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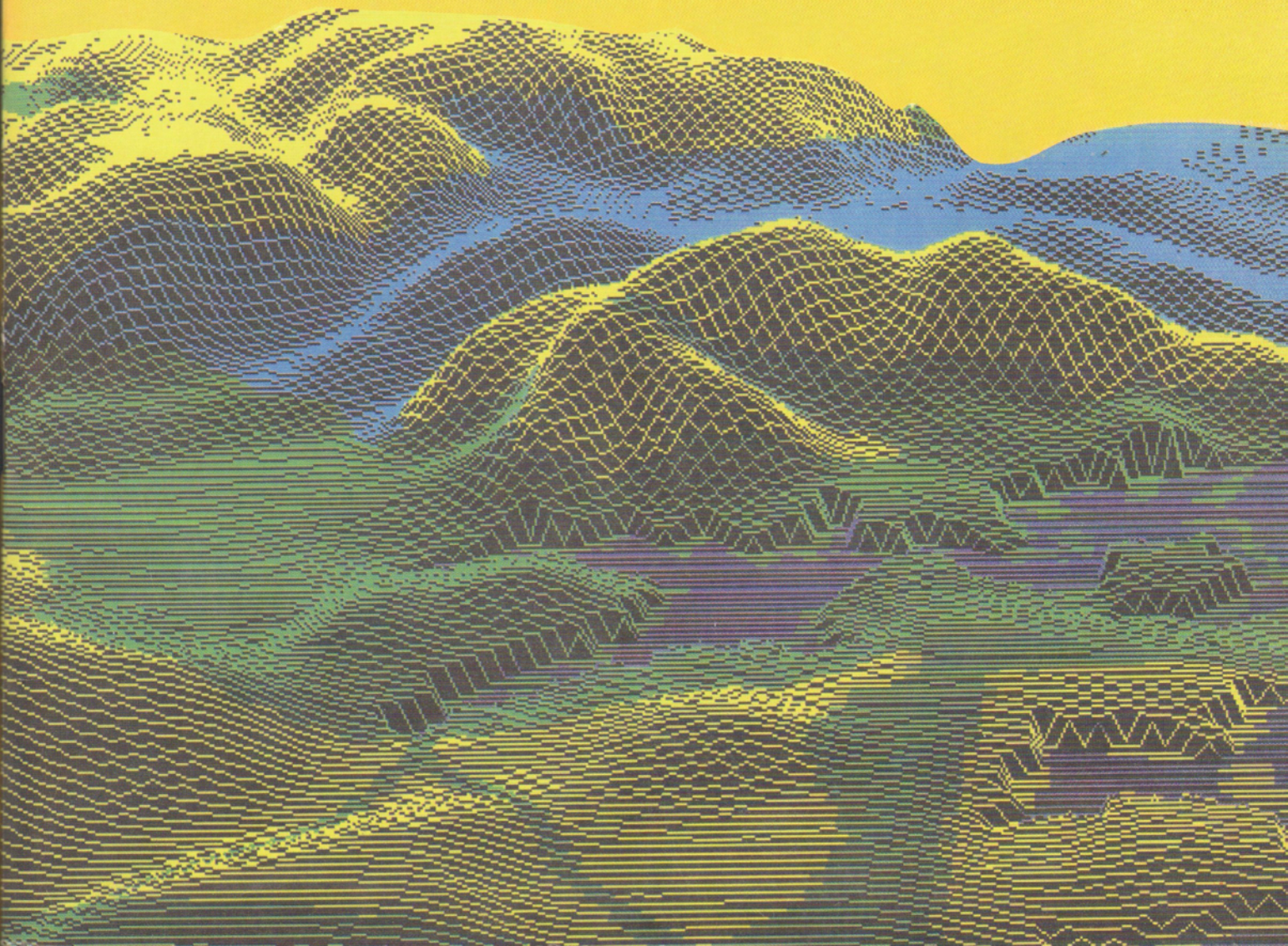

Křivé jezero Lake is one of the common river arm lakes in the extended alluvial plains of the Lower Moravian Lowland (Basin of Vienna). Highly productive inundated riverine meadows and forests with typical willow stands are subjects of the nature protection in the proposed Danube-Morava-Dyje National Park.

