogenic influences is necessary too.

P. T. Flawn (1970) specifies in the preface to hist book „environmental geology" as a part of ecology dealing with the relationship of man to his geological locality.

R. U. Cooke and J. C. Doornkamp (1974) consider „environmental geomorphology" a discipline dealing with the geomorphological aspects of human influence on natural milieu. They suppose that the revival of interest and the specialization of geomorphologists in these problems is caused by the exploitation of natural resources and its consequences which have to be solved by society, and 2) the transformations of geomorphology as a whole, because the latter must work in the solution of the problems of environment in context with social, economic and technical sciences i. e. sciences with which the exchange of information is mutually relevant. The knowledge resulting from the analysis of individual geomorphological processes is also of use in environmental management.

F. N. Milkov (1974, p. 4) suggests to regard anthropogenic geomorphology as an independent science or as „a special part of general geomorphology". He considers as subject of study of anthropogenic geomorphology anthropogenic morphosculptures and its task — the study of direct and attendant anthropogenic forms with the registration of the effects of economic activities on the modelling of natural relief forms.

P. F. Molodkin (1976, p. 77) defines anthropogenic geomorphology as a part of general geomorphology studying the anthropogenic relief of the Earth surface, its structure, development and genesis. As method of study he considers the anthropogeomorphological analysis investigating the mechanism of natural and anthropogenic processes in the modelling and development of the anthropogenic relief.

R. W. Tank's (1976, p. 2) delimitation of the characteristics of the geological environment is based on the conception of ecology as a science dealing with the relationships between organisms and environment.

J. C. Frye (1976, pp. 3—6) takes interest in the task of the sciences on Earth in tackling the environmental problems which he divides into five groups: 1) gathering of data for planning practice with respect to physiognomy, surface and sub-surface characteristics especially in extension of urban areas (in utilization of topographical and geological maps, knowledge of engineering geology, soil mechanics, prognoses of potential landslides, etc.), 2) determination of factors affecting the security and stability of surface and subsurface waste dumps, 3) provision of information for planned utilization and ensurance of water resources for the population, 4) identification of perspective natural resources, 5) recognition of man as the main geological factor by monitoring of the changes he evokes in environment and preventing the consequences of these activities.

From the review submitted it follows — besides the knowledge mentioned above — that 1) most authors study anthropogenic relief transformations for the needs of research in the sphere of the formation and protection of environment; continuity with other geographical disciplines is elaborated only slightly, reserves exist above all in the application of the knowledge of the complex discipline dealing with the relationships between society and natural milieu — the landscape science. 2) some authors (P. T. Flawn, 1970, R. W. Tank, 1976) slightly suppress in their approaches the principle of regionalism (in I. P. Gerasimow's conception — 1976) in behalf of the principles of anthropogenism and ecologism. 3) some authors (D. G. Panov, 1966, W. D. Thornbury, 1969) attribute the solution of numerous problems of anthropogenic geomorphology to applied geomorphology. In spite of the fact that the author of this paper considers applied research as one of the most important criteria the results of the discipline to social needs, he believes that applied geomorphology makes use only of a partial knowledge of geomorphological branches and, accordingly, even of knowledge resulting from the study of anthropogenic relief transformations. This means that applied and anthropogenic geomorphology are different disciplines of geomorphology.

3. Contribution of Czechoslovak geomorphologists

The works of authors dealing in Czechoslovakia with some aspects of anthropogenic geomorphology can be summarized in 3 groups. The works of first group deal with theoretical problems and result usually either in general systematic classifications of anthropogenic relief forms or delimit the effects of man on the Earth surface (L. Zapletal, 1969; J. Demek, 1973; M. Hrádek, 1976). The second group consists of works devoted to the geomorphological analysis of a certain teritory with application of its basic method — geomorphological mapping. The maps belong by their conception to general geomorphological maps, including besides genesis, aspect and age of relief forms even an information on anthropogenic relief forms. These forms are in large, medium and small-scale maps represented almost exclusively by conventional extra-scale symbols. Works drafted in this way have — as to number — the upper hand to both further groups (J. Demek, 1959; V. Král, 1969; B. Balatka et al., 1972; T. Czudek, 1971; A. Ivan, 1975). The third group is represented by works investigating and recording exclusively the effects of man on the relief. They present either: a) a review of anthropogenic forms and interferences with the relief (J. Loučková, 1969, 1974) or of forms and transformations of the relief by a certain type or gamut of economic activities (O. Stehlík, 1971; L. Zapletal, 1976 a, b) or evaluate the effect of economic activities on the relief in the whole complex (O. Stehlík, 1975).

4. Means of expression

Traditional, effective and still basic means of expression of the results of geomorphological studies are their cartographical interpretations in the form of thematic maps and cartograms.

The geomorphological map is considered an information system which is a model of really existing geomorphological geosystems. Owing to the increase of information on the relief, its full recording in a geomorphological map is still more difficult if the criteria of correctness, objectivity and lucidity are to be respected. This is why other, special geomorphological maps develop whose contents is determined by the purpose of application. In my opinion, these maps only elaborate a certain part of the information system which has already been recorded in the general geomorphological map. The general geomorphological map keeps, therefore, its fundamental significance, irreplaceable so far.

From the point of view of the tasks imposed on geomorphology by the problems of the interrelations of society and environment, geomorphological maps can be divided into two groups. The first group of maps supplies information on the character of the relief and its suitability for utilization by a certain type of human activities. Sufficient information of this kind can be derived from general geomorphological maps characterizing the aspect, genesis and age of the relief, or from partial geomorphological, above all morphographic and morphometric maps (e. g. maps of vertical dissection, density of dissection, density of erosion network, valley depths, etc.). The second group represented by special maps makes possible the evaluation of the economic activities of man with respect to the relief which lead in most cases to the disturbance of the natural dynamic equilibrium of the relief, resulting in a transformation and modification of the course and intensity of geomorphological processes (erosion, development of landslides, etc.).

The author of this paper attempted to compile such a special map in the region of the Boskovická brázda (Boskovice Furrow) (M. Konečný, 1978). In the original of the map he represented by contour lines and conventional symbols with differentiation in colour the individual anthropogenic relief forms and by flat tint the probable soil erosion in mm per year for the whole area covered with agricultural land.

A great advantage of these maps compared to general and partial geomorphological maps is the possibility of the expression of the prognosis of geomorphological processes on the basis of the preceding development and the present-day state of the relief.

Difficulties in the application of general and special geomorphological maps are caused by the lenght of their preparation and the various demands of the map users who often lack training in utilization of such maps. In the first case, much can be improved by automation of map construction, in the second case by elaboration and stabilization of the respective legends of general and above all special geomorphological maps.

To satisfy the increasing demands of various institutions on a sufficient number of topical relevant information on the relationship man — environment, a progressive classification of information and a formation of information systems take place. Improved geographical and/or geomorphological information systems are becoming their organic components. I consider an information system — according to Langefors (B. Langefors, 1966) — a system involving elements for collection, transmission, preservation, processing and giving of information. A special feature of a geographical and, accordingly, a geomorphological information is its space and time character. A space information demonstrates the distribution of elements of certain properties and allows to study their interrelationships.

Data on the natural milieu are obtained in field research by the study and interpretation of air and space photos or by the combination of these methods. In information systems they usually refer to rectangular projections of certain space units (squares, hexagons) on a chosen topographical area. The space units become in this way the territorial carrier of information. The amount of the information carried is determined by the purpose and level of the information system. These criteria are valid also for the amount and structure of information supplied into the information system by the individual scientific disciplines. Processing of gathered information is carried out in computers, making possible the printing of cartograms of the characteristics of the different elements or their various combinations.

Anthropogenic geomorphology supplies to such information systems data concerning anthropogenic transformations of the relief. Output information can inform on the individual anthropogenic relief forms, the modification of the course of present-day geomorphological processes including their prognosis and supply an idea of the degree of the anthropogenization of the territory.

5. Tasks of anthropogene geomorphology

In my opinion, the solution of the following tasks is absolutely necessary for a further intensive development of anthropogenic geomorphology and an increase of its significance for social practice:

1) elaboration of the theory and methods of research of the origin and development of relief forms and relief-forming processes owing to economic activities of society
2) elaboration of theoretic bases of anthropogeomorphological prognoses of relief development in depedence on the economic activities of society, regional-geographical and zonal-climatic conditions
3) delimitation of anthropogenic factors in the formation and transformations of the relief and elaboration of the typization and classification of anthropogenic relief transformations
4) selection, systematization and preliminary data processing for the needs of information systems on the territory.

6. Conclusion

The author of the paper submits a review of the main questions, problems and tasks of a new branch of general geomorphology — anthropogenic geomorphology. He believes that anthropogenic geomorphology will enrich the whole geomorphology with new knowledge elucidating the reciprocal relation and effects of human society on the relief and will utilize the possibility of tackling the fundamental problems of environment for which it has the necessary qualification.

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Résumé

ANTROPOGENNÍ GEOMORFOLOGIE — OTÁZKY, PROBLÉMY, ÚKOLY

Autor článku se zamýšlí nad otázkami, problémy a úkoly antropogenní geomorfologie. Za její předmět studia považuje v širším smyslu všechny přímé či zprostředkované vlivy lidského společenství na reliéf pevnin a oceánů, a ve smyslu s. s. studium vzhledu, geneze a stáří antropogenních tvarů reliéfu, jakož i prostoročasové aspekty registrace, vyhodnocování a prognózy antropogenních transformací reliéfu daného území. Upozorňuje, že někteří autoři zařazují problematiku této disciplíny do tzv. „environmental geology". Ve většině případů však jde o zavádění fyzicko- a socioekonomicko geografických aspektů vzájemných vztahů člověk — prostředí, které nejsou vždy od geografů k dispozici. Dále autor uvádí přehled některých názorů na pojetí antropogenní geomorfologie a věnuje speciální část rozvoji disciplíny v Československu. Za základní prostředek vyjádření výsledků geomorfologických studií považuje kartografickou interpretaci ve formě tematických map a kartogramů. Z hlediska úkolů, které před geomorfologii klade problematika vzájemných vztahů společnosti a prostředí, lze geomorfologické mapy rozdělit do dvou skupin. První podává informaci o charakteru reliéfu a jeho vhodnosti pro využití určitým typem lidské činnosti (Obecné a dílčí geomorfologické mapy). Druhá, reprezentovaná mapami speciálními, umožňuje hodnocení a prognózu hospodářské činnosti na reliéf. Autor upozorňuje i na úlohu geografických, resp geomorfologických informačních systémů v informačních systémech o území a možnosti zpracování informací pomocí počítačů, jejichž grafická zařízení umožňují vytištění kartogramů charakteristik jednotlivých prvků, či jejich kombinací. Antropogenní geomorfologie poskytuje pro takovéto informační systémy údaje týkající se antropogenních transformací reliéfu.

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Ročník 1980 • Číslo 1 • Svazek 85

LUDVÍK LOYDA

PARALOGISM IN GEOMORPHOLOGY

There is no doubt about climatic geomorphology to be one of natural sciences. Nevertheless its development is in no way similar to them. The greater part of these sciences has originated in the antiquity already and their evolution has by far not yet been completed. On the other hand geomorphology has resulted from the work of only one generation of scientists. They created its fundamental principles and solved all its problems in the main. Nowadays, their precepts are being only applied to, and there is no problem more which could not be made clear on this basis.

Therefore, geomorphology was not developing as slowly as other sciences, but it arose nearly all of sudden — after the victorious struggle of erosional ideas concerning the river valley genesis against the tectonic conception This was acknowledged by Hettner (1928, p. 28): „Mit dem Siege der Erosionstheorie ist die Morphologie eine selbständige Disziplin gegenüber der Tektonik geworden."

With regard to the lack of deep boreholes, of geophysical and geodetic measurements, the erosional as well as tectonic explanations had of course to be entirely or mostly speculative at that time. That is why deduction became the only working method of climatic geomorphology — from the forms of the relief directly their genesis was deduced. On this basis the genetic system of W. M. Davis was elaborataed. But Hettner (p. 29) did not agree with this incorrect method and criticized Davis's ideas: „. . . ihre ganze Deduktion von der Erosion des fliessenden Wassers ausgeht; sie rechnen damit als mit einer bekannten, nicht weiter zu untersuchenden Tatsache."

Onesided erosional deductions cannot be held for a research of nature, in fact, but only for individual ideas trying to elucidate the origin of valleys and of other forms of the relief. Hettner is right if noting that only mistakes arise in this way. Therefore he criticizes the erosion theory sharply: „ . . . sie macht sich die Art des Einschneidens und die Grenze der Erosionsarbeit oft nicht genügend klar und ist dadurch zu falschen Vorstellungen und Schlussfolgerungen gekommen, die sie bei einem Durchdenken leicht hätte vermeiden können."

In addition to the above-mentioned reproofs he warns against dogmatic use of these incorrect explanations and calls for the deduction method to be complemented with the inductive way of research: „Auch heute enthält die Theorie (der Erosion) noch eine Anzahl zweifelhafter Sätze, vor deren dogmatischen Anwendung man sich hüten muss. Sie muss mehr bisher in jeder einzelnen Ausstellung mit der Wirklichkeit verglichen, durch induktive Betrachtung geprüft werden." Moreover he reproves the geomorphologists for their ignoring of this requirement all the time: „Die meisten jüngeren Morphologen widmen sich dieser Arbeit solider Grundlegung zu wenig."

It is evident that there are serious defects and imperfections within the fundamentals of the erosion theory i. e. in the root of all the climatic geomorphology, too. This is understandable, since geomorphology did not virtually originate as a science exploring natural processes, but as a science only publishing considerations about valley genesis. This state lasts practically from the time of the origin of this science. Its working method has not at all changed till now. This is proved even by Carson's and Crickmay's judgment of the scientific level of modern geomorphology. Carson (1971) writes: „Much attention has been given — at a superficial level — to corrasion as a major general mechanism of erosion. Notwithstanding the attention paid to corrasion by geomorphologists, however, very little is known about the mechanics of this process."

Of course, if research has not at all advanced till our time, then original erosional conceptions still remain unverified. That is why they cannot be held for scientific precepts. They are still only primary ideas which can well be right but more probably are not. Every hypothesis has to be verified — otherwise it remains only an idea and is of no value for science. Crickmay (1974, p. 195) is very well aware of the peculiarity and relevance of today's state of things in geomorphology and he estimates it very critically — he is sure that the requirement to verify precepts would be quite a revolution („this, in itself, is a form of revolution; passive, perhaps, but all the more insidious").

The lack of verification is thus the fundamental feature of the whole erosional theory. Since it is the question of mere speculations, it is useless trying to argue against them, e. g. by a detailed geomorphological study in river valleys. We find here for the most part nothing which could prove or disprove erosional interpretations. The incorrectness of genetic erosional explanations is to be likely brought to light by an analysis of their form and subject and by their mutual confrontation. Thus we get out of the framework of natural research, but if the incorrectness of erosional presuppositions is to be detected, there is no other way.

In contrast to other sciences, disputations have not in fact been taking place in geomorphology. The only controversy between adherents of erosional interpretations on one hand and adherents of tectonic views on the other hand took place in the past century already. With a common lack of substantial proofs, it must have been only the matter of an exchange of opinions. It was, therefore, the mere ability to argue promptly which gained the victory for the erosional theory.

As early as in the antiquity philosophers pursued from a common point of view the analysis of the incorrect but successful argumentation. That is to say, that already then a successful advocate of a wrong conception unjustifiably gained a reputation of a wise man, of a scientist. This was the way of the sophists disputes. Even experts — after Aristotle — got embarassed by their arguments. Neither recognizing the grounds of a discussed problem nor convincing the opponent, but gaining a victory at any rate is the question in such an argumentation. The sophists' seemingly conclusive argumentation is, in fact, always fallacious in its form or subject.

