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La recherche actuelle sur le paysage en Hongrie

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Background and main fields of landscape research

1 Hungary. Although projects in purely fundamental research also survive, *market conditions* are gradually extending to geography as well. In Hungary classical landscape geography heavily relied on geomorphology (Horváth, 1997; Pécsi & al. 1993; Marosi, 1980). In our opinion, recently *new directions* evolved in landscape research and they secure a respectable position for the discipline both among the natural sciences and in society. Unfortunately, geography is gradually being pushed back in primary and secondary public education. In higher education however, specialisation related to landscape study (training research geographers, landscape architects, experts in agricultural and rural policy or in environmental management etc.) is increasingly popular.

2 In Hungary landscape hierarchy and pattern studies as well as the research of interactions between landscape factors have the longest tradition. This research trend also covers the delimitation of landscape units. A recent comprehensive work provides *An inventory of microregions in Hungary* (Marosi & Somogyi, S. 1990). A team of physical geographers, pedologists, and climatologists summarises the major features of the 230 microregions in Hungary in two bulky volumes. As formulated by the editors, the main requirements the inventory had to meet were hierarchical construction, precise location (a map of landscape units attached); commensurability (applying numerical parameters wherever possible), easily intelligible language (avoiding unnecessary scientific terms or technical formulation); expandability (through the inclusion of additional ecological factors); a comprehensive recording of actual conditions (enabling the use of the inventory as reference). This is a standard reference now also for

workers in related disciplines (eg. landscape planning, environmental impact assessment etc.).

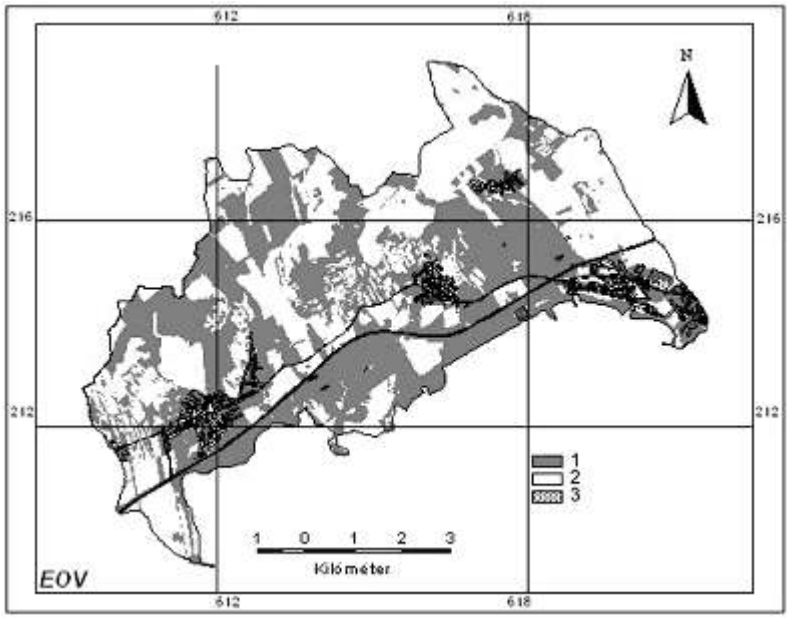
3 In the study of landscape structure, landscape patterns have received more attention recently. The applicability of *quantitative landscape pattern* parameters is investigated in South-Transdanubia, where arable land, pastures and meadows, vineyards and orchards form a typical Central European landscape mosaics. New tools of research, particularly GIS application open up new opportunities. The EU accession of Hungary requires a reduction of intensive cultivation over and thus research also serves practical purposes (Csorba, 1996; 2000). The impacts of the recently completed land privatisation can also be judged from the analysis of landscape pattern (Lóczy *et al.*, 1999). An interesting opportunity for comparison is provided with landscapes in EU countries (Lóczy, 1998).

4 Geo-ecological mapping is a particular tool for the exploration of the structure of landscapes. The Hungarian adaptation of the German 1:25000 geo-ecological mapping was implemented in the nineties and this may provide a framework for these kinds of analysis (Mezosi & Rakonczai, 1997).

5 Research in previous decades was characterised by functional landscape analyses, bound with regional planning and aiming at an optimal utilisation of land resources. The trend encouraged by regional planning and landscape management aimed at the optimal use of the landscape with its resources and various potentials (Schweitzer & Tiner, 2000; Marosi, 1980). As fundamental research issues of *landscape sensitivity* are studied (Kerényi & Csima, 1999). It was intended to determine to what extent physical potentials and actual land use in a landscape unit are in accordance; what environmental, ecological and landscape aesthetics conflicts are observed in the Tokaj wine-growing region, in selected areas of the North Hungarian Mountains and in the Hortobágy plain. Several smaller test areas were investigated for the environmental protection and landscape conservation implications of agricultural and infrastructural developments on the ecological landscape pattern (Kerényi & Szabó, 1997) and for heavy metal contamination of floodplains from industrial sources (Szalai, 1997).