Photo: J. Kolejka

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Contents

MAPS OF NATURAL LANDSCAPE TYPES AND LAND USE IN THE CZECH REPUBLIC

(at the scale of 1 : 1 500 000)

as a basic countribution to functional maps of Landscape Use in Central Europe

Jaromír KOLEJKA - Vítězslav NOVÁČEK

Abstract

Natural landscape types were formed exclusively by the action of natural forces and at the same time they presented natural material base for the formation of territorial structures of the environment. Properties of any natural territorial unit influence both the choice of anthropogenic actvities in the landscape and their distribution in the area. On the basis of natural landscape and through the influence of human activities territorial units of the present landscape with its characteristic structure are formed. Land use is an essential physiognomic element of the contemporary landscape and data on land use inform us about basic functional differentiation of the territory in the Czech Republic.

Shrnutí

Základní členění krajinné sféry na území České republiky odpovídá rozložení megaforem reliéfu Země, tj. nížin a vysočin. Nížiny se vyznačují převážně plochým nebo zvlněným akumulačním nebo erozně-akumulačním reliéfem, který vzniká v důsledku dynamických procesů na sedimentech různého stáří a téměř homogenním klimatem. Vysočiny, které jsou tvořeny pohořími a vnitrohorskými sníženinami, jsou charakteristické značnou vertikální i horizontální členitostí erozně-denudačního reliéfu. Zvláštní postavení mezi nimi zaujímají kotliny a pánve. Geneticky jsou vázány na vysočiny, neboť vznikají společně s nimi a to jako lokální sníženiny v důsledku působení endogenních nebo exogenních činitelů.

Krajiny nížin, pánví, kotlin a pohoří můžeme členit podle typu podnebí a jeho účinků na půdní kryt a biotu. Na pozadí určitého mezoklimatu se jako nižší diferenciační činitel uplatňují v nížinách, pánvích a kotlinách charakteristické dominantní tvary reliéfu se specifickou geologickou stavbou a oběhem podzemních vod. V krajinách pohoří tuto roli zaujímají morfometrické parametry reliéfu, které popisují výškovou a horizontální členitost terénu ve spojení s geologickou strukturou.

Přírodní krajinné typy vznikly výhradním působením přírodních sil a zároveň tvoří přirozený materiální rámec pro formování teritoriálních struktur životního prostředí. Vlastnosti každého přírodního územního celku ovlivňují výběr antropogenních aktivit, které působí v krajině a jejich rozmístění v území. Na základě přírodní krajiny se vlivem lidské činnosti utvářejí územní jednotky současné krajiny s charakteristickou strukturou. Využití ploch je tedy projevem hospodářského, ale i mimoekonomického působení na přírodní prostředí a to v závislosti na přirozených vlastnostech daného území, výrobních a intelektuálních schopnostech a možnostech obyvatelstva, historickém, politickém a sociálním vývoji aj. V průběhu historického vývoje se na území dnešní České republiky vytvořili čtyři základní funkční typy současné krajiny, které jsou definovány prostorovou strukturou využití ploch. Využití ploch je hlavním fyziognomickým prvkem současné krajiny (společně s přírodním-fyzickogeografickým pozadím), které nám dokumentuje prostorovou strukturu krajiny z environmentálního hlediska. Existující teritoriální struktura využití ploch s přírodním pozadím charakterizuje ráz současné krajiny a definuje její územní jednotky.

Key words : natural landscape type, territorial structure, land use, physiognomic element, territorial unit, Czech Republic

1. Introduction

The requirement for the creation of a special map of functional aspects of the landscape is known from the middle 1980's. Different detailed projects evaluating functions of the landscape made by man or serving him were made even much earlier, but no international cooperation occurred until present. International importance of this kind of map is based on the opportunity to compare the landscape use in individual countries and evaluate present state of the environment in European countries in particular. The idea of compilation of the

map of landscape use for Central European countries was presented by professor A. RICHLING (University of Warsaw, Poland) and under the technical, organizational and material support of the Austrian Institute of East and South-East European Studies (Vienna, Austria): the map was finished in 1994. A large amount of data were collected in every participating country which made a good material for understanding the integrated map. Separated data on the natural background - landscapes and present state - land use describe different development in regions of the Czech Republic.