Aristotle enumerates 13 kinds of fallacious arguments (paralogism). Some of them are to be found among the genetic precepts of geomorphology, too. Let us start e. g. with the geomorphologic term „erosion". This term is the point of departure of all other erosional explanations and an example of a multisense word (homonymy). In erosional precepts „erosion" aplies either to trasport (wearing away), or to disturbing activity (corrasion, abrasion), or to various combinations of more processes — weathering, corrasion, corrosion, denudation, and transport.

In the German geomorphologic literature erosion is not even regarded as a separate process — „Erosion, Transport und Akkumulation . . . doch nicht scharf zu trennende Vorgänge sind, sondern in steter Wechselwirkung stehen“ (Machatschek 1954).

It is sure that a vague i. e. incorrect subject of the basic term „erosion“ must lead to incorrect and little reliable erosional explanations. One of the fundamental erosional theorems — that a river can deepen its valley even in the hardest rocks if having time enough — can serve as an example. In its support it is said that even drops of water can deepen a pit in a hard stone („Der Tropfen höhlt den Stein", Hettner 1928). This seemingly conclusive argument is, of course, an example of paralogism called „ignoratio elenchi“. One statement is here wilfully changed for another. Surely both these processes cannot be confused — the matter is corrosion and weathering in the case of dropping water, but corrasion and transport in the case of river activity.

After another deep-rooted presumption the mere existence of a valley with a water stream on its bed is held for a proof of the erosional genesis of the valey. This is nothing than another paralogism, called „petitio principii", i. e. the thing still to be proved is held for entirely proved already. Such an erosional interpretation could be correct only in the case if the valley originated in loose rocks. To give general validity of erosional genesis to all valleys is also an example of the paralogism „fallacia secundum quid" — what is valid under specific conditions is held here for common.

If we ask the question „what has existed earlier — the valley or the river flowing on its bed", we get near the paralogism „fallacia consequentis“ which counfuses the cause with the consequenc. It is rather difficult to imagine how and where the stream has flown before a valley was formed — especially on the surface of hard rocks. On the other hand it is quite easy to understand that water always gathered (as it is in our time) in the lowest parts of the relief i. e. in depressions and valleys. Therefore the existence of the valley must have been antecedent to the forming of the water streams. A diametrically different opinion is taken for granted by the erosional theory.

The genesis of river terraces can be surely explained in two ways — by erosional or by tectonic activity. Climatic geomorphology rejects the tectonic explanation and halds the erosional genesis for self-evident and proved. Here it is again the question of the above-mentioned paralogism „petitio principii“. To this kind of paralogism probably all other erosional explanations can be ranged — on the inversion of the relief, on the water erosion being more intensive than the glacial erosion, on the erosional origin of submarine canyons, on antecedent and epigenetic cutting down of rivers into hard rocks, on the origin of valleys on the Mars and on the Moon, on the backward erosion, on the cutting down of meanders, etc. As, in fact, none of the erosional interpretations has been proved, all the erosional „theory" cannot be held for right.

By bringing cases of paralogism in erosional explanations to our attention, we are able to understand better why Peschel's right tectonic interpretations from the past century could be rejected so easily and without research. This reminds us again of the low quality of erosional genetic interpretations which form the basis of modern climatic geomorphology.

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Résumé

PARALOGISMY V GEOMORFOLOGII

Je známo, že geomorfologie se nevyvíjela od starověku jako většina ostatních přírodních věd, ale vznikla vlastně naráz — při vítězné konfrontaci erozních názorů s tektonickými. Není vědou, která zkoumá přírodní procesy, ale na základě dedukcí pronáší pouze úvahy o údolní genezi ap. Tento stav trvá dodnes. Erozní výklady zůstávají přitom stále neověřeny, a tak je vlastně nelze považovat za vědecké poučky. Požadavek ověřování těchto výkladů by zřejmě vyvolal úplnou revoluci (Crickmay 1974).

Chybné dedukce se ovšem nedají vyvrátit podrobným geomorfologickým zkoumáním přírody. Protože jde pouze o úvahy, lze jejich nesprávnost odhalit spíše rozborem formy a obsahu jednotlivých pouček a jejich vzájemnou konfrontací. Tím se zabývali i filozofové starověku. Úspěšný obhájce chybného názoru už tehdy získával neoprávněně pověst moudrého člověka. Tak vedli své spory sofisté. Aristoteles uvádí 13 druhů paralogismů (klamných soudů), které sofisté používali a z nichž některé nalezneme i v geomorfologických výkladech.

Známým paralogismem je víceznačnost slov (homonymie). Jejím příkladem může být hned základní pojem „eroze". Ta je považována buď jen za transport nebo jen za rušivou činnost nebo za kombinaci více procesů — zvětrávání, koraze, koroze, denudace a transportu.

Erozní vznik údolí v tvrdých horninách je zase přirovnáván k vyhlubování jamky kapající vodou. Jde tu o paralogismus „ignoratio elenchi", tj. o vědomou záměnu jednoho procesu za jiný. Nejrozšířenějším je však paralogismus „petitio principii", kdy je za dokázané považováno to, co je třeba teprve dokázat. Sem patří snad všechny erozní poučky — o erozním vzniku říčních údolí, o inverzi reliéfu, o vzniku podmořských kaňonů, o epigenezi a antecedenci (v tvrdých horninách), o zařezávání meandrů, o větší síle eroze vodní než ledovcové ap. Protože žádné erozní tvrzení není vlastně dokázáno, nemůže být dokázána ani správnost erozní teorie jako celku.

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VÁCLAV ZAJÍČEK

INNOVATIONS IN REGIONAL TASKS OF WATER PROTECTION AND UTILIZATION

The effects and impacts of human activities on hydrosphere components are in many countries the subject of scientific research activities mainly in those with developed economy. Mutual exchange and confrontations of findings, methodological approaches and especially application of scientific data in practical solutions are everywhere of great significance. This holds specially true in actions that in their conceptions and processing contain progressive innovation elements.

In this sense the presented contribution deals with those topics in which national efforts can bring the best results on international scale. It is based on the fact that the problem is of interdisciplinary character and essentially belongs into the field of geography; additional scientific disciplines and application fields act as supplementary components.

1. Initial stage

The first, mainly analytical stage of increased till harmful damage of the hydrosphere components can be characterized as the period of the recording of damages, evaluation of causes and sometimes also of withdrawing from them. One of the important results of research activities in this stage is the differentiation of three categories of effects and resulting disproportions:

1. Harmful impacts of components of the socioeconomic field on the hydrosphere and especially on utilized or effectively utilizable water resources.
2. Harmful impacts and unbalanced interactions inside the hydrosphere mainly in the interactions between water management sectors.
3. Harmful impacts manifesting themselves from the hydrosphere outside, especially by the activities of water management on other natural, economic and social sectors.

The first group includes impacts of objects or production complexes of the primary and secondary sphere and effects of residential agglomerations as well as of man as individual. They have a harmful impact on precipitation, soil, ground and surface waters.

Shortcomings in interactions (category 2) arise, on the one hand, from activities of water management on the hydric base of the watershed and concern e. g. exploitation exceeding the acceptable extent of natural resources, on the other hand they are connected with the neglecting of hydraulic linkages existing between the components of the hydrosphere; this holds especially true for the hydrodynamic relationships of surface and groundwater.

The third group includes, on the one hand, harmful impacts caused by water as element, on the other hand local and regional effects of hydrotechnical structures (dams and impounding reservoirs, bridges, drainage systems, etc.).

The analytical period brought also numerous findings for the solution of practical problems (Zajíček 1973), of which it is necessary to emphasize mainly the following ones:

— The majority of problems can be solved, some immedietely, others after a longer time. Hence these problems can be tackled with a not exaggerated optimism.

— In spite of the fact that of the three mentioned categories the first is the most important, the hydrological and water management sector must arrange the relationships indicated in items 2 and 3. Only then can it assert its interests belonging to category 1.

— The solution of practical tasks cannot be narrowed down to the protection of isolated water resources. It requires the application of a wider spatial strategy in the genesis, regime and utilization of the hydrosphere components, especially in regions with intensive economic development. This means that the solution must be based on the optimal arrangement of structures and processes in space. Technological solutions are supplementary measures.

— Every collision between hydrosphere and the economic field must be overcome in its potential stage and on the principle of global optimisation, taking into balanced account economic, technical and ecological aspects.

— From the analytical phase it is necessary to exploit the maximum for the qualitative improvement of the location theory principles and for the spatial organization of economic activities. From this arises also the requirement not to admit actions causing mistakes and disproportions for the future.

— One of the most important principles in this sense is to stop with the prevailing one-sided exploitation approach to the hydrosphere components and to respect their potential in the planning and management processes on the scale of continents, countries and localities.

Under Czechoslovak conditions, the primary analytical research stage was essentially concluded at the beginning of the 70 's. It has become the basis for the synthetical solutions, and mainly for the permanent conceptional activity on this subject.

2. Solution principles

In the present stage of work there exist already sets of findings from the solution of problems as well as from satisfactorily executed tasks of economic development. Generally, in a cultural region the hydrosphere components maintain the necessary quantitative and qualitative level only when three basic principles are consistently consident in research as well as implementation field:

a) Hydrology permanently supplements its fund of findings, being able to provide in all situations necessary data, arguments as well as complex data.

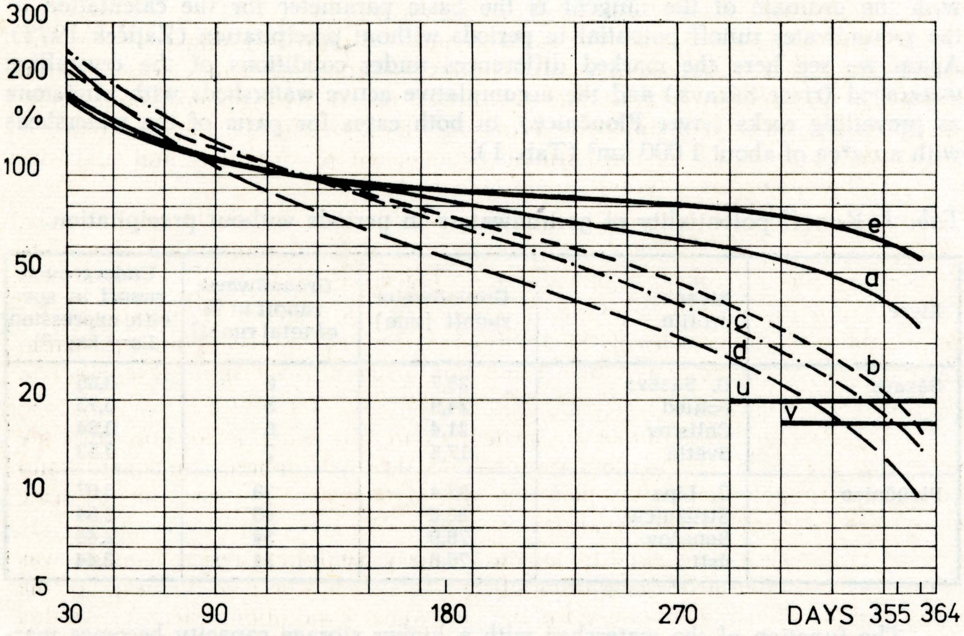
b) Research develops and practice implements hydrotechnical innovations, which already take a balanced account of water management as well as interests of other sectors in the given region.

c) The factor water is included on all levels of planning activities among the most important indicators; it serves mainly as location factor.

2.1 Supplementation of the fund of hydrological findings

Although this first principle concerns the advance in hydrology as such, it applies mainly for hydrological sectors effectively bound to the subject under discussion. Of greatest importance are problems of the discharge regime and problems of vulnerability of the different runoff components.

Water resources are mainly threatened under extreme runoff conditions, especially during drought periods. For their evaluation in watersheds of different size, dimensionless duration curves and additional characteristics arising from them are used satisfactorily. This holds true mainly for Central Europe having relatively small differences in the basic climatic parameters. As decisive factors in the distribution of runoff act categories of rock media in the different watersheds



1. Dimensionless duration curves of daily mean discharges for 30 to 364 days in the year: a — Svitava—Letovice, b — Labe State frontier, c — Morava — confluence, d — Svratka below Bystřice, e — Somme: u, v — parameters referring to 355 day water.

Selected duration curves in the Labe and Danube watersheds (Fig. 1) characterize thus on regional scale the poor capacity of rivers to overcome dry periods on a higher runoff level (Type d) in granite-gneiss regions; on the other hand they exhibit a high cumulative potential of the mighty layers of sedimentary rocks (Type a). With larger watersheds (Type b, c), the resultant characteristics correspond to the shares of the partial watersheds of the preceding types. The abscissae u, v in the range of low flows, e. g. in the ordinate of 355-day water (20 % Qa in the case of the river Labe and 17 % Qa in the case of the river Morava) determine for their tributaries the minimum limit of the necessary enrichment, reaching at least the runoff level of the main watersheds. In places where to the basic hydromechanical condition of the rock medium increased precipitation frequency (in higher mountain positions or in seaside regions) must be added, the runoff characteristics in the range of 100 to 365-day waters are even more favourable. Under broader European conditions this can be seen in the case of the river Somme (Type e), which is a representant of a Cretaceous watershed in the French Atlantic zone. From this base we get further to the evaluation of runoff in the necessary intervals determined according to the m-day scale; in a similar way we process also floods in the n-day field.

Based on the duration curves of daily mean discharges, it is then possible for the chosen watersheds to evaluate the runoff phase of groundwater in periods without precipitation. In this case we define the duration curve analytically by means of an interpolation equation and we use the maximum of its derivation curve for the determination of the inflexion point of the tangent, which together with the ordinate of the tangent is the basic parameter for the calculation of the groundwater runoff potential in periods without precipitation (Zajíček 1973). Again we see here the marked differences under conditions of the crystalline watershed (river Sázava) and the accumulative active watersheds with sandstone as prevailing rocks (river Ploučnice), in both cases for parts of the watersheds with an area of about 1 000 km² (Tab. 1).

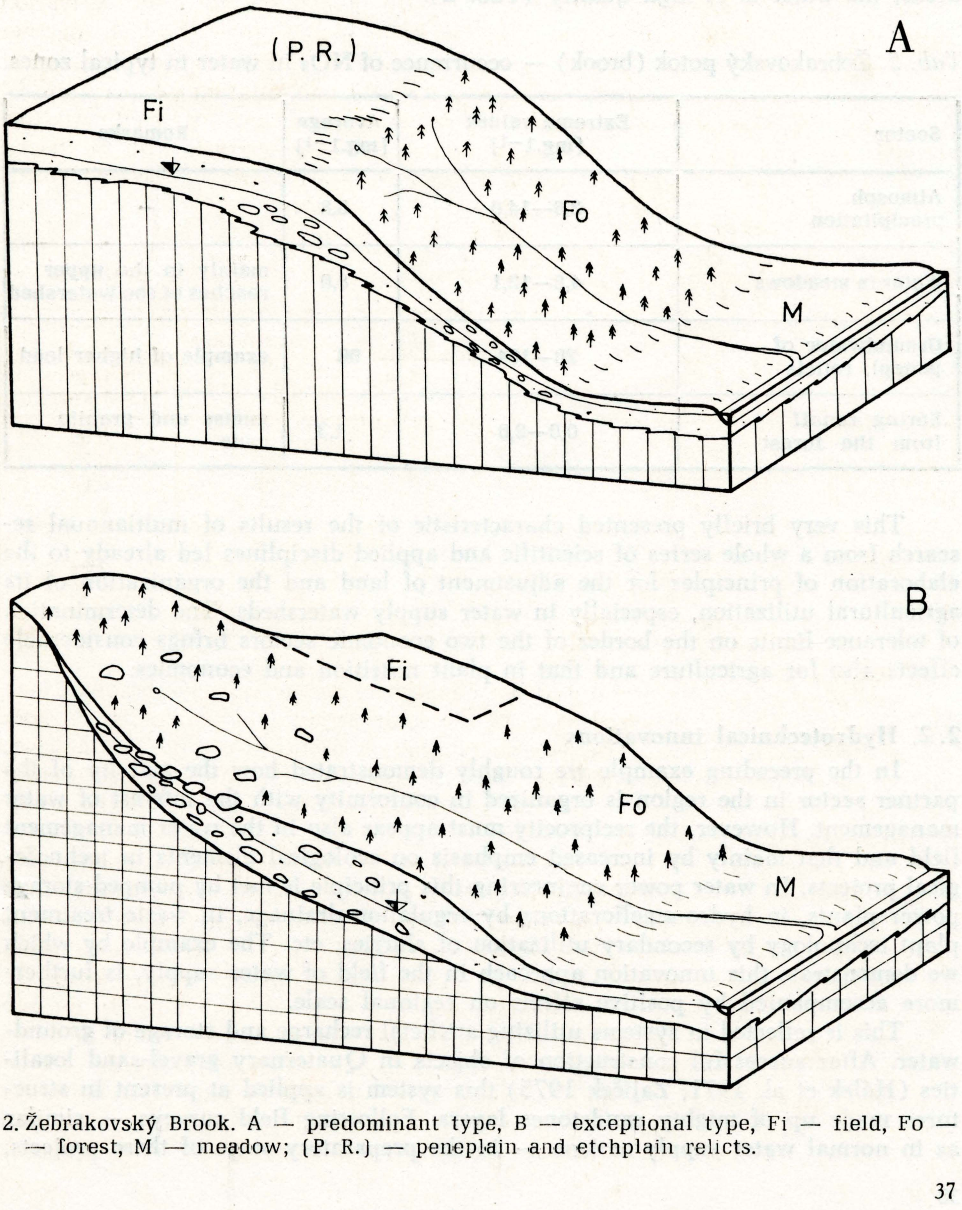
Tab. 1. Runoff potentiality of groundwaters in periods without precipitation.