6 On the Lake Velence catchment an attempt was made to identify physical *hazards and risks* involved by the agricultural, recreational or conservational use of land (Fig. 1). Land privatisation, also affecting this area, raises the questions (Mezosi & Bódis, 2000): what are the risks of land use changes, how is the economic value of land modified, what are the limitations to land use, what hazards emerge in landscape factors and how and where do they intensify each other? Five environmental (physical) hazards were taken into consideration in the test area. They are typical of this region: soil erosion hazard by water, diversification of the plant associations, decreasing fertility of soils, changing scenic beauty of the landscape, alteration of the river system. After the classification of the hazard (serious, medium, slight), the cumulated serious hazards are presented in Fig. 1.

Figure 1. Cumulated hazards on the catchment area at the Lake Velence (based on sample field experiments).



1: ONE OR TWO ENVIRONMENTAL HAZARDS; 2: THREE TO FIVE ENVIRONMENTAL HAZARDS; 3: BUILT-UP AREA.

7 Hungarian geography has ever devoted much attention to riparian landscapes (Schweitzer, F. 2001, Gábris, Gy. 1995, Somogyi, S. 1999). With increased flood hazard and reduced economic significance of flood-free lands, a new era begins in this field. Major projects of river restoration are outlined for the Danube and Tisza Rivers. Before the flow regulation measures, the medieval floodplain economy (named in Hungary the system of "foks" after the channels which drained water from floodplains) had supported large populations and had been an effective tool of flood control. Research to promote the restoration of this economy at least along certain sections is under way.

8 Geographers contribute to land rehabilitation research projects with practical purposes (eg. in hardcoal and uranium mining areas in the Mecsek Mts. Foreland). A comparative survey of baseline environmental conditons is followed by the modelling of expected trends of landscape development.

9 Another typical area of landscape research is urban ecology, where remarkable results have been achieved through the application of remote sensing and GIS (Géczy & Bódis, 2000; Mucsi, 1996; Tózsa, 1995). The research primarily focused on the assessment of the urban environment, the state of the green areas and the connections between the environmental state and health.

10 Recently process-oriented microscale landscape analyses were made to approach the landscape from functioning (Szabó, 1997) and anthropogenic impacts on the landscape (Fig. 2.) (Csorba, 1996) were studied.

Figure 2. Level of the anthropogenic impact in Tokaj vineyard area (Csorba P. 1996).

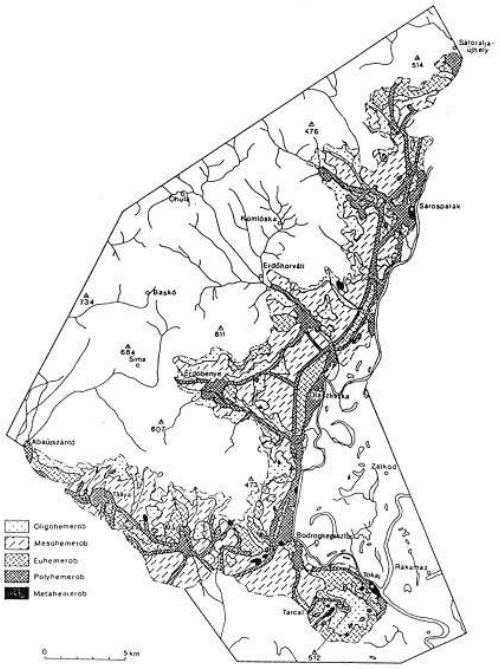


Fig. 2. Hemerobia map of the Tokaj-Hegyalja area.

OLIGOHEMEROBIC LEVEL: MODERATE IMPACT; MESOHEMEROBIC LEVEL: MEDIUM IMPACT; EUHEMEROBIC LEVEL: INTENSIVE ANTROPOGENIC IMPACT; POLYHEMEROBIC LEVEL: VERY INTENSIVE IMPACT; METAHEMEROBIC LEVEL: THE HEAVIEST ANTHROPOGENIC IMPACT.

11 Several projects are engaged in landscape budget surveys including nutrient flows (Kevei-Bárány, 1998; Papp & Sánta, 1997; Kertész, 1995; Szabó & Molnár, 1995).

12 Finally, *historical research* has to be mentioned (Füleky, 2000; Frisnyák, 1996; Nemerkényi, 1994). A scoring system is elaborated for the assessment of landscape units in the Great Hungarian Plain for the major land uses in three time sections: 11th-14th century, early 19th century, and early 20th century (Lóczy, 2000).

13 In Gödöllo (near Budapest), landscape ecological research is based on pedological, and agricultural background knowledge (Kiss, 1997). A special archeological, cultural-historical and morphological research here, the *kurgans project*, combines botanical, paleoecological, pedological interests of these mounds (Barczi & Joó, 2002).

Scientific and practical relations of landscape research, and its financial background in Hungary

14 In the inevitably interdisciplinary landscape research it is extremely difficult to ensure the continuous collaboration of experts from all sciences (ecology, geography, forestry, agriculture etc.) involved, although in landscape conservation there are some good examples of co-operation (