2. Map of Natural Landscape Types

2.1 General land overview

The territory of the Czech Republic - the inland country in the Central Europe - is extended in the west-east direction with its length exceeding 400 km. Width of the territory in the north-south direction is in average over 200 km. The aggregate area of the Czech Republic is 78 862 sq km. A decisive factor for territorial differentiation of the landscape sphere in the territory of Czech Republic is configuration of the relief and particularly its altitudinal variability. Mezoclimatic stratification is then depending on this factor. Elevation climatic changes usually call for adaption of vertical arrangement of zones with the characteristic soil cover, biota and in a certain way modified hydric regime in dependence on conditions of the terrain as well as on the geological structure.

2.2 Mapping

Any landscape can be described in two fundamental ways : by emphasizing specific features of the individual components of the landscape unit and relationships between them, by which the area differs from other regions - this is typical for the characterization of the individual landscape, non-repeatable in space and time; and by searching more general features of the components, relationships or the complex, which would distinguish the given area from its surroundings but with similar localities occuring repeatedly in space and time on an individual basis - this applies to typological landscapes. Between the landscapes of both conceptions, there are relationships of superiority and subordination, i.e. hierarchical relationships which are defined by the measure of similarity of definition between the feature values. External manifestation and results of the process of classification of territorial units is typization and regionalization. By this way, we can demarcate in the process of mapping the natural landscape, the landscape types of the precisely defined hierarchical rank, definition set of properties and the measure of internal homogeneity. This fact transferred into the map means identification and localization of these territorial units within an interest region with the identical hierarchical arrangement. The hierarchy of differentiation factors applied in the process of typization and regionalization of the natural landscape in the Czech Republic resulted in a system of types of choric units which repeat across the country and which are illustrated in the scale of 1 : 1 500 000 (see Appendix No.1).

2.3 Natural landscape types of the Czech Republic

Three historical Czech lands developed here in the past thousand years: Bohemia in the west, Moravia in the east and Silesia in the north-east. The origin of these historical lands is narrowly related to the natural environment.

Bohemia, the most western one of the Czech lands, posseses a circle-like form of polygonal countours created by medium high border mountains surrounding the so called Bohemian Basin with some central elevations to the south from the Prague metropolitan area. Starting from the southern corner of the country contours to the west are as follows: Šumava Mts. (Bohemian Forest), Český les Mts. (Oberpfalzer Wald Mts.), Smrčiny Mts. (Spruce Mts.), Krušné hory Mts. (Ore Mts.), Labské pískovcové pohoří Mts. (Elbe Sandstone Mts.), Lužické hory Mts., Jizerské hory Mts., Krkonoše Mts. (Giant Mts.), Orlické hory Mts. (Eagle Mts.), Českomoravská vrchovina Highland, Novohradské hory Mts. The drainage network in Bohemia is typical radial concentric with one output only - River Labe (Elbe R.).

Moravia in the east is an exemplary transit country consisting of two crosspassing terrain depression systems. The main transit gate system is a chain of the Outer Carpathian Depressions on the contact of the Meso-European Bohemian Highland in the west with the Neo-European Carpathian folded mountain zone in the east. This chain goes from south-west to north-east counting the Svratka-Dyje Lowland, the Gate of Vyškov, Upper Moravian Lowland, Moravian Gate (main European watershed across) and the Basin of Ostrava. The transit corridor of secondary importance goes from the Danube in the Basin of Vienna in south-east to north-west into the Basin of Klodzko following the Morava river valley upstream, later crossing the main European watershed.

Silesia (both Polish and Czech parts) is located on the steep northern slopes of the Sudeten Mts. (Bohemian Highland) and the Beskydy Mts. (Carpathians) and in their northern foothills. Facing north Silesian mountains and foothills are drained by mostly parallel tributaries of the Odra river leaving the Czech territory not far from the foot of the mountain ranges.

This main general features of the natural background influenced not only functions of the teritorry (land use), but to certain stage human behavior and feeling.