River	River profile	Groundwater runoff (mm)	Groundwater runoff in % of total runoff	Underground runoff in specific expression ($l.s^{-1}.km^{-2}$)
Sázava	D. Sázava	28,7	8	0,85
	Pohled	24,9	8	0,75
	Chlístov	21,4	8	0,64
	Světlá	17,5	7	0,53
Ploučnice	Č. Lípa	97,4	39	3,07
	Stružnice	88,8	40	2,84
	Benešov	76,9	34	2,45
	ústí	76,8	34	2,44

The function of the watershed with a higher storage capacity becomes markedly evident also in the evaluation of the underground component in the total runoff from the watershed. For these instances it is useful to use the original method of separation (Kliner, Kněžek 1974). Applying this method, the relation between the actual variations of the groundwater table and the discharges in a surface stream is used.

In watersheds with low retention capacity of the litho-and pedosphere, the results of these analyses belong among the arguments for the construction of impounding reservoirs, where contrariwise to the former practice, there exists the possibility to make use of additional innovation elements. So for instance, based on regionally treated characteristics of showers, we consider regions from this aspect extremely inclined to soil denudations and thus we contribute, in the predesign stage, to the selection of variants. In addition we devote attention to the problems of larger water abstractions from reservoirs to cover the needs of other watershed and especially to the problem of compensation measures for the initial watershed, which we process using diurnal hydrographical data from long-term observation series (Malíšek et al. 1977). Numerical methods and suitable programs for large computers permit to overcome even problems of complicated water management systems. Thus we reach an incomparably more exact evalution than when using methods based on monthly parameters.

All mentioned work procedures are based on data of hydrographical services. In tasks requiring a more detailed knowledge of interactions (specially when interconnecting quantitative and qualitative problems) we use also the results of purposive research in small model watersheds. As example of a whole series of similar studies we present briefly the conclusions from a study of principles of nitrate load in waters. These results were obtained in the experimental water-



2. Žebrakovský Brook. A — predominant type, B — exceptional type, Fi — field, Fo — — forest, M — meadow; (P. R.) — peneplain and etchplain relicts.

shed of the Žebrakovský Brook near Světlá nad Sázavou, a typical representative of a peneplain region type, in which impounding reservoirs are situated in Czechoslovakia as well as in neighbouring countries.

Peneplain relicts are due to previous development in the Tertiary and Quaternary covered by relatively permeable soils and are utilized by agriculture (Fig. 2). Residual nutrients escape into groundwaters and springs and also into surface streams. Even relatively large percentages of forests on the slopes under the peneplain relicts have only a slight ameliorating function. On the contrary, where the forest reaches as far as the watershed divide (Type B) and the whole process of infiltration and groundwater flow to the springs takes place in forest areas, the water is of high quality (Tab. 2).

Tab. 2. Žebrakovský potok (brook) — occurrence of NO_3 in water in typical zones.

Sector	Extreme values (mg.l^{-1})	Average (mg.l^{-1})	Remarks
Atmosph. precipitation	2,6—14,0	5,8	—
Water in meadows	4,8—12,1	8,0	mainly in the upper reaches of the watershed
Groundwater of penepl. relicts	26—104	60	example of higher load
Spring runoff from the forest	0,0—2,6	1,3	gneiss and granite zone

This very briefly presented characteristic of the results of multiannual research from a whole series of scientific and applied disciplines led already to the elaboration of principles for the adjustment of land and the organization of its agricultural utilization, especially in water supply watersheds. The determination of tolerance limits on the border of the two economic sectors brings considerable effects also for agriculture and that in plant nutrition and economics.

2. 2. Hydrotechnical innovations

In the preceding example we roughly demonstrated how the activity of the partner sector in the region is organized in conformity with the interest of water management. However, the reciprocity must appear also in the water management field and that mainly by increased emphasis on ecological elements in technological projects. In water power engineering this principle is met by pumped-storage power plants, in hydro-ameliorations by regulation drainage, in waste treatment plant technology by secondary utilization of slurries, etc. The example by which we demonstrate this innovation approach in the field of water supply, is furthermore accompanied by positive effects on regional scale.

This is reflected in systems utilizing artificial recharge and storage of groundwater. After successful construction of objects in Quaternary gravel-sand localities (Hálek et al. 1971, Zajíček 1975) this system is applied at present in structures made up of mighty sandstones layers. Following field surveys — similar as in normal water supply actions — in the preparatory stage of these projects, model simulation and preliminary evaluation is applied, which in turn leads to the basic design of the system and its size category.

On the other hand, the solution proper of hydraulic processes in the groundwater reservoir must include innovation elements, beginning already with the determination of the necessary filtration and storage parameters exceeding the extent of current hydrogeological investigations. In the storage space and in the zone between infiltration objects and the well recovery line, substancially non--stationary groundwater flow processes are encountered; this can be described by partial differential equations including the mentioned parameters. In concrete cases it has been shown to be suitable to aproximate partial derivations by differential expressions for a rectangular network (Stránský 1975) and to obtain thus systems of differential equations, easily processable on a digital computer. Formally these equations can be written in the form

$$A_{i-1,j} \cdot h_{i-1,j,n} + A_{i,j-1} \cdot h_{i,j-1,n} + A_{i+1,j} \cdot h_{i+1,j,n} + A_{i,j+1} \cdot$$
$$\cdot h_{i,j+1,n} - A_{i,j} \cdot h_{i,j,n} = n_e \frac{h_{i,j,n} - h_{i,j,n-1}}{\Delta t} - W'(x,y,t),$$

where coefficients

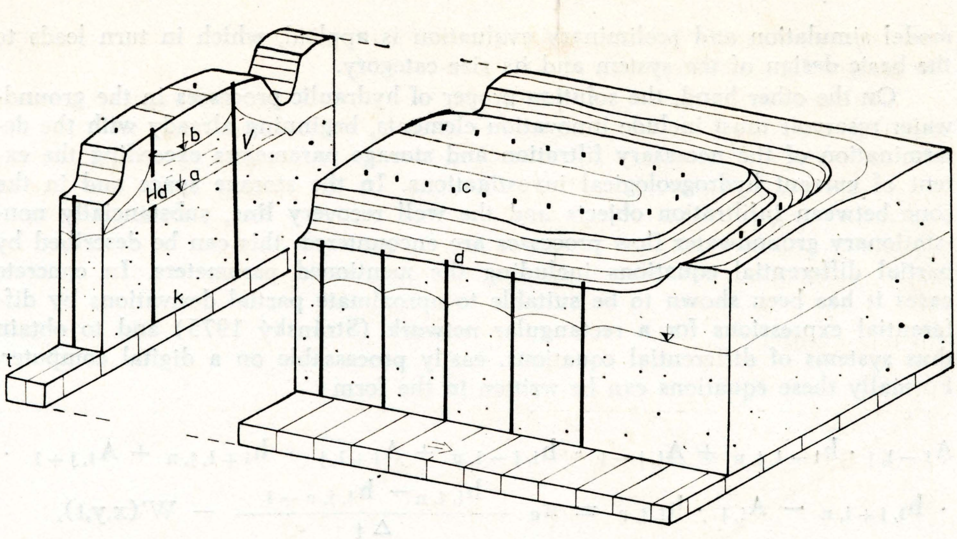
$A_{i,j}$ — are expressions including the coordinates of transmissivity tensors in the area studied,
h — groundwater table level in the nodes of the system (i,j),
n_e — effective porosity,
W' — value expressing summarily outflow and inflow of groundwater in the area studied,
Δt — time increment,
n — number of the solved time level $n \cdot \Delta t$.

This simplified characteristic of the working procedure indicates that after the preliminary evaluation of each locality, it is necessary to incorporate as innovation link of the working procedure sectorial pilot-plant infiltration. Results obtained from this process correspond to the physical characteristics of permeability coefficients that, under conditions of sedimentary rocks, are decisive for very important transmissivity parameters.

In the locality of Černý důl near Mladá Boleslav with sandstone layers about 100 m thick, this infiltration test led to the determination of the values of the coefficient of permeability in the interval of the first half of the order of 10^{-1}m.s^{-1}. For the underground reservoir (Fig. 3) we derived the acceptable rising of the water table H_d by up to 40 m as well as the specific values of the recoverable quantity of q (l . s^{-1}) in characteristical points between the original (a) and raised level (b). The obtained graphical relation is defined analytically as an exponential function

$$q = 31{,}0069\ H_d^{\,1{,}07933}.$$

From the given range of raised levels and possible drops below the natural level is the optimal operational range in the interval H_d = 20 to 25 m. In such a case the system capacity reaches 1 000 l . s^{-1}, similarly as in the existing water supply base at Káraný. Another interconnecting link of the two systems is the water source for artificial recharge — pretreated water from the river Jizera.



3. Conditions for artificial recharge and storage of groundwaters in the locality of Černý důl: a, b — original and raised groundwater table; c, d — infiltration and well recovery line.
k — sandstone; t — marlstone; Hd — raised groundwater table; V — newly obtained water volume. Illustration not to scale.

Water supply bases of this type provide water of better quality than surface water reservoirs and, in comparison with them, they have very low space requirements. Capital investments mostly do not reach even 50 % of the costs required by reservoirs on surface streams.

2. 3. The greater importance of the factor „water" in planning activities

The main principle for meeting this thesis, which is based on the results of the preceding chapters, is the shift of water resources from the category of affected factors to that of affecting factors. In this sense it is naturally necessary to abandon the one-sided concept of the water management potential of the watershed as source for drinking water supply and in all development tasks to consider it in three basic functions:

— in the primary supply sense for the residential and production sector,

— in the role of a sound receiving body, capable up to the critical loading level of the river to deal with the permissible pollution load from the residential and production sphere, predominantly in the form of waste treatment plant effluents;

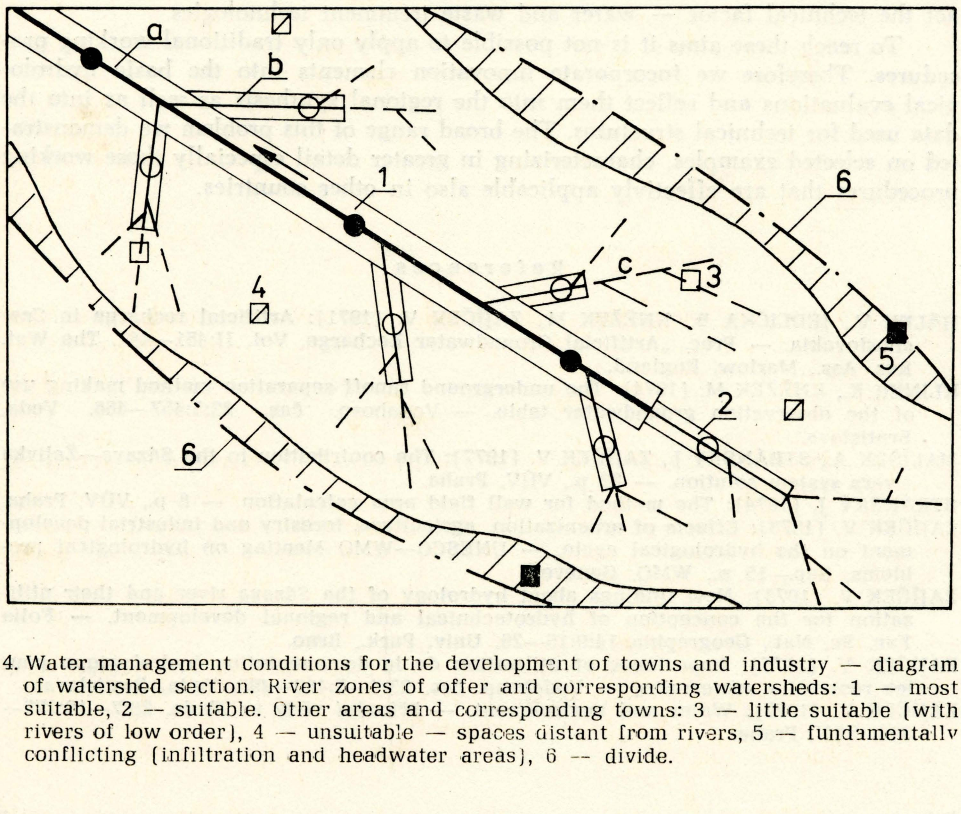
— in the role of an positive urbanization factor with the composition function of a large water surface in residential surroundings.

The main development regulative is unequivocally represented by the second function, be it in the form of offer or limits for economic sectors. It is characterized as representing the reserve of the stream capacity arising from the difference between the natural quantitative and qualitative base of the stream and the tolerance limit for the acception of substances which are added as residual pollution. This reserve is thus dependent on the sanitary, biological and chemical limits given by the water laws in different countries and on the discharge value in a given place or river reach. This concerns naturally mainly discharges warran ted even in dry periods. For this reason we dealt with them and their evaluation in greater detail in the introductory chapter.

From this two basic conclusions can be reached for the application of the innovation elements as well as in the managing and decision-making field:

1. National economic planning as well as lower planning categories must bind their activities and presumed consequences of the differnt actions to the territory limited by hydrographical borders; this kind of procedure must be maintained even when the focus of the economic processes lies in otherwise bordered territorial entities.

2. With a view to the safeguording of a healthy environment, it is necessary in this connection to meet the principle of the critical loading level of rivers.



4. Water management conditions for the development of towns and industry — diagram of watershed section. River zones of offer and corresponding watersheds: 1 — most suitable, 2 — suitable. Other areas and corresponding towns: 3 — little suitable (with rivers of low order), 4 — unsuitable — spaces distant from rivers, 5 — fundamentally conflicting (infiltration and headwater areas), 6 — divide.

In a certain watershed (Fig. 4) we can thus differentiate zones of „offers", where conditions exist also for placing of more demanding users (territorial stripes 1, 2), and other localities up to infiltration and headwater areals (zone 5) where aspects of water resources protection should dominate. These principles can be naturally applied in various countries, mainly in developed or intensively developing countries. In Czechoslovakia, we have treated in this way mainly zones of offers (Zajíček 1977) for the main watersheds. This was done in the interest of their utilization for location greater economic activities and to elimit disproportions, which occur in infiltration and headwater zones.