Without respect to regional view, landscapes of lowlands, basins and mountains were distinguished in the territory of the Czech Republic. The natural landscapes of external (north) and internal (south) lowlands are represented by flood plains following the main rivers of Dyje, Morava and Odra as broad belts (MAZÚR et al., 1985, KOLEJKA 1992a, KOLEJKA 1992b). Most of them are accompanied with higher terrain of fluvial terraces and accumulation-erosional hilly lands with sandy arenosols, chernozems or vertisols, originally covered with ancient xerophilous oak forest in the south in the Basin of Vienna. Typical accumulation-erosional hilly lands, morainic hills and polygenetic foothills with luvisols and pseudogleys and oak-hornbeam forests were common in the margins of the Silesian lowland in the north. A similar situation occurs in Moravian mountain foreland landscapes, both in open and enclosed ones, where according to climatic changes from south to north the southern chernozems and phaeozems are being gradually substituted with pseudogleys in the north.

The Western Carpathian landscapes, e.g. wide intermountain valleys and erosionally dissected medium high mountains with brownearths or podzolic soils were in the past covered with the xerophilous oak, oak-hornbeam and beech-coniferous forest depending on the sea elevation, occupy only a part of Central Moravia and border zone to Slovakia. Hight of these flysh rock mountains with some isolated limestone cliffs ranges from about 300 m high hilly lands in Central Moravian Carpathians up to 1300 m high and steep sandstone of the Beskydy Mts.

The ring of the Bohemian border mountains consists mostly of faulted mountain ranges built of old crystalline rocks covered with poor podsolic soils and beech-coniferous forests. Most of these mountains reach over the height of 1000 m above the sea level. The highest point of the Bohemian Highland is Mt.Sněžka (1602 m) in the Giant Mts. There are some extended flat mounts of subalpine character, dissected with Pleistocene glacial land forms.

Inland slopes do not go continously down into the Bohemian Basin. A chain of basins divides the border mountains from central mountains in the south-west and in the north-west. Many of them are of the Tertiary/Quaternary volcanic origin in North-western Bohemia (e.g. Bohemian Middle Mts., Doupovské hory Mts.). About southern two thirds of the Bohemian Basin are composed of variable medium high mountains, predominately hillylands, small basins and relatively deep and narrow river valleys. Geology of this area is very complex consisting of non-metamorphic Lower Paleozoic sedimentary rocks of Barrandien, partially limestones, Upper Paleozoic agglomerates, old volcanic bodies and metamorphic and magmatic Proterozoic/Paleozoic rocks covered mostly with poor oligotrophic browneearths and pseudogleysols, stony rankers and rendzinas originally covered with dominating oak-beech and oak-pine forests in the Central Bohemian Hilly land. Only exeptionally reach some ranges mountainous forms, e.g. Brdy Mts. to the south of Prague, with the highest point of Mt.Praha (862 m).

The northern third of the Bohemian Basin is filled with Mesozoic, Tertiary and Quaternary deposits of the Bohemian Cretaceous Tableland. Although the central flat and hilly part of this large depression is covered with loess and alluvial deposits with fertile soils along the River Elbe and its tributaries, many rock outcrops occur on the margins of the tableland, forming typical cuesta a table mountain terrain.

Eastern extension of the Bohemian border mountains is interrupted by the Boskovická brázda Furrow and Podorlická brázda Furrow, a chain of long and narrow tectonic and erosional depressions with a flat bottom and a relatively rich soil cover.

A complex system of the mountain landscapes goes from the Brno area in the south to the Polish boundary in the north, based on folded metamorphic and sedimentary rocks of the Varisian age, mostly covered with poor cambisols. Many medium and small karst areas follow from the City of Brno to the nothern limit of the Jeseníky Mts. and Rychlebské hory Mts. They are located in Devonian limestones and in older crystalline marbles. The massif of the Králický Sněžník Mts. (1424 m) is drained into three sea basins : Baltic Sea in the North, Black Sea in the South-East and North Sea in the West. The highest mountains in this region - the Jeseníky Mts. with Mt. Praděd (1492 m) posses a typical vertical consequence of landscapes starting from oak-beech forest on the foot up to the alpine meadows on the flat tops of main ridge and some isolated domes.