3. Conclusion

The necessity to protect and suitably utilize water resources is an acknowledged postulate in all countries all over the world. A problem, however, is the use of rational and effective methods.

Good results can be obtained only when the protection of water and water management is a part of complex tasks of environmental control in which the natural base and its economic function are maintained in a balanced state. Principles of protection must be reflected in national economic plans. This aspect places in the foreground the condition of tolerance limits of rivers and their respecting in the development of the region. This actually decides about the future function of both running and standing waters in watersheds, regions and the whole country. In a balanced state with this regional arrangement must also act the technical factor — water and waste treatment technologies.

To reach these aims it is not possible to apply only traditional working procedures. Therefore we incorporate innovation elements into the basic hydrological evaluations and reflect them into the regional synthesis as well as into the data used for technical structures. The broad range of this problem we demonstrated on selected examples, characterizing in greater detail especially those working procedures that are effectivly applicable also in other countries.

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Résumé

INOVACE V REGIONÁLNÍCH ÚLOHÁCH OCHRANY A VYUŽITÍ VOD

Referát je začleněn do tematiky nazvané „Důsledky lidské činnosti v prostředí hydrosféry". Je v něm snaha o aktivní řešitelský přístup, jehož cílem je v rozhodující problémové oblasti přispět k docílení souladu mezi hospodářským rozvojem a vodními zdroji. Rozumíme jimi vodohospodářský potenciál povodí, který se uplatňuje ve třech základních funkcích, totiž jako primární vodárenské zdroje, dále jako recipienty, v nichž se odpadní látky ze sídelní a výrobní sféry projevují jen po mez únosnosti toků, a posléze jako kompoziční městotvorné prvky, zvláště ve formě velkých vodních ploch uvnitř zástavby.

Základní podmínkou pro dosažení uvedeného cíle je rozpracování a postupné uplatňování potřebných koncepčních principů pro styčnou oblast sociálně-ekonomických systémů a vodohospodářského sektoru. První princip spatřujeme v *posilování fondu hydrologických poznatků a ukazatelů* inovačního charakteru, účelově zaměřených k regionálním úlohám. Mezi ně patří např. charakteristiky retenčních potenciálů jednotlivých povodí (obr. 1) anebo ukazatele odtokové potenciality podzemních vod v bezsrážkových obdobích (tab. 1). Z kombinace detailně studovaných procesů v modelových povodích (obr. 2) vyplývají poznatky o příčinách zatížení vodních zdrojů některými nežádoucími látkami, např. dusičnany (tab. 2). Tím je i ukázána cesta k zvládnutí problematiky.

Druhý princip spočívá v *rozvoji a aplikaci hydrotechnických inovací* usměrněných hledisky krajinné ekologie. Jejich typickým zástupcem jsou podzemní nádrže doplňované umělou infiltrací (obr. 3), kterou v našich podmínkách aplikujeme především v říčních terasách a v křídových pískovcových strukturách.

Třetí zásadou je podstatné *zvýšení role vodních zdrojů v plánovací činnosti,* především jejich přesun z kategorie ovlivňovaných složek mezi faktory ovlivňující. Hlavní rozvojový regulativ přitom představuje únosnost toků, která je rezervou (nebo deficitem) mezi průtokovou a kvalitativní základnou toku a tolerančním limitem pro příjem látek přicházejících ve formě reziduálního znečištění. Umožňuje ochranu pramenných a dalších zranitelných území, ale i využití zón s dostatečnými rezervami (obr. 4) pro situování větších hospodářských aktivit.

Uvedené zásady a jejich aplikace jsou podány jako příspěvek k racionální organizaci a rozvoji společenských a výrobních aktivit v souladu s principy prostorové ekonomiky. Účinně se uplatňují ve stadiu příprav rozvojových úkolů a tak umožňují přenesení střetů mezi hydrosférou a hospodářskými sektory do oblasti jejich potenciálního výskytu. Technologické prvky v systémech (zvláště čistírny odpadních vod a úpravny) jsou kvalifikovány jako průvodní články doplňující primární regionální řešení. Zásady i dokumentované pracovní postupy jsou analogicky použitelné i v jiných rozvinutých zemích.

SBORNÍK ČESKOSLOVENSKÉ GEOGRAFICKÉ SPOLEČNOSTI
Ročník 1980 • Číslo 1 • Svazek 85

ROSTISLAV NETOPIL

SMALL MONTHLY WATER BEARING VALUES OF THE STREAMS OF THE CZECH SOCIALIST REPUBLIC

The increasing off-take of water from rivers and of groundwater for the satisfaction of the needs of industry, agriculture and the population in towns and villages results in an increasing interest in a better knowledge of the regime of small water bearing values of streams. Their occurrence and long duration can cause serious not only operation and production difficulties but owing to considerable pollution of streams even health and hygienic ones, especially below places of point pollution by waste water where their necessary dilution for the sake of a more efficient self-cleaning process is impossible. Owing to the fact that small water bearing values can occur simultaneously on all streams of extensive territorial units, the damages caused by them can attain a higher extent than those evoked by floods. These reasons as well as the effort of getting better acquainted with the elements of the discharge regime of Czech rivers led me to the investigation of the spread in space and time of small run-off and its regional dependences in the rivers of the Czech Socialist Republic in the period between 1931 and 1970.

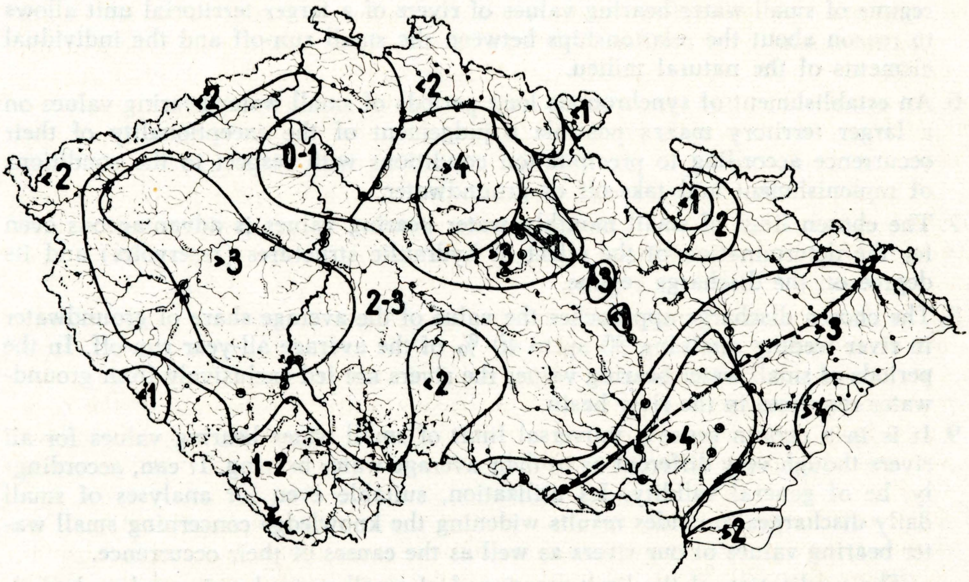
For the purpose of temporal delimitation of small water bearing values discharges exceeded in average 355 days in a year were used in our country until lately. But it appeared that this limit ceased to be suitable not only for water supply planning focussed on the utilization of rivers as water resources and economically advantageous ways of liquidation of waste, but even for the study of the regime of small water bearing values. Their main disadvantage as a criterion of small discharges was that the substance of this discharges contradicted the different natural conditions of the Czech rivers affecting the magnitude and frequency of the small water bearing values. If the discharges mentioned above are used, the frequency of occurrrence and the average duration of the small water bearing values would be absolutely equal not only in our rivers but in general in all streams of the world which contradicts the different conditions for river feeding and, accordingly, even for the run-off from the river basin.

The first task of research was to find a more suitable limit for the analysis of the small water bearing values of rivers be it judged according to the values of daily or monthly discharges. The task was tackled on the rivers of the Morava River basin and the results were published (R. Netopil 1976). In the publication the analysis was described of the frequency of occurrence and the distribution in time of small monthly water bearing values for which the monthly run-off corresponding to 3 % of the annual average run-off appeared to be suitable. It corresponds in substance to the discharge attaining 36 % of the long-term average discharge (normal). It has the following advantages:

1. It comports with the character of the small water bearing of rivers for it is mostly lower than the average of the series of discharges of the months of smallest water bearing values in the individual years.
2. It allows to find out the agreement or disagreement in the distribution in time of the periods of small water bearing values and with rivers with analogical natural and geological conditions in the river basin affecting the run-off and even the agreement or similarity in the duration of those periods.
3. In the case of rivers with diverse natural and geological conditions in the river basin it gives a true picture of the deviations caused by them both in the average duration and in the duration of the individual periods of the small water bearing values.
4. In rivers with very steady run-offs the monthly discharges do not fall to the limit of small water bearing values at all or only exceptionally. This is in line with the properties of these streams in which even minimum discharges need not have the character of a small water bearing.
5. The possibility of a cartographical representation of the diverse features of the regime of small water bearing values of rivers of a larger territorial unit allows to reason about the relationships between the small run-off and the individual elements of the natural milieu.
6. An establishment of synchronous long periods of small water bearing values on a larger territory makes possible a judgement of the exceptionality of their occurrence according to precipitation conditions with respect to the conditions of replenishment and take-off of groundwater.
7. The chosen limit of small monthly water bearing values is advantageous even for the determination of the effect of hydraulic structures (reservoirs) and its degree on the discharge regime.
8. The chosen discharge approaches the value of the average share of groundwater in river feeding attaining 30 up to 40 % of the average all-year run-off. In the periods of small water bearing values the rivers are fed exclusively from groundwater resources in the river basin.
9. It is in a certain sense a universal limit of small water bearing values for all rivers though very different as to their average water bearing. It can, accordingly, be of general validity. Its utilization, suitable even for analyses of small daily discharges, provides results widening the knowledge concerning small water bearing values of our rivers as well as the causes of their occurrence.

The application of the limit mentioned of small water bearing values has allowed to get a completely new idea of the considerable differences both in average duration and in the distribution in time of the small water bearing values, of their regional deviations and, accordingly, even to determinate the territorial units, in which the rivers are endangered by a distinct fall of discharges to a diverse extent and in a diverse time. The 40 years sequences of monthly discharges from 133 water gauging stations and from 26 stations with at least 20 years sequences are certainly sufficient for objective conclusions both as to the regime of small water bearing values in our streams and as to possible effects of some properties of the natural milieu on the regime.

An analysis of the occurrence of small monthly water bearing values has shown that their average duration changes in the rivers of the Czech Socialist Republic from more than 4 months to less than 1 month with cases when the monthly discharges did not fall to the limit of the small water bearing values in the whole period at all or only sporadically. A sporadic or zero occurrence was established in rivers with basins on permeable sandstones of the Czech Plateau and in rivers below larger reservoirs with power generation and protective function. The first case is in line with the high natural equalizing ability of run--off in a permeable rock milieu in which groundwater resources originate, replenish and are equally taken-off, appearing as an important resource of river feeding. The dissected relief of the sandstone plateaus contributes to a more intense exchange of groundwater resources. The fact that in the same Czech Plateau where outcrops of impermeable rocks occur (clays, claystones) the average duration of small water bearing values attains 4. 7 months proves that the degree of permeability of the rock milieu is a first-rate factor for the frequency of occurrence of small water bearing values. In the second case water reserves in water basins controlled from the point of view of water supply are concerned, the utilization of which according to plan causes considerable oscillations in discharge in the course of the day which do not manifest themselves in monthly run-off.



1. Average duration of small monthly water bearing values (1, 2, 3, 4 = average duration expressed in months).

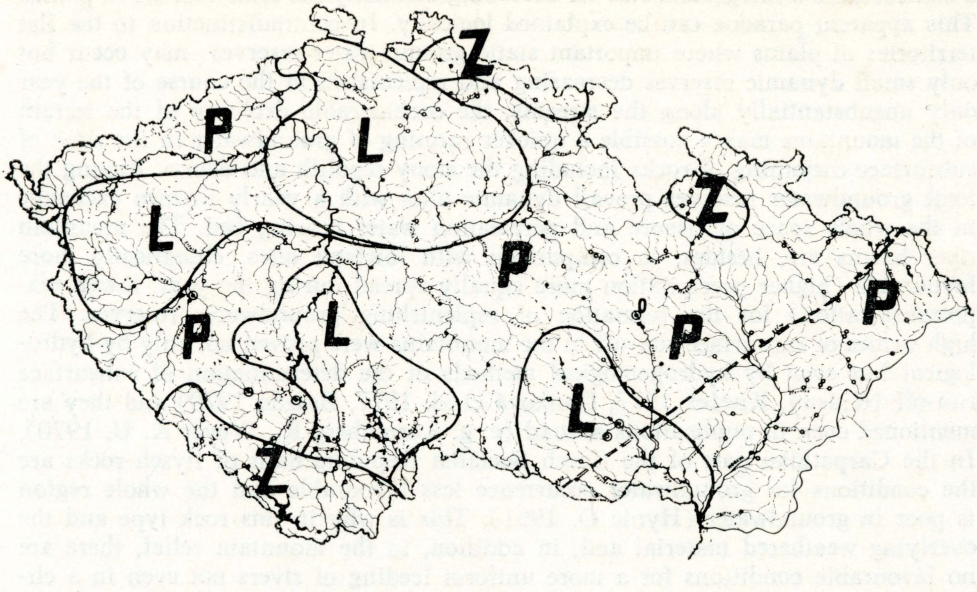
In the other rivers the average duration of small monthly water bearing values decreases with increasing altitude of the river basin above mean sea level sinking in the highest mountain chains below 1 month. But this conclusion is valid only for the rivers of the territory of the Czech Massif. In the Carpathian part of the Morava and Odra river basins the changes mentioned were not confirmed. Even this second law governing the spatial deviations of the average duration of small monthly water bearing values is connected to a certain extent with the rate of the run-off of groundwater and its share in river feeding. In mountainous regions built of relatively less permeable rocks i. e. crystalline or diagenetically strongly consolidated sedimentary rocks numerous authors established a considerable underground run-off exceeding distinctly the same run-off in plains. This apparent paradox can be explained logically. In contradistinction to the flat territories of plains where important static ground-water reserves may occur but only small dynamic reserves decreasing and replenished in the course of the year only unsubstantially along the streams, the considerable declivity of the terrain of the mountains makes possible a quicker running of groundwater in the zone of subsurface disjoining of rocks including the stony regolith and debris. Among the total groundwater reserves prevail dynamic ones with a yearly intense exchange in the whole space of fissure and percolation water bearing bed. The mountain river basins are, besides, in comparison with lowland ones, climatically more favourable (higher precipitation more equally spread during the year, lower evapotranspiration) for the formation of replenishing groundwater reserves. The high values of subsurface run-off in the mountains were proved not only by hydrological but even by hydrogeological methods of the determination of subsurface run-off (Krásný, Kněžek 1977, Daňková et al. 1977, Brázda 1970) and they are mentioned even in publications abroad (e. g. Karrenberg R., Weyer K. U. 1970). In the Carpathian part of the Czech Socialist Republic built of flysch rocks are the conditions for groundwater occurrence less favourable and the whole region is poor in groundwater (Hynie O. 1961). This is why in this rock type and the overlying weathered material and, in addition, in the mountain relief, there are no favourable conditions for a more uniform feeding of rivers not even in a climatically more favourable terrain (river basin in the summit zone of mountain ridges).