2.4 Dual character of Czech landscapes

Despite its small extent and spread on the Earth surface, the territory of the Czech Republic is very diversified, especiallly due to the relief variability. Some differences are obvious at the first sight between the western Hercynian part and the eastern Carpathian part. Territories of the Bohemian Highlands are characterized by lesser variability of mountain ranges and relatively greater variability of lowlands and basins. The Carpathian area exhibits dominat great natural variability of mountains and lower variability of depressions. The Bohemian Highland is characterized by extensive flat and dissected hilly lands on acid rocks and by shallow flat basins. In the Carpathians there are systems of pronounced basins mutually separated by high dissected mountain ranges, often on the flysch or limestone rocks with high energy of the relief.

3. Land Use Map

3.1 Land use and land cover development in the Czech Republic

The Czech republic is a country where exact land registration has been conducted for 170 years. The investigations carried out from 1824-1843, enabled cadastral maps to be drawn up at the scale of 1 : 2 880. Every plot (the "parcel") was registered according to its use and property. These records were regularly revised and completed both in the textual and cartographic parts.

The small scale land use maps were made in former Czechoslovakia (for example : Atlas of the Czechoslovak Socialist Republic /1966/, at the scale of 1 : 1 000 000; Atlas of the Environment and Health of the Population of the Czech and Slovak Federal Republic /1992/, at the scale of 1 : 1 000 000). The land use map at the scale of 1 : 500 000 of the Czech Republic was compilated by authors J. KOLEJKA and V. NOVÁČEK in the year 1992 to cover requirements of a government commission. In the Institute of Geography CSAS in Brno were constructed the maps of land use at large scales, which were component of the regional geographical research. All of them contain three basic categories : technogenous land use forms, agricultural land use forms and forestry land use forms.

Land use is accordingly a manifestation of economic but even extra-economic human effects on the natural environment in defence respecting natural qualities of the given territory, economic and intellectual abilities and possibilities of the population, historical-political and social development and even aesthetic attitude of people to neighbouring environment.

Since the beginning of the Neolithic, i.e. on the territory of present-day Czech Republic since the 5 000 years B.C. a conscious selective transformation of the landscape took place. Very sensitive landscape components and elements, such as flora, fauna and water regime were the first subjects to the transformation , particularly due to expansion of agricultural areas. Later, mainly in connection with developing extraction of mineral raw materials and origin of extensive urbanized regions, remodelling of relief, changes of the river pattern and expansion of cultivated land occurred. Since supreme Middle Ages, in the course of colonization campaigns of miners, herds and timber men almost the entire territory of our country has been affected by anthropogenic influence. With respect to the fact that the anthropogenic pressure on nature took place in waves, often with subsequent weakening of the influence, utilization of the areas has always been locally selective. Areas most suitable for the given purpose were utilized first in the natural environment i.e. those occuring nearest the place of permanent settlements. After the considerably extensive deforestation in the Middle Ages when share of the forest compared to the original state decreased to approximately 10 %, restoration of forests above all on poor lands, steep slopes, in less populated regions, frontier regions but even in some cases on the areas of emptied medieval ponds was carried out. At the beginning of the 19th century, the distribution of woodland and other areas stabilized in substance. The later partial corrections in the distribution are connected mainly with the development of intensity of economic effects on natural environment and with the development of continuing urbanization and industrialization of the territory.

Result of the historical development of four basic functional types of present landscape defined by spatial pattern of the land use can be differentiated as follows: man-made and urbanized landscape, agricultural landscape, agricultural-forest landscape, forest and grass landscape (see Appendix No.2).

3.2 Applied land use mapping

The proper content of the land use map is the result of integrating data of different character. The map displays the structure of physiognomic elements of landcape utilization in the Czech Republic and was compiled using various thematic maps, satellite and aerial data and - last but not least - information collected during the field research and mapping. In establishing some of the given kind use categories shown in the map, needed to accept even few compromising solutions (be it for technical or time reasons). For example, the category of settlements and urban areas consisting only of the settlements and their surroundings with population number of 50 000 and more, was drawn according to the present state recorded in the satellite photographs of high resolution.

3.3 Regional land use types in the Czech Republic

The types of man-made and urbanized landscape are formed by urban and rural built-up areas in the intravillans of settlements, built-up production areas, recreational weekend-house colonies, roads and motorways, energetic and irrigation canals, artificial water bodies, mining and abandoned areas. The types of agricultural landscape involve landscapes with a distinct prevaleance of arable land, landscape with a distinct prevaleance of grassland, landscape with substantial share of orchards and plantations of fruits and vegetables, including hop-field areas. The agricultural-forest areas and forest-grassland areas shape transition group. Forest and meadows consist of areas of coniferous, mixed and deciduous forests and Alpine meadows.

The land use map reading allows to distinguish that the types of the present-day landscape of the Česká vysočina (Bohemian Highland) possesses much more

often mixed polyfunctional character than a monofunctional one. Basically, the favourable terrain and other natural conditions lead to the development of a relatively complex pattern of small and medium-size functional areas, accompanied in some selected regions even by the network of fishponds (typical of Southern Bohemia). The monofunctional blocks of predominately coniferous forest cover extensive areas and are common for the boundary mountain ranges. Large arable field landscapes are typical of the Labe (Elbe river) and Ohře river basins as well as of Moravian margins of the Česká vysočina (Bohemian Highland). Mixed functional types of the present-day landscape occur in some parts of Eastern Moravia, where the pattern of forests, meadows and pastures is representative. The present landscape of the Southern Moravia is a typical agricultural area with the substantial share of orchards and vineyards. The agricultural areas with arable land and distinct share of hop-gardens are typical of the lower Ohře river basins and surroundings of the town Rakovník in the Central Bohemia.

3.4. Understanding the land use map

The physiognomic elements of the landscape utilization delimited in this way, content of the land use map, help to imagine the spatial structure of the landscape from the environmental point of view. The information presented by this suitable manner became a valuable starting point for solution of problems connected with spatial organization of the cultural landscape.

The present land use pattern is heavilly affected by some damaging man activities, for example air pollution, building operations, agricultural and recreational activities. The coniferous forests cover in the northern mountains needs a basic reconstruction due to the large portion of dead canopies caused by polluted air. Some constraints of interests in this area (forestry, recreation, ecological function, watersupply, etc.) make the future unclear. Large ecological stabilizing measures connected with land use structure should be realized both in steep slope mountain and river valley areas and in extended agricultural lowlands of Central Bohemia, Central and Southern Moravia simultaneously with the programme for land privatization.

4. Conclusion

The map natural landscape types and the map land use were utilized as foundation material for compilation of the map Landscape Use in Central Europe at the scale of 1 : 1 500 000. Coordinator of this international project is prof. Andrzej RICHLING from the University of Warsaw, Poland. The map landscape Use in Central Europe (incl.accompanying text in English and German) will be published at the beginning of 1995, its edition being guaranteed by the Austrian Institute of East and South-East European Studies in Vienna.

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Explanations to the map - Appendix No. 1

(the numbers correspond to numbers in the legend of enclosed map)

1 Flood plains with alluvial soils and riparian forests, local reeds and halophilous vegetation

2 Higher plains of accumulation, often terraced with chernozems and arenosols and xerophilous oak forest

3 Higher plains of accumulation, often terraced with luvisols, arenosols and oak-hornbeam forest, local oligotrophic oak-pine forest

4 Accumulational-erosional plain and gentle undulated regions with chernozems and xerophilous oak forests

5 Accumulational-erosional hilly regions with chernozems, luvisols, pseudogleys and oak-hornbeam forests

6 Erosional denudational hilly regions with luvisols, grey forest soils and oak-hornbeam forests

7 Erosional hilly regions with luvisols and grey soils and xerophilous pubescent oak forest

8 Erosional hilly regions with luvisols and grey soils and oak hornbeam forests

9 Erosional hilly regions with arenic and podzolic soils and oligotrophic oak-pine forests

10 Undulating loess landscape with degraded chernozems phaeozems, local vertisols and xerophilous oak forests

11 Hilly glacial and glacio-fluvial surfaces with grey forest soils, cambisols, local pseudogleys and oligotrophic red pine forests and local oak-hornbeam forests

12 Dissected pediment surfaces of varied origin with chernozems, phaeozems, vertisols, local cambisols and xerophilous oak forest and local oak-hornbeam forests