The pointed out properties of the natural milieu of the river basins manifest themselves even in the deviations of the distribution of the small monthly water bearing values in the course of the year. The following laws follow from their analysis:

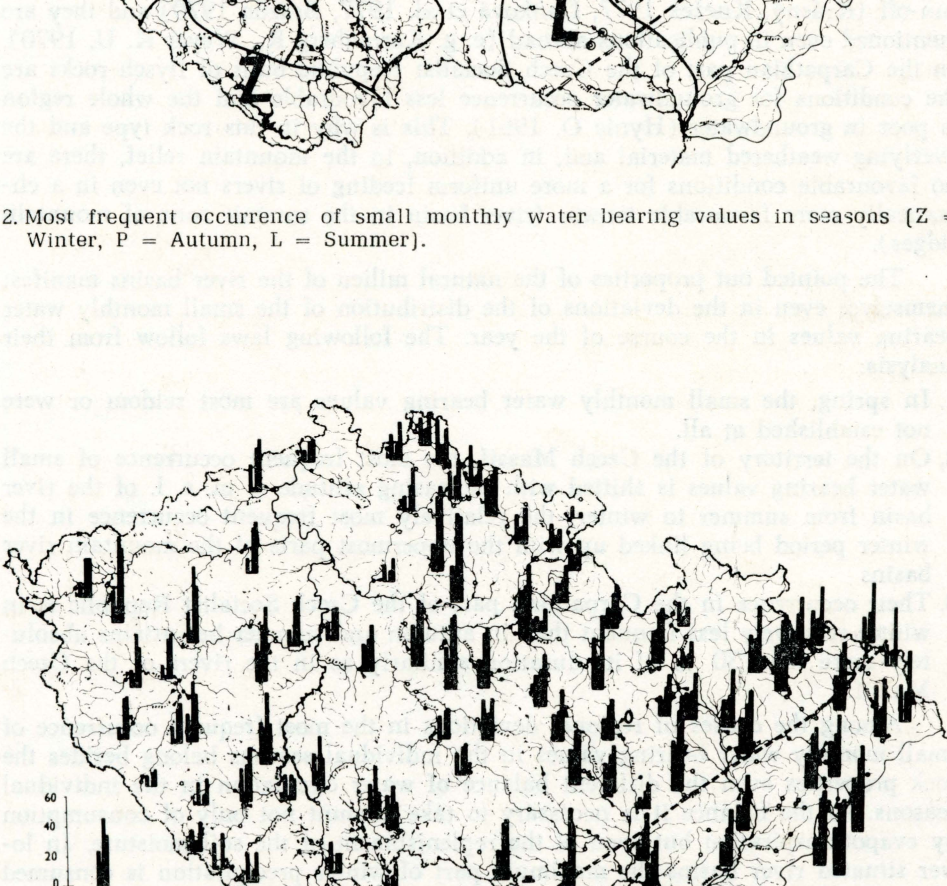
1. In spring, the small monthly water bearing values are most seldom or were not established at all.
2. On the territory of the Czech Massif, the most frequent occurrence of small water bearing values is shifted with increasing altitude a. m. s. l. of the river basin from summer to winter, the relatively most frequent occurrence in the winter period being linked up with the uppermost parts of the mountain river basins
3. Their occurrence in the Carpathian part of the Czech Socialist Republic is in winter relatively less frequent than in autumn and summer but attains absolutely more than 30 % of its duration similarly as in the rivers of the Czech Massif.

Among the causes of regional deviations in the most frequent occurrence of small monthly water bearing values in the individual seasons belong besides the rock properties even the different balance of water circulation in the individual seasons. In the balance it is necessary to take account not only of consumption by evapotranspiration but even of the replenishment of the soil moisture. In lower situated river basins the maximum part of winter precipitation is consumed for restoration of their reserves so that the increase of groundwater quantity is unsubstantial. In the mountains the greatest part of winter precipitation accumulates in the snow cover so that there the increase of the groundwater quantity is interrupted.

Following knowledge follows from the analysis of the regional deviations in the frequency of occurrence of small monthly water bearing values:



2. Most frequent occurrence of small monthly water bearing values in seasons (Z = Winter, P = Autumn, L = Summer).



3. Occurrence of small monthly water bearing values in seasons (percentage). Winter, Spring, Summer, Autumn.

1. In spite of the differences in the relative duration of small water bearing values in winter, their total occurrence in this season is similar in lowland as well as mountain rivers. The small water bearing values can last the whole winter once in three up to five years in average.
2. In spring, the frequency and even probability of the occurrence of small water bearing values decreases with the altitude a. m. s. l. of the river basins; in rivers flowing from the highest mountains their occurrence was established either not at all or isolatedly in March which has in such places rather properties of a winter month.
3. In summer, great regional deviations in the frequency of occurrence of small water bearing values were established. Rare cases show that they need not occur at all, in other rivers they can last in average every second year the whole summer. The frequency of their occurrence decreases with the increasing altitude a. m. s. l. But this rule is not valid in the Carpathian part of the Morava and Odra river basins.
4. In autumn, the regional deviations in the frequency of occurrence of small water bearing values decrease but the relationship between the frequency of their occurrence and the altitude a. m. s. l. of the river basin keeps preserved.

As to the continous duration of small monthly water bearing values, i. e. their periods, it appeared that in rivers with their basin in plains, hilly lands and lower highlands they can exceptionally exceed one year, in mountain rivers usually only 4 up to 6 months. In the former, their occurrence for more than 6 months is more frequent, in the latter ones it is rather rare. In both cases the long periods of small water bearing values are connected with lack of precipitation, especially in the autumn and winter periods. Owing to the fact that with the said lack of precipitation is connected even the insufficient increase of groundwater reserves, they can draw out even for the following spring and summer seasons.

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Résumé

MALÉ MĚSÍČNÍ VODNOSTI NA ŘEKÁCH ČESKÉ SOCIALISTICKÉ REPULIKY

Za hranici malých měsíčních vodností řek autor používá měsíčních průtoků, odpovídajících 36 % dlouhodobého průměrného průtoku, odvozeného z období 1931—1970. Ukázalo se, že tato hranice má mnoho předností před dosud používaným denním průtokem průměrně překročeným 355 dnů v roce. Mezi nimi je i ta, že jí lze použít i pro vymezování období malých denních průtoků. Zhodnocením měsíčních průtoků čtyřicetileté řady ze 133 vodoměrných stanic a nejméně dvacetileté řady z 26 stanic v povodí Labe, Odry a Moravy na území ČSR dospěl autor k závěru, že průměrné trvání malých měsíčních vodností se může měnit v rozsahu od méně nežli 1 měsíce na horských řekách až po více nežli 4 měsíce v roce na řekách rovin, pahorkatin a nižších vrchovin. U řek s povodím na propustných pískovcích a pod některými vodními nádržemi se nevyskytly buď vůbec, nebo jen zcela ojediněle. Jejich časové rozložení je takové, že nejčetnější výskyt se posunuje s rostoucí nadmořskou výškou povodí od léta do zimy. V regionálních odchylkách průměrného trvání i časového rozložení malých měsíčních vodností, ale i v extrémní délce a četnosti výskytu jejich period lze pozorovat zákonitost vertikální zonálnosti a výrazného účinku míry propustnosti nejen hornin, ale i zvětralin na nich. Jejich vlastnosti spolu s reliéfem podmiňují tvoření i dynamiku vyčerpávání zásob podzemní vody, která je jediným zdrojem napájení řek v době výrazného poklesu jejich vodnosti. Přiložené kartogramy poskytují přehled o regionálních odchylkách v průměrném trvání a časovém rozložení malých měsíčních vodností.

SBORNÍK ČESKOSLOVENSKÉ GEOGRAFICKÉ SPOLEČNOSTI
Ročník 1980 • Číslo 1 • Svazek 85

LUDVÍK MIŠTERA

THE GEOGRAPHY OF ENTERPRISES IN THE SYSTEM OF SOCIO-ECONOMIC GEOGRAPHY

The geography of enterprises as a component of the system of socio-economic geography is a young branch of science. It was defined for the first time in a theoretical article of the same name in 1963 (L. Mištera, 1963) in which foundations were laid to the said branch. The author published a number of works dealing with this problem. The monography about the West Bohemian ceramic enterprises (L. Mištera, 1967) in which he checked the significance of the geography of enterprises in practice was most extensive.

It cannot be said that world geography had not paid attention to the enterprise but it regarded it always above all as a social and economic unit. The study of the enterprise was not in the complex of relationships but rather in global judgement of its position in the branch of industry or in the region. Works of this kind are numberless.

The conception of the geography of enterprises was mostly approached — though only in a descriptive form — with respect to the character of the work by V. P. Maksakovskij (1961) in the publication about large industrial establishments of Poland, Czechoslovakia and German Democratic Republic.

In connection with the needs of society the problems are tackled above all by Czech and Slovak geographers (M. Střída — 1968, V. Svárovský — 1966, J. Sabaka — 1972 — 1978, J. Šišák — 1978). This requires a system approach to the need of structural changes in political economy, mainly in industrial production which is projected into the individual regions through the mediation of geography in relationship to environment.

The questions of the enterprise are tackled thematically by economists, sociologists (enterprise sociology) and mainly by historians (history of enterprises) L. Česeněk (1971) appreciates the significance of the author's viewpoints of the geography of enterprises for the history of enterprises, P. Šindler (1976) points out the social need of the geography of enterprises.

Methodological approaches and historical conditions

The geography of enterprises, its tasks and aims are in harmony with the tasks and aims of geography. The geography as science, and/or a system of sciences, investigates the territorial and spatial interactions both inside the components of organic and inorganic nature and society and their reciprocical interaction relationships.

The subject of research of the geography of enterprises is the enterprise, the subject of investigation the interaction relationships evoked by the enterprise.

The enterprise is conceived as a production unit dislocated territorially. The enterprises manifest themselves spatially as elementary complexes. The quantitative and qualitative aspects of the phenomena and relationships of the enterprises to the natural and especially to the socio-economic milieu manifest themselves as a component of the landscape sphere.

The geography of enterprises originated on certain historical conditions of social development. The development of production, especially the industrial one, in the world caused that the industrial enterprise has become in its milieu the bearer of social and economic progress and, consequently, even the subject of study. The effects of economic laws of socialism such as equalization of the standard of living, abolishion of the differences between well-developed and less-developed regions, between countries and inside the countries, between the towns and the province made of the enterprise a unit of planned production activity.

The philosophical and methodological contents of the geography of enterprises is founded with experimental and empirical approach. The task of the geography of enterprises is to investigate above all the optimum possibilities of the territorial division of labour on the basis of the well-developed social division labour, in its production specialization and concentration. The study of territorial and spatial relationships makes possible the establishment of the optimum location of the enterprises in places with suitable production and social conditions.

The structural changes in economy carried out according to plan require a scientific approach on numerous levels of the dislocation of production, in their territorial manifestations and relationships. The superiority of socio-economic and social conditions over production-technical ones is a characteristic feature and follows from the tasks and aims of a socialist society. The geography of enterprises does not investigate accordingly only the production aspect of the enterprise, its production effect, but the impact of the activities of the enterprise as a social unit in the socio-economic and social sphere.

The integration process of the whole state enters by the mediation of enterprises of production significance into the present-day stage of the internationalization of the world economy in a socialist integration process. Linking up of the state economy into the economy of socialist integration affects necessarily even the progress of specialization and concentration of production not only in the sphere of social division of labour but even in its territorial manifestation. The enterprise presents itself as a representative of specialized and concentrated production even spatially in territorial specialization and concentration in territorial division of labour.

The enterprise as a dynamic factor of social changes

We understand the enterprise as a subject of research as a source of energy and dynamics of economic and all-social development. It creates by its dynamic effect a complex of phenomena acting in the natural, socio-economic and technical spheres. It acts like an impulse cell in the dialectic relationships of this complex.

The enterprise is accordingly not a passive subject of research where it would be possible to add the individual phenomena but it is an active subject. It has its interior and exterior structure. The phenomena investigated have their values. Their development and state reflect the laws governing the social development, the level of generative forces. The enterprise appears in the dialectics of relationships as a live organism responding to the changes in its surroundings and its own structure.

The interior structure of the enterprises manifests itself in the technical and/or production-technical sphere. It comprehends above all the basic problems of production, the level of the products, their use value and the economic production outcome. The enterprise presents itself as the producer.

The exterior structure of the enterprise encroaches both upon the sphere of natural and that of economic relationships and creates social relationships. The range of its action is determined by the position of the enterprise in the social and territorial division of labour, i. e. the kind and extent of production, the quality and quantity of production relationships. It manifests itself in positive and negative effects on the environment, its exploitation and social-economic valorization.

Spatial manifestations of the enterprise and impact of their effects

The spatial manifestation of the enterprise can have a territorial extent from microregion up to macroregion. The interior structure manifests itself socially mostly in the microup to mesoregion and the exterior structure economicially according to the orientation of production even in the macroregion. The area extent is different, according to the kind of production and the significance of the enterprise. The areas of consumer-supplier relationships can be of considerable areal extent especially in the international division of labour.

The enterprise exerts a decisive influence upon the natural and socio-economic milieu. The impact of society on the landscape sphere is increasing with the development of production and rational introduction of science and modern technique into production. The beginning of the chain reaction, the revolutionism of production and social changes in society is in the enterprises.

The enterprise affects substantially the environment of man and its shaping, for production draws the complex of social relationships into the social process. It affects the mode of life, the living standard, the standard of housing conditions, social security, the possibilities of cultural life, etc.

The geography of enterprises leads the enterprise as subject of study into the dialectically copious quantity of variations of relationships in the effects of the exterior and interior structure inside and outside the enterprise manifesting themselves actively both positively and negatively. The geography of enterprises studies the activity from the viewpoint of spatial relationships and this is why even other scientific branches and/or specialists mainly economists, jurists, doctors, etc. should participate in the search for optimum solution.

Sometimes, geography is defined as a science on complexes. By this is meant its significance from the point of view of the synthesis of knowledge from natural, social and technical sciences. The complexes are of different territorial extent and have a different spatial level from geospheres up to basic geographical objects. The enterprise is one of these complexes affecting by its effects the natural, social and technical spheres. The geography of enterprises investigates the enterprises in their concrete spatial manifestation and territorial effect, the quantity and quality of these relationships. Practical checking of theoretical approaches has proved that two levels are involved in this process.

In the case of vertical level on the one hand the components of the place to the given enterprise are analyzed, on the other hand the sector or branch relations from the viewpoint of production. In horizontal level, the relationships of the enterprises to the individual components of place are systematized as regionally specific relationships, and/or among components of different places, i. e. from regionally general viewpoints.

The system approach in the geography of enterprises is based on the necessity of a complex critical examination of the enterprise as a geographical object. The system approach involves the morphological, structural, functional, dynamic and prognostic-model systems. The individual systems are step-likely linked up, the extent of investigation is determined by the tasks and aims of research. But the tasks and aims of each system are determined in a gradation leading to a complex investigation of the effects and relationships of the enterprise, its interior and exterior structures.

The geography of enterprises as a research basis for the branch of socio-economic geography

The geography of enterprises originates on the margin of geographical sciences proper and has a multidisciplinary character in its utilization. As a component of the system of socio-economic geography it makes itself felt in the geography of industry, agriculture, services, transport, population, settlements, towns, etc. with a close relationship to the disciplines of physical geography and the protection and modelling of the environment. But even the relationships to a number of other branches of science, such as economic sciences, especially economics and planning, are of the same significance. But it encroaches even into the sphere of social sciences for the enterprise is not only the basic production unit but even a social and political unit.

The geography of enterprises is of special significance for investigations in the geography of industry. The geography of industry investigates in harmony with the tasks and aims of geography the laws and particularities of the dislocation of industry in the complexity of spatial relationships and interaction relationships to a certain concrete industry, branch, sector or landscape sphere. The aim is, similarly as with the other scientific disciplines of socio-economic geography, to specify the territorial particularities and differences in the social and territorial division of labour from the viewpoint of dialectic relationships of a higher geographical complex, i. e. the branch, sector or region, landscape sphere.

The geography of industry studies the dislocation, its general laws and particularities globally, i. e. the industry as a whole, a complex, and separately, i. e. industrial branches and sectors. It is the geography of enterprises which is engaged in individual concrete enterprises and singular research. The results of these investigations improve qualitatively the scientific content of the geography of industry placing it on a new broad fundament which will make possible to reveal the profound general and special inherent laws. The geography of enterprises affects analogical the development of the other branches of socio-economic geography supplying them with basic data which are necessary for a qualified judgement of the state.