13 Dissected pediment surfaces of varied origin with luvisols, pseudogleys and oak-hornbeam forest

14 Limestone hilly region of denuded tectonic relief with rendzinas and xerophilous oak forests with sprinklings of sub-Mediterranean types

15 Basins and wide intramontane valleys without typological differentiation with phaeozems, local pararendzinas and xerophilous oak forests

16 Basins and wide intramontane valleys without typological differentiation with phaeozems and luvisols and oak-hornbeam forests and local beech forests

17 Basins and wide intramontane valleys without typological differentiation with pseudogleys, cambisols and oligotrophic oak and oak-pine forests

18 Basins and wide intramontane valleys without typological differentiation with cambisols, podzolic soils and beech forests

19 Deep erosional valley systems with rankers, cambisols and slope aspect related very variable vegetation cover

20 Surfaces of truncation in old massifs with cambisols and oak forests

21 Surface of truncation in old massifs with cambisols, podzolic soils, local pseudogleys with oligotrophic oak and oak-pine forests

22 Surfaces of truncation in old massifs with cambisols, rankers, local luvisols and oak-hornbeam forests

23 Surfaces of truncation in old massifs with cambisols, podzolic soils, luvisols and pseudogleys with beech-coniferous mixed forests

24 Flat upland areas of cuesta landscape with pararendzinas, cambisols and beech-coniferous mixed forests

25 Highlands landscape, mainly shaped by erosion with grey-brown podzolic soils, brownearths and oak-hornbeam forests

26 Highlands landscape, mainly shaped by erosion with brownearths, local podzolised and oligotrophic oak-pine forests

27 Highlands landscape, mainly shaped by erosion with brownearths, podzolic soils, rankers and beech or beech-coniferous mixed forest

28 Mountain landscape of subalpine character with podzolic soils, rankers and subalpine scrubs and grassland

29 Karst landscape with cambisols and oak-coniferous forest

30 Karst landscape with luvisols and cambisols and beech-coniferous mixed forest

Explanation to the map - Appendix No. 2

(the numbers correspond to numbers in the legend of enclosed map)

Man-made and urbanized landscape

1 - residential and productional built-up areas

2 - mining and devastated areas

3 - surface waters including bigger artificial lakes

Agricultural landscape

4 - with distinct prevaleance of arable land

5 - with arable land and distinct share of fish-ponds

6 - with arable land and with share of grass growths

7 - with prevaleance of grass growths

8 - arable land with distinct share of orchards

9 - arable land with distinct share of vineyards

10 - arable land with distinct share of hop-fields

Agricultural-forest landscape

11 - agricultural-forest areas with mosaic type of use, mostly agricultural with substantial share of dispersed forest areas covering less then 50 % of the area

12 - agricultural-forest areas with predominance of arable lands, forest surface together makes less than 30 % of the area

13 - forest-grassland areas, dispersed forest areas and permanent grassland (meadows and pastures)

Forest and meadows landscape

14 - deciduous forests

15 - coniferous forests

16 - mixed forests

17 - alpine meadows

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Reviewer

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Selective landscape use on the territory of Southern Moravian Carpathians. Prevailing rich chernozems carry an intensive agriculture even on terraced slopes. Southern dry steep slopes are covered with shallow calcarous pararendzina soils and nature near xerothermic steppe or forest-steppe vegetation islands. Oak forests and rocky grassland is typical for the limestone steep slopes of the Pavlovské vrchy Hills (in background). Photo: J. Kolejka

CZECH REPUBLIC
NATURAL LANDSCAPE TYPES

13° 14° 17° 18° 19°

51° 50° 49°

GERMANY POLAND SLOVAKIA AUSTRIA

LANDSCAPE TYPES

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30

1 : 1 500 000

CZECH REPUBLIC
LAND USE

13° 14° 17° 18° 19°

51° 50° 49°

GERMANY

POLAND

SLOVAKIA

AUSTRIA

PRAHA

Hradec Králové

Ostrava

Brno

České Budějovice

LAND USE CLASSIFICATION

1	7	13
2	8	14
3	9	15
4	10	16
5	11	17
6	12	

1 : 1 500 000