In settlement and town geography the enterprise and/or enterprises manifest themselves as settlement-forming agents. The enterprise has the function of an a priori factor for it provides job opportunities and ensures the economic basis of the population, forms its own economic infrastructure and affects directly the social infrastructure.

From the historical, evolutionary point of view, the enterprises came into existence either subsequently in already existing settlements or primarily and their establishment gave an impulse to the creation of a settlement. There is a sufficient number of examples of both groups. The geography of enterprises investigates the position of enterprises as settlement-forming factors.

Usually in each larger settlement, town, there is one main, most important enterprise which affected substantially the development of the respective settlement and was of decisive significance in its development.

Necessary structural changes transform the present-day proportion of relationships and location factors. The active share of the geography of enterprises in the solution of the territorial division of labour has a concrete impact even on the sphere of settlement problems. The utilization of the potential of place, keeping the balance is linked organically to the existence of the production expressed in terms of organization by the basic production complex — the enterprise.

The relationships of the geography of enterprises and population geography are very close. The enterprises linked together by organization into production units are a dynamic component in the distribution, numerousness and cumulation of populations. They came to be the main economic basis of the population in the function of the „maintenor", they provide job opportunities. The unevenness in the distribution of the population is determined more by the dislocation of enterprises, mainly industrial ones, than by natural factors. The enterprises affect by their attractivity gravitationally practically all demographic agents from migration up to the age structure.

Spontaneous and planned migrations are in their way a social manifestation of the influences of the enterprises. The monoindustrial or polyindustrial structure as a result of the specialization and concentration of production creates similarly preconditions for the extent of profession varieties in the rate of employment.

In geographical regionalization the enterprises manifest themselves too as a dynamic elementary complex. The most important enterprises give the character of a certain region, express its position in the territorial division of labour. The dislocation of the enterprises expresses the heterogenity, homogenity or nodality in the region. Location relationships to natural factors, economic or social factors, are in many lines of determinating significance. The concentration of production owing to specialization expresses even a certain degree of the specialization of the region in the territorial division of labour.

The decisive position of the main, most important, enterprise manifests territorially mostly in the microregion and mesoregion according to the character of production and the significance of the enterprise which is the subject of investigations of the geography of enterprises. The different extent of the areas of activities depends on the developed interior and exterior structure of the enterprise. The highest degree of macroregional activities in the region is usually attained by enterprises producing means of production which exceed by the extent of production the all-state significance.

In a region, there are usually several enterprises. The microregions proper are mostly territorially affected by enterprises with a production of predominantly local up to regional significance. Large enterprises with a production of all-state and international significance make felt their attractivity in mesoregions. From the point of view of the dislocation of the enterprises and their economic and social functions, the region can be divided into areas of activities of the individual most important enterprises. The basic economic infrastructure, the population to whom the enterprises provide employment, settlements with social infrastructure and, naturally, a number of other medium-size and small enterprises of complementary significance are bound to the main enterprises.

Analytical-synthetical analyses within the frame of the geography of enterprises have proved that the enterprises are the main element of dynamics in the utilization of the potential of the region. The geography of enterprises together with the other even non-geographical disciplines studies its utilization. It envisages on the basis of prognoses and models the possibilities of optimum utilization, investigates and studies the adherence to the autoregulation of the system, points out the disturbance of the equilibrium, the existing or arising deformations caused by the enterprises. The geography of enterprises supplies these analytical-synthetical analyses as basic data for the territorial analysis of a region.

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České shrnutí

GEOGRAFIE ZÁVODŮ

Geografie závodů vzniká jako nové odvětví v systému socioekonomické geografie. Její úkoly a cíle jsou v souladu s úkoly a cíli geografie. Objektem zkoumání je závod, předmětem vztahy, interakční vazby, které jsou jím vyvolány. Závod je pojímán jako jednotka územně dislokovaná, prostorově se projevující jako elementární komplex. Geografie závodů vzniká v období zespolečenštění výrobních prostředků, které uvolnilo výrobní síly společnosti.

Závod se jeví jako zdroj energie a dynamiky ekonomického a celospolečenského rozvoje, je aktivním objektem. Má zvláštní význam pro bádání kvantitativně a kvalitativně fundované v oblasti geografie průmyslu, zemědělství, infrastruktury, sídel a měst, obyvatelstva a v geografické regionalizaci. Geografie závodů je sledována z hledisek teoretických, metodologických a jejího uplatnění v praxi.

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Ročník 1980 • Číslo 1 • Svazek 85

JOSEF HŮRSKÝ

THE REGION CONFIGURATION INDEX

In geographical studies as well as in regional planning appears sometimes the need to compare the nodal regions — i. e. practically to classify them — not only according to their extent but also to their shape and to the position of the corresponding nodes (centres) in the region. The index of capability of the centre to form a region relatively rounded and compact can be called „the index of form'' and the capability of the centre to form a region in all directions approximative equably „the index of centrity". The better prospect of common application has as title for both these abilities „the index of configuration".

The given problem can be elaborated from two points of view. In the first place it is possible to treat every region separate their boundaries were individually delimited by lower limit — e. g. by the lower limit of the numbers of commuters, of immigrants, of transport intensity etc. — typical for the corresponding region. The other alternative is to treat the whole system of nodal regions, i. e. the whole regionalization. The boundary lines of nodal regions resemble the watersheds being economicogeographical divides of certain type, e. g. of geography of production, of transport, of population etc. This paper gives preference to the second of the two alternatives mentioned. The author's subdivision of the Czech Socialist Republic based on passenger traffic attractivity was used for he given purpose. This is a very representative economicogeographical criterion of regionalization. The advantage of it — compared with the results of the other economicogeographical regionalizations — is a relatively great density of fixing points for the boundary lines of the regions.

A very exact method of indication of both these indexes supposed measuring in maps, i. e. making good use of curvemeter and planimeter. That would be accomplished — considering the whole territory of the Czech Socialist Republic — at best only for the regions of higher order, i. e. for 12—14 in numbers. As there are only some of these regions delimited, it was necessary to make use of the system of middle order regions, the number of which is in different economicogeographical regionalizations of the Czech Socialist Republic roughly 100—150.

The author tried some time ago a compromising solution of the mattter in a study considering the province (kraj) North Bohemia. He compared the sinuousness of the time accessibility divide lines on the one hand and on the other hand the sinuosity of district borders — of corresponding district centres of course. He compared the lengh of both lines, their different spread, the deviation from their ideal position etc.[1]) Even the application of this method would require — considering the 150 middle order regions of the Czech Socialist Republic — too much time.

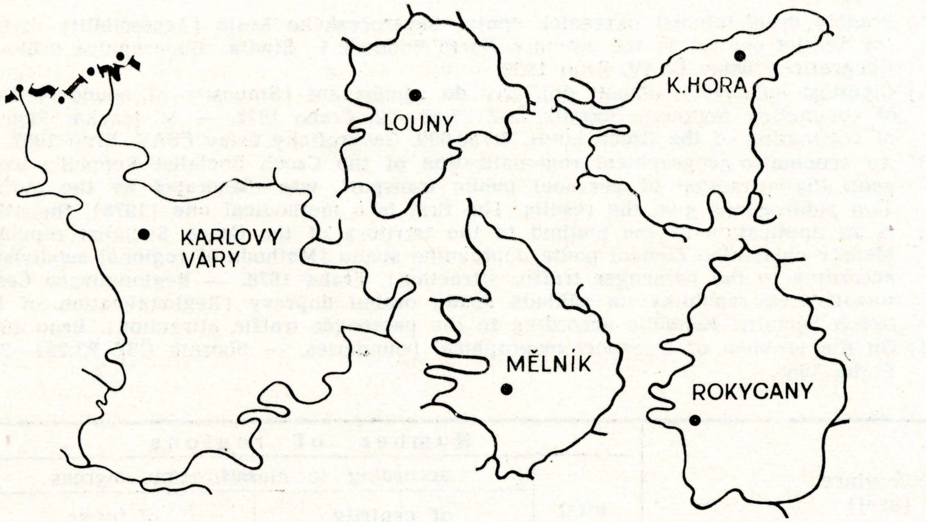
During the further tests we cosidered also the accuracy of the data of the position of some bus-stations and the accuracy of maps available and we came to conclusion, that in fact a classification into 6 degrees is fit for the purpose and that to the aim considered an estimating measurement using compasses and rule is sufficient. In this way the author determined the cofiguration index of 137 commuting regions of the Czech Socialist Republic, which were delimited by M. Macka. A report of this with a cartogram was published by the author in this journal.[2]) With regard to the substantially more sinuous forms of the commuting regions with many enclaves etc., it was necessary to use a more differenciated classification than for the passenger traffic regions.

In the reforms of the territory organization more weight was adjudged to the position of the centre inside the administrative region than to the configuration of the region. Observing the position of the centre we have to consider, that the nearer the centre to the boundary line lies, the more disandvantegeous its position is. Theoretically the degree of deviation of the centre from the geometrical centre of the region would be decisive. As a means of device we can use — especially in transitory cases between two classification degrees — a pair of tangential circular lines, the one to the nearest point of the boundaries, the other to the most distant one. The width of the annular space is to be seen to first, but the rang of the boundary line is to be respected too. The most unfavourable is the situation of a regional centre in a bend of a province border line or especially in that of the frontier line, as it is in the case of the town Varnsdorf at the north frontier of Bohemia. Such extreme cases and the regions with the position of their centres very near to the regional boundaries are of course to be included in the lowest, i. e. in the first classification degree. It is roughly the tenfold of the distance between the nearest and the most distant point mentioned which is the limit for this lowest degree. In the sketch enclosed the regions of Kutná Hora and Rokycany are of this degree of centrity.

It must be said, that sometimes the distance between the geometric centre and the regional centre cannot be decisive. The large forest areas and other sparsly inhabited territories of the region ought to be taken into account. In these cases the metric centre must be considered as the centre of the inhabited region. As a rule such consultations with the geographical map make for a more favourable classification degree of centrity.

The index of the form of a region is to be found as the degree of deviation from a circle or from a hexagon. As an elementary means of device we can again use a pair of tangential circular lines. In this case the circles have not their centres in the centre of the region, because the one is in its boundary inscribed and the other circumscribed. Besides the width of the annular space also the shape of the extremities is to be considered. For the lowest first classification degree the regions with disunited parts (enclaves) and wih long polypous extremities are very typical. For the most rounded form was fixed the degree 6, perhaps „too consequently" (see the region of Louny classified with 5 in the sketch enclosed), but in the form classification of regions of the lower order the degree 6 would certainly submit a greater, i. e. more proportional, frequence.

The suitable corrections in accordance with the geographical map are for the degrees of form more problematic than for the degrees of centrity. Such cases can be looked on only as the polypic incision in the region of Mělník (In NWN of the centre of the region. See the sketch enclosed.) It is given by the course of the river Labe. The causes of high sinuosity and high decentrality of centres in the regions are very diverse and it would pass over the frame of this paper to go through. For comparing the different types of regions it must be said that the greater number of fixing points of the transport geographical regionalization compared with the other economicogeographical regionalizations causes of course a higher sinuosity of the boundary line. E. g. the boundary lines of the regions constructed from the point of view of the geography of industry are more freely interpolated, and therefore more generalized than the transport geographical boundary lines.



1. Five Czech transport geographical regions as example for determining classification degrees (1—6) of the centrity and form of the regions. (Karlovy Vary 4.3, Louny 6 5, Kutná Hora 1.2, Mělník 3.3, Rokycany 1.5).

In concluding, it must be said, that both characteristics had an important function even at elaboration of the regionalization.[3] In the final adjustment of the system of regions the very low values of the index from of the region contributed to the decision to make some corrective changes in the system of centres. In the most part of the cases the corrections were realized by „implantations" of new regions and chiefly subregions. The necessary assumption in this case was, that the complementary centres had their centrality value near to the primary settled lower limit. Also the effort to adapt the system of centres to the system of centres of the total tertial sphere (incl. retail business, culture, sanitation, sport atc.), participates on the final adjustment of the system of regions. By this correction some regions raised their centrity classification degree mostly from 3 to 5, as it is evident from the asymetry of frequency data in the table adjoined. A certain share of regions with an unfavourable position of their centres remained, especially in the neighbourhood of big centres, which seem to attract the smaller centres of their neighbourhood. The sketch adjoined demonstrates as example the region of Rokycany „attracted" by the centre of the province of the West Bohemia Plzeň; but even more „attracted" regional centres are in the vicinity of Praha and Ostrava.

In connection with the problem mentioned it is perhaps suitable to refer to the sharpness of the boundary lines. This index has its significance especially for the unification (generalization) of boundary lines treated from various economicogeographical aspects (retail, transport, production atc.). The author pointed to the realization of this problem in his paper written on the occasion of the International Geographical Congress of New Delhi (1968).[4]) Even if the sharpness (distinctness) of the boundary lines were in the mentioned questionable parts of the regionalization network classified in 3 degrees only, the balance of the corresponding factors will be easier.

1) Předěly dosažitelnosti okresních center Severočeského kraje (Accessibility divides of district centres in the province North Bohemia.) Studia Geographica 8:70—78, Geografický ústav ČSAV. Brno 1969.
2) Členitost spádových oblastí dojížďky do zaměstnání (Sinuosity of boundary lines of commuting regions). Sborník ČSZ 77:88—92. Praha 1972. -- M. Macka: Regions of commuting of the Czech lands. 1:750 000. Geografický ústav ČSAV. Brno 1967.
3) An economico-geographical regionalization of the Czech Socialist Republic, based upon the attraction of personal public transport, was elaborated by the author. Two publications give the results. The first is a methodical one (1978), the other is an application of the method to the territory of the Czech Socialist republic: Metody oblastního členění podle dopravního spádu (Methods of regional subdivision according to the passenger traffic attraction). Praha 1978. — Regionalizace České socialistické republiky na základě spádu osobní dopravy (Regionalization of the Czech Socialist Republic according to the passenger traffic attraction). Brno 1979.
4) On the problem of transport-geographical boundaries. — Sborník ČSZ 73:254—260 Praha 1968.

Province (kraj)	Number of regions												
	total	according to classification degrees											
		of centrity						of forms					
		1	2	3	4	5	6	1	2	3	4	5	6
Middle Bohemia	21	2	5	1	2	9	2	1	2	4	6	7	1
South Bohemia	14	0	0	1	1	9	3	1	0	3	7	3	0
West Bohemia	13	2	0	1	3	7	0	0	2	6	1	4	0
North Bohemia	22	5	1	2	3	8	3	0	3	2	10	7	0
East Bohemia	31	1	2	4	4	18	2	0	1	10	11	9	0
South Moravia	22	1	6	1	5	7	2	0	0	8	9	5	0
North Moravia	26	2	2	4	8	9	1	1	1	11	9	4	0
Czech Socialist Republic	149	13	16	14	26	67	13	3	9	44	53	39	1

Résumé

UKAZATEL KONFIGURACE OBLASTI

V ekonomicko-geografických rozborech i v plánovací praxi se občas jeví potřeba porovnat nebo i roztřídit nodální oblasti určitého typu nejen podle relativní velikosti, ale i podle členitosti jejich tvaru a podle polohy centra uvnitř oblasti. Schopnost vytvořit oblast relativně celistvou lze nazývat „ukazatelem tvaru oblasti" a schopnost vytvořit oblast rozkládající se od centra do všech stran relativně rovnoměrně „ukazatelem středovosti". Příznivější vyhlídku na obecné uplatnění má však jako označení souhrnné charakteristiky „ukazatel konfigurace oblasti".

Tvar oblasti lze chápat jednak individuálně na základě zdůvodněné hraniční hodnoty, jednak podle postavení oblasti v celé regionální soustavě téhož řádu; v tom případě je směrodatný průběh předělových čar (produkce, dopravy, služeb ap.). Tento druhý typ je podstatou ekonomicko-geografické regionalizace a již proto je metodicky nepoměrně významnější.

Jako podkladu tu bylo použito autorova oblastního členění České socialistické republiky založeného na spádu osobní veřejné dopravy, jemuž lze přiznat z ekonomicko-geografického hlediska značnou reprezentativní hodnotu. Hlavní jeho výhodou je — ve srovnání s výsledky oblastních členění podle jiných ekonomicko-geografických kritérií — podstatně větší hustota upínacích bodů určujících zmíněné předělové čáry, tj. oblastní hranice.

Přísně exaktní postup při kvantitativním určování obou charakteristik předpokládá kartometrická měření, tj. použití křivkoměru a planimetru. S ohledem na přesnost pramenných podkladů i požadovanou detailnost výsledků je však nejúčelnějším řešením klasifikace do šesti stupňů. K dosažení tohoto cíle se vystačí s jednoduchou empirickou metodou, totiž měřením v podstatě odhadovým toliko s použitím kružítka a pravítka.

Ukazatel tvaru sleduje především stupeň zaokrouhlení, teoreticky tedy stupeň odchylky od ideálního tvaru kruhu. Jako elementární pomůcky lze použít dvojice kružnic, z níž by jedna byla oblasti vepsána, druhá opsána. Poloha centra je přirozeně tím nevhodnější, čím více je centrum vysunuto k okraji oblasti. Pomůckou je opět dvojice kružnic, v tomto případě ovšem se středem v oblastním centru. O stupeň odchylky od polohy geometrického centra jde spíše jen teoreticky. V některých případech rozsáhlé lesní komplexy a jiné velmi řídce zalidněné areály si vynucují, abychom se řídili spíše polohou těžiště osídlení.

Oběma charakteristikám musel být přiznán vliv již v rámci samotné ekonomicko-geografické regionalizace České socialistické republiky, totiž při závěrečném slaďování regionalizací z různých odvětvových hledisek, zvláště však regionalizace podle dopravního spádu s regionalizací podle služeb, jejímž autorem byl M. Blažek. Nízké hodnoty obou ukazatelů přispěly v nejednom případě k rozhodnutí o dodatečných změnách v obou soustavách center. Tyto konečné úpravy se dotkly asi 5 % z celkového počtu 120 oblastí — resp. 150 oblastí a podoblastí.

Připojená tabulka udává, kolik ze 149 oblastí (bez Prahy) je klasifikováno stupni 1—6 ukazatele středovosti a ukazatele tvaru oblastí, a to podle krajů České socialistické republiky. V titulu kartografického náčrtu jsou uvedeny hodnoty zmíněných ukazatelů.

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Ročník 1980 • Číslo 1 • Svazek 85

MIROSLAV HAVRLANT

FUNCTIONAL TYPOLOGY OF LANDSCAPE WITH RESPECT TO RECREATIONAL NEEDS

The contemporary development of advanced societies lays ever increasing claims on planning, especially on that of economic character. The realization of relevant aims, well secured financially, depends on particular territorial systems whose categories are closely connected with the economic exploitation of the landscape, with the conditions of settlement and the possibilities offered by the natural potential of the landscape. Regional planning must, at the same time, respect the existing function of the landscape or the prognosis of its development. The necessity of complex analyses for the realization of the above-mentioned aims provides geography with extensive possibilities of application.

In contradistinction to works dealing with individual components of the landscape with the aim of the regionalization we watch in this case also the requirements of the inhabitants of the industrial and urbanized areas in the quality of the environment and their recreational possibilities in the place of residence and its near hinterland.

To ensure recreational possibilities in suitable conditions becomes a problem especially in heavily industrialized and urbanized areas. It is here that the method of functional analysis finds its most extensive utilization; three basic functions of the landscape are applied in this method: productional, residential and recreational ones. When analyzing them, it is also necessary to find a means for defining the meaning of each of these functions, for determining the priority of one of them.

The submitted article is an attempt at a functional analysis conceived in this way, with an estimation of forest stands considered as one of the basic factors of the recreational potential in the conditions of Czechoslovakia (they can be similarly analyzed in different conditions in other factors as water surfaces a. s. o.). The forest stands have in the ČSSR an economic function primarily, with possibilities of forest exploitation. Besides, however, forests in a landscape affect the quality of the living environment, too, and they have a significant share in the bioclimatic and water economic conditions, in the aesthetic and hygienic factors of the landscape and in recreational possibilities. A number of forest stands are, however, utilized for special purposes (reservations, hunting-grounds, etc.) and cannot be used for recreational aims.

We have taken into consideration the following criteria for the evaluation of forest stands in connection with their recreational function:

a) species composition: although a number of writers regard coniferous stands as more convenient for recreation, in our conditions we must rather take into consideration mixed forests which, in this case, increase the effectiveness of the „dust filter" and are also more suitable from the landscape point of view.

b) age composition: it makes itself felt especially in young stands which are impassable when densely planted and therefore not utilizable for recreation.

c) wood floors: the undergrowth in forests may even have several floors and the lowest floor may be so densely overgrown that older forests may be impassable even at normal density of tree stand. In that case, although they may fulfil their bio-climatic and water economic functions very well, they are — as such — inconvenient for recreational purposes.

d) location and size: we consider the utilization of forest stands only in those cases if they do not form isolated islands in the economically utilized landscape and if they are directly connected with other forest complexes or other areas which can be utilized for recreation. As a basic unit of size, we have chosen an area of 500 ha of stands which are passable and located in a convenient relief.

When analysing forest stands we also estimate the relief, the quality of the soils and the location, as all of them can impose limitations on recreational utilization. When estimating the relief, we take into consideration especially the sloping of the terrain and the exposition of the slopes. We regard the gradient up to 10^0 as the limiting value because such slopes can still be employed for the purposes connected with recreation, including the construction of buildings and roads, and they are easily passable. The other limiting value is the gradient of 20^0; above this value, the slopes are practically impassable for common holiday-makers and we must eliminate them from the considered utilizable area. Practical experiences also reveal that the quality of soils in low places is often harmfully affected by the high level of underground water. Such slimy forest grounds eliminate forest stands from recreational utilization. The location of wooded areas in the vicinity of industrial enterprises should be estimated in a similar way because they may fulfil the function of hygienic belts in noisy and dusty localities but cannot be utilized for recreation. A mere sum total of green public areas is not a decisive indicator for the estimation of recreational possibilities. It is obvious that climatic conditions of considered areas must be included in the relations affecting the utilizability. When analyzing the hinterland of the industrial region of Ostrava, we found out that the above-mentioned factors caused the limitation of the utilizability of forest stands for recreation by more than 50 per cent. Qualitative indicators must be complemented by further factore, such as the hygienic one — effects of gas emissions, the health one — the danger of contracting encephalitis, the spare dislocating a. s. o.

We can divide forest stands into three groups when carrying out their final evaluation from the point of view of their utilizability:

a) utilizable forests — fully convenient,

b) forests which may be utilized after certain adjustments and improvements, such as the thinning, the cutting down of the undergrowth, the draining of slimy areas, the making of paths in sloping terrains, etc.

c) unutilizable forests — forest stands are in such conditions that they would have to be completely reconstructed for recreational utilization, which continues many years; or the qualities of the terrain and/or climatic conditions, such as steeply sloping terrains, inverse hollows, etc., are thoroughly inconvenient. This does not mean, however, that these forest stands cannot fulfil the rest of their functions; on the contrary, they usually fulfil them very well.

Forest stands estimated in this way must than be incorporated into the functional typology of the landscape. In our case, we applied, when doing so, the point of view of employment and economic basis with the prevailing industry. The division of communities considered as units of settlement can then be carried out according to a system which is commonly used in this country (Tab. 1).

Tab. 1.

Settlements with weak or even negligible economic bases of their own	with employment in the place of residence up to 35 per cent	residential type
Settlements with their own economic bases	with employment in the place of residence from 36 to 58 per cent	residential — productional type
Settlements with significant economic bases of their own	with employment in the place of residence from 59 per cent and more	productional — residential type

In connection with the above-mentioned types of settlements, we also take into consideration the recreational function based on forest stands regarded as a recreational potential. Besides their size, location and other qualities, we should try to find their relations to agriculturally utilized areas. If these forests represent at least 35 per cent and have all the above-mentioned qualities, we regard them as recreationally utilizable; when their share is lower, we regard the considered area as productionally-agricultural, in which forest stands — usually scattered — can serve for tourism because of their scenic value. But even the functional value of agricultural lands is dependent on other factors, such as the relief and climate, and its value will be different in lowlands and in higher mountain locations with sloping reliefs.

When determining the priority of functions, we must take into consideration the density of population, too. The recreational function of the landscape can become prior only in such places where the density of population is relatively low. We have set the limit of 60 persons per 1 sq km for this purpose, as it represents the nation-wide average. The other two functions — residential and productional ones — are usually combined with the recreational function. Only in those cases where the density of population is lower than 20 persons per 1 sq km while the capacity of the recreational potential is high and the share of agricultural areas is minimal, we can regard such a region as a purely recreational type of landscape. Questions connected with the level of equipment and accessibility are secondary in such a case and can be settled within the framework of further plans of development.

In Czechoslovak conditions, the residential function of the landscape appears as prior most frequently. In a number of cases, in the vicinity of larger towns, it even appears as monofunctional in the typology of communities; but in the typology of the landscape, other factors, especially productional and recreational, always complement it in those places where the recreational potential has a more significant capacity.

The productional function usually appears as prior only in larger towns or

Tab. 2. Functional typology of landscape.

RECREATIONAL AREAS — FORESTS

Determination of forest stands for recreational utilization

share in comparison with agricultural areas at least 35 per cent

The elimination of the forests cultivated for special purposes, impassable, etc.

to evaluate together with:
relief
location
accessibility
etc.

Forest: non-utilizable
conditionally-utilizable | > 500 ha
utilizable |

Recreational function ⟹ Functional analysis of landscape

DENSITY OF POPULATION

Determination of priority of functions

over 60 persons per sq km	function usually secondary locally important
21—60 persons per sq km	usually prior function
up to 20 persons per sq km	may even be monofunctional

ECONOMIC ACTIVITY

Determination of settlement unit functions

Employment and commutation

industry
agriculture

over 50 per cent of agricultural areas → always productional function (up to 600—700 m above sea level)

Function:	residential — employment in the place of residence up to 35 p. c.
	residential — productional 36—58 p. c.
	productional — residential 59 p. c. and more

Functional analysis of landscape

CARTOGRAPHIC ANALYSIS

SYNTHESIS

THE VALUATION
OF THE SOCIOECONOMIC
EVOLUTION AND ITS MAIN TENDENCIES

Evaluation of natural conditions and other presumptions

The synthesis social and the natural optimumes from the time and space point of view and various forms of recreation agglomerations with the industrial basic and/or in typical productional agricultural areas in which more conspicuous factors of the recreational potential can hardly be found. But in some towns, the recreational function can play an important role, too, even for holiday-makers from more distant places: it depends on the situation of the locality and on the recreational potential. We can mention, as examples, seaside resorts in a number of states, tourist centres operating all year round in the Alps; such cases occur in the ČSSR, too, though they are not very numerous — e. g. Rožnov p. Radhoštěm, Liptovský Mikuláš, Karlovy Vary, Třeboň, etc.

Each of the three basic functions — productional, residential or recreational — may hold the prior position in the typology of the landscape, while the remaining two usually make themselves felt as well. Monofunctional areas are less frequent: they are limited to several mountainous regions on the territory of Czechoslovakia.

The above-mentioned relations of all basic factors, which we analyze with the aim of the functional typology of the landscape in view, are presented in the table 2.

Tab. 3. Typology of landscape with a recreational function (with a corresponding recreational potential — forests, areas of water, etc.)

density of population number of inhabitants per 1 sq km	economic basis in the place of residence		
	low or even negligible	basis of its own	conspicuous
	employment in the place of residence		
	up to 35 per cent	36—58 per cent	59 per cent and more
61 and more	residential —recreational residential —productional —recreational	residential —productional —recreational	productional —residential —recreational
21—60	residential —recreational residential —recreational —productional recreational —residential recreational —residential —productional	residential —productional —recreational residential —recreational —productional recreational —residential —productional	productional —residential —recreational productional —recreational —residential recreational —productional —residential
up to 20	recreational	recreational	recreational

Fifteen types of landscape are theoretically possible, with the priority of functions determined by the following relations (nine types of landscape are practically possible):

The submitted system of functional analysis represents a sample which would require verification under different concrete conditions.

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Résumé

FUNKČNÍ TYPOLOGIE KRAJINY S PŘIHLÉDNUTÍM K POTŘEBÁM REKREACE

Potřeba komplexních územních analýz se v současné době stává vysoce aktuální pro seriózní územní plánování a prognózování dalšího vývoje. Autor ve svém příspěvku uvádí příklad metodiky, které použil při funkční analýze ostravské průmyslové oblasti v ČSSR s cílem stanovení priorit funkcí, které jsou pak vodítkem pro další záměry prostorového rozvoje. Jako rekreační plochy jsou řešeny lesní porosty, u nichž jsou hodnoceny mimo jiné i biologické kvality, vazby k zemědělskému půdnímu fondu, a dále vztahy vyhovujících rekreačních ploch k hospodářským a demografickým poměrům. Hodnocením vzájemných vztahů dochází pak autor k určení významu jednotlivých funkcí a typu krajiny, v níž registruje tři základní funkční složky: výrobní, obytnou a rekreační. Kartografická syntéza pak umožňuje rajonizaci zkoumaného území.

REVIEWS

THE INFORMATION BULLETIN „DIDACTICS OF GEOGRAPHY"

The scientific — technical revolution is characterized by an irrepressible influx of informations. Nowadays nobody is capable any more to master all his specialization by studying on his own. That's why in the Czechoslovak Socialist Republic an information processing system has been established to collect, classify and make accessible all information on particular branches of knowledge. At the Pedagogical Faculty of Charles University in Prague the Information Centre for Didactics of selected disciplines of natural sciences has been founded; this Centre issues information bulletins, which include an annotated bibliography of articles printed in Czechoslovak and foreign periodicals.

Since 1977 this Information Centre at the Pedagogical Faculty of Charles University in Prague has been issuing also the Information Bulletin „Didactics of Geography", which enables orientation in contemporary geographical journal literature aiding to solve the problems of school geography in the Czechoslovak Socialist Republic and abroad. It leads also to the systematic knowledge concerning the development of geography didactics, it helps to apply good experiences in school practice and in this way it contributes to speed up and to improve the process of modernization in geography teaching.

Every volume of the Information Bulletin contains a survey of some 50 geographical, methodological and pedagogical journals whose excerpts have been included. All annotations (about 300 in a copy) -apart from bibliografical registration- are supplied with the index of the uniform classification. This enables the choice of themes and the filing of entries. The classification represents roughly the structure of didactics of geography and is drafted out insuch a ways to include even the wider problems of school geography. To elaborate this for the need of information proved to be rather complicated because the articles of complex character are too wide and it is difficult to express the relations within the framework of a particular entry. This is the reason why the classification will be made more precise in the future and the Bulletin editors intend to work up the list of basic terms.

The first part of the classification is based on the structure of general didactics of geography.

1. Didactics of geography as a science
2. The social conditions of geography teaching
3. Institutional conditions of geography teaching
4. The geography teacher
5. The pupil in geography teaching
6. The aim of geography teaching
7. The contents of geography teaching
8. The organization of geography teaching
9. The realization of geography teaching
10. The methods of geography teaching
11. Geography teaching media
12. Conceptual framework and achievement in geography teaching

The second part of classification deals with the didactics of different geography disciplines, which participate in the didactic geography system and form the basis of the geography subject matter. Owing to the fact that the object of investigation is shifted more and more from general problems to special questions of instruction in different courses, such as physical geography, economic geography, geographical cartography, teaching about the country side etc., this special part of classification will be further worked out.

The Information Bulletin „Didactics of Geography" is issued in 3 versions: in Czech, English and Russian. It is sent as a free copy to scientific organizations, to schools of university level, which educate teachers of geography and to all persons that are interested in the didactics of geography or to those who take part in organization of school practice in geography. Versions in foreign languages are sent abroad if they are ordered.

Since 1976 the first three volumes with annotations have been issued. We plan to broaden the excerption basis by including further foreign journals and university bulletins.

Pedagogical workers from the whole country take part in working out the Bulletin; all people interested in cooperation in the field of geography are welcomed. The editors will be grateful for every information about any journal suitable for excerption. The Bulletin will be exchanged for all periodicals sent regulary from abroad.

The address of the editor's office: Ústřední knihovna pedagogické fakulty UK — OBIS, 116 39 Praha 1, Rettigové 4.

The Information Bulletin „Didactics of Geography" is the only publication of its kind and proves the signaficance given to the development of geography didactics, which is the scientific basis of geography teaching in the socialist school in Czechoslovakia.

České shrnutí

Oborové informační středisko (OBIS) pedagogické fakulty UK v Praze vydává od roku 1977 Informační bulletin didaktiky geografie, který umožňuje orientaci v současné geografické časopisecké literatuře přispívající k řešení problémů školské geografie v ČSSR a v zahraničí. Každý svazek bulletinu obsahuje na 300 anotací časopiseckých článků z celého světa za běžný rok. Každý záznam je opatřen indexem jednotného třídění možňujícím tematický výběr a seřazení záznamů do kartotéky. Třídění zahrnuje problematiku obecné a speciální didaktiky geografie a též širší otázky školské praxe. Bulletin vychází ve třech verzích: v jazyce českém, anglickém a ruském. Je zasílán zdarma odborným pracovištím a zájemcům zabývajícím se didaktikou geografie nebo se podílejícím na řídící a odborně organizační činnosti v oblasti praxe školské geografie. Excerpční základna bude dále rozšiřována o nové zahraniční časopisy a sborníky vysokých škol v ČSSR. Redakce uvítá další zájemce o spolupráci při tvorbě bulletinu.

Adresa redakce: Ústřední knihovna (OBIS) pedagogické fakulty UK, Rettigové 4, 116 39 Praha 1.

Dušan Frič

REFERENCES

V Häufler: Ekonomická geografie Československa (Economic Geography of Czechoslovakia). 685 pp., 264 illustrations, maps and charts. Academia, Praha 1978. University text-book. Price 53 Kčs.

The standards of economic and regional geography in individual countries might be judged, among other things, according to one, certainly not insignificant aspect: how the geographical literature of the given country has treated its own state territory. If one accepts that criterion, then Czechoslovak economic geography can hold its own very well, for only few countries, not excepting far more populous ones with a far stronger developed geography can boast such an economic-geographical monography as that which Professor Häufler presented to expert circles and the broader public in 1978. His „Economic Geography of Czechoslovakia" is the most extensive work on that subject published in the entire post-war Czechoslovak geographical literature. Its scope and penetration can be matched only by a similar work written by I. M. Mayergoys, the late Professor of economic geography at Moscow's Lomonosov University.[1]) In foreign geographical literature one finds similar works compiled, as a rule,

[1]) MAYERGOYS I. M. (1964): Czechoslovatskaya sotsialisticheskaya respublica. 730 pp. Isdatyelstvo social. ekonom., Moscow.

by several authors jointly; it is therefore remarkable, that in this case there is only one author. V. Häufler is active university professor of economic geography at the Faculty of Science Charles University in Prague. His undertaking such an extensive work was justified by his thirty years' teaching at Charles University, where he has given lectures on the subject for many years and published dozens of research papers and essays. His most recent and greatest book is therefore a fitting climax to his entire previous pedagogic and scientific activity. Häufler's studies and essays treating the economic and regional geography of Czechoslovakia cover a wide range of problems: agriculture, industry, transport — but above all the population, on which the author's interest focussed in the past 15 years, during which he published several larger papers on changes in its geographic distribution and ethnic composition. On this occasion, one cannot fail to recall his first extensive work on the geography of Czechoslovakia, dealing with the mountainous regions and their utilization, which — by its subject and approach — has remained unique in Czechoslovak geographical literature to this day. In 1960, the publishing house of the Czechoslovak Academy of Sciences (now Academia) published the first comprehensive post-war geography book on Czechoslovakia, in which V. Häufler was the author of detailed economic-geographical treatises on agriculture, transport, as well as of the entire regional part.[2])

In the book under review, the author chose the classical economic and regional-geographic approach, in particular the comparative method. The work is divided into 10 chapters, the first being devoted to the geographical position of Czechoslovakia, its borders and territorial shape, the second dealing with the physical geographic environment. The third chapter is concerned with the problems of pupulation and settlement, the fourth and the following three chapters are devoted to the economy of Czechoslovakia and its individual branches. Chapters eight and nine present a regional survey of the Czech and Slovak Socialist Republics, and the last chapter treats the international economic relations of Czechoslovakia and its status within the Council of Mutual Economic Aid. The proportions of the individual parts fully harmonize with the subject of the book — 8 percent are devoted to physical geography, 62 percent to the population and the economy according to branches, and 30 percent are taken by the regional survey.

From the first, introductory, chapter, the broad erudition of the author is evident. In particular, his well-founded historical approach is remarkable, which facilitates an understanding of wider geographical continuities.

The chapter on the physical- geographic environment is written in a matter-of-fact and orderly way and is based on the latest sources. The author, though an economic geographer, takes note also of the problem of negative effects exerted by the activities of man on nature, and the problem of nature conservation. It might be useful for the reader to compare the situation in Czechoslovakia as depicted in this chapter with that of other, in particular neighbouring countries, where the problems of environmental protection are not fundamentally different.

In the chapter dealing with population and settlements, the author fully applied the results of his previous long-term research. Here, too, his historical approach is manifest, when he takes note, in particurai, of long-term changes in the demographic trend and the geographical distribution of the population of Czechoslovakia, paying much attention also to ethnic composition and changes in it. However, one misses a larger number of international comparisons, e. g. is to. changes. in the proportion of the Czechoslovak population compared with the world population.

The economic geographer will be interested above all in that part in which the author characterizes the economy of Czechoslovakia as a whole as well as its individual sectors. This part is of an almost encyclopeadic nature, containing a mass of valuable and well classified data nd surprisingly topical facts. It is a pity that the author did not give more room to economical-geographic territorial relations in the manner in which he demonstrated them e. g. in a simple chart on iron metallurgy; one has to consider, however, that the facts involved cannot easily be made public.

The extensive regional part greatly enhances the value of the entire book; it compared with other similar works it is far more detailed.[3]) The author presents the re-

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2) HÄUFLER V., KORČÁK J., KRÁL V. (1960): Zeměpis Československa (Geography of Czechoslovakia) 660 pp., NČSAV, Praha.

3) See e. g.: STŘÍDA M. (edit.) (1963): Oblasti Československa (Regions of Czechoslovakia) 220 pp. SPN, Praha.

gional survey of Czechoslovakia according to administrative units, i. e. according to regions and districts, with all regions treated according to a single pattern. Objections might be raised against this approach, but it should not be forgotten, that this definition of regions facilitated the use of available statistics and the approach was also subject to the fact that the book is to serve as university text-book. However, in the preamble to this part, a theoretical introtduction could have been useful, in order to acquaint the reader in greater detail with the present stage of comprehensive economic-geographical regionalization of Czechoslovakia. In this part also a greater number of charts describing territorial industrial complexes would have been welcome, such as the chart showing the area of Kladno—Beroun or the North Bohemian Coal Basin.

The book is concluded by a chaysten on international economic relations of Czechoslovakia and the position, or part played by Czechoslovakia, in the Comecon. It is the first time that a book on Czechoslovakia's geography contains a chapter thus conceived, which will be of interest also to non-geographers (e. g. the role played by individual regions in Czechoslovakia's export).

The graphical aspect of the publication should be described as an asset, though some smaller maps (in particular the complex maps of the regions), appear a bit too heavyor due to the cross-hatching and are sometimes badly legible. A useful supplement for the study of this book will be, without doubt, the Atlas of Czechoslovakia (1966), or its forthcoming new edition.

In conclusion, it should be said that the author presented a work which not merely meets the exacting requirements on an university text-book, but that it is at the same time a detailed monography on Czechoslovakia, which the public has been waiting for for a number of years. The subject, however, will be of interest also beyond the borders of Czechoslovakia, and it might be recommended to the Publishers to consider publication of a foreign-language version (e. g. English), somewhat abbreviated if necessary, to replace the „Geography of Czechoslovakia",[4]) which has been out of print for some time.

Josef Brinke

Zdeněk Kukal: Atlantis ve světě moderní vědy (Atlantis in the Light of Modern Science). Academia, Praha 1978. 257 pp., price 52 Kčs.

Dr. Zdeněk Kukal is an outstanding Czech geologist. He spent many years prospecting oil in Arabian Countries. Among geographers he is known by his books; some of them translated into English and published by Elsevier. Three years ago Dr. Kukal published a large textbook of oceanography, the first modern one in the Czech language. I suppose this was the reason, which lead dr. Kukal to thoroughfull analyse of Atlantis Story. Searching for the mysterious Island of Atlantis is a very thrilling scientific adventure. A considerable number of papers have been written about Atlantis. It can be estimated at 3600. 95 out of this number being books. I am of the opinion that Kukal's book represents an outstanding book in this history. I personally read this book with a great interest. The methods of analysis used by the author are really very modern. Dr. Kukal is using newest data and proving the value of most information about the problem under study.

I read this book twice. For the first time just after the book appeared in the Publishing House of the Czechoslowak Academy of Sciences in Prague. For the second time now, when I was asked to write this review. And twice I was unhappy when I came to the last page of this splendid book, because the result of author's analysis is... we did not find any traces of the legendary and mysterious Atlantis, either in the islands of Atlantic Ocean and Mediterranean Sea or on the sea floor. Neither geology and geography, nor history and archeology including etnography are able to present even the smallest positive prooff of its existence. We conclude, therefore, that the whoiee Atlantis is a pure invention of Plato...

As a scientist, I have to agree with the conclusions of Dr. Kukal's very complex analysis. Devoted scientists did have not found Atlantis so far and according the author will never find it, but their efferts dedicated to Atlantean researches encouraged and brought about many other geographical, geological, historical, archeological and other discoveries.

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[4]) DEMEK J., STŘÍDA M. et al. (1971): Geography of Czechoslovakia. 330 pp. Academia Praha.

I would like to congratulate Dr. Zdeněk Kukal to his successfull book, but as a plain Man I still hope, that somebody will find somewhere on the spreading sea bottom ruins of the Atlantis. Sometimes, perhaps. P. S. English speaking readers can follow ways of the author's thinking in the rather extensive summary in English.

Jaromír Demek

Jaromír Demek et al.: Životní prostředí České socialistické republiky (The Environment in the Czech Socialist Republic). Státní pedagogické nakladatelství, Praha 1978. 158 pp., 1 map. Price 31 Kčs.

The list of references in the reviewed book disloses the number of Czech books treating of the environmental problems. The book by J. Demek et al. (E. Quitt, H. Kříž, B. Nováková, D. Sekaninová, A. Buček, J. Raušer, P. Halouzka, V. Toušek, A. Götz, O. Stehlík, D. Kvasničková) most of whom work at the Geographical Institute of the Czechoslovak Academy of Sciences in Brno, is the first to treat of this most vexing problem from the general geographical point of view.

In the introduction the authors give the fundamental terms applied in geography when speaking of the living environment in what is called the system approach. The second chapter is dedicated to environmental changes taking place on the Earth. The largest part, however, (pp 37—136) is concerned with concrete problems peculiar to Bohemia and Moravia.

In this part the authors describe the present state, the main problems to be solved and the prospects of the environmental protection in the CSR. The chapter opens with a survey of the demographic conditions and continues with the analysis of elements of the natural sub-system and elements of the socio-economic sub-system. The enclosed maps show the types of natural landscape as well as the cultivated areas in the CSR. The main subject of this chapter-as well as of the whole book- is the synthesis of the present influences of economic activities of the human society upon the landscape in the CSR and upon its elements, i. e. upon the relief (the origin of anthropogenous forms), upon the atmosphere, hydrological conditions, soil conditions as well as upon the fauna and flora. At the close of this chapter the authors treat of the aggravating environmental problems especially in urban areas where on an area taking up 16,3 % of the whole area of the CSR 50 % of its population, 60 % of all industrial enterprises, and 80 % of all services are concentrated. The increase in the death rate in Prague by 35,92 % over the last 16 years — especially due to what are called the civilization diseases — shows clearly the urgency to remedy environmental problems as much as possible. The authors pay much attention to the prospects of the environment in the CSR choosing the realistic approach based upon scientific and statistic data. They rightly see the main reason of its present state in the energetic situation which necessitates he burning of the less valuable fossil fuels, e. g. the brown coal from the basin of the Krušné hory (Ore Mountains) containing a large percentage of sulphur. They also treat of the increasing danger of air pollution due to the extreme exhaust emissions which is expected to reach almost 1 million tons of carbon monoxide (CO) emitthed in the air in the CSR by 1985. Also the fresh water supply, the traffic and pastime organization will become substantial problems all over the world as well as in our country. Much attention should be paid to a deliberate education in schools, families, social organizations, in the press, radio broadcasts and television programs regarding the care of the environment. The authors stress the importance of a complex geographic approach viewing the problems of environment protection with respect to the stormy economic evolution taking place in the individual areas and to the anticipated growth of the living standard. They describe different possibilities of socialist and capitalist states to solve these complicated and economically difficult problems.

The book contains many numerical data as well as several tables which help to complete the picture of the present state of the environmental problem in the CSR. No other book offers the teachers of geography so many well classified data on this subject. Nevertheless, the next edition should be more detailed, containing more concrete data regarding the individual regions. General statements of this kind „comparatively large numbers of mineral resources are found (p. 57) in the CSR" should not be used. More exact data are required. The maps should depict the real, not the presumed state (e. g. the map on p. 69 depicts not yet existing protected landscape areas — Novohradské hory, Vitorazsko, Králický Sněžník, Bílé Karpaty, etc). Also the influence of the deleterious emissions from the neighbouring states causing great damages in the forests along the frontier, e. g. in the Jizerské hory (Mountains) and the

Krkonoše (Giant Mountains), should not be (p. 67) omitted. More attention should be paid also to the medical-geographical conditions in the CSR showing the quality of the environment, and to the travelling. The quality of some graphs (Fig. 13, 13, 28) is also disputable. A considerable enrichment of the book is the enclosed coloured map of the environment in the CSR on the scale of 1:500 000, compiled and published by the Geographical Institute of the Czechoslovak Academy of Sciences in Brno in 1978 (3rd edition).

The book is not meant to bring the results of its authors' scientific research, but is claimed to provide the teachers of geography (biology, geology and also other subjects) with a complex view of individual environmental problems in the CSR as they arise in the course of a powerful economic advance, and require a perfect balance of natural and technogenous processes.

As the first manual of this kind written in Czech, the book is sure to serve its purpose well. Only, it should have had an abstract in some foreign language.

J. Rubín

Supplement

ORBIS GEOGRAPHICUS BOHEMOSLOVACUS

A LIST OF THE MAIN GEOGRAPHIC INSTITUTES AND INSTITUTIONS IN CZECHOSLOVAKIA

SEZNAM HLAVNÍCH GEOGRAFICKÝCH ÚSTAVŮ A INSTITUCÍ

Compiled by Václav Král — *Sestavil Václav Král*

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D. Geographical Journals and Periodicals — Geografické časopisy a periodika

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Journal of the Czechoslovak Geographical Society

(1) Academia, Vodičkova 40, 112 29 Praha 1
(8) Václav Král
(4) J. Demek, V. Häufler, R. Hendrych, J. Kvitkovič, M. Macka, L. Mištera, L. Mucha, F. Nekovář, P. Plesník, J. Rubín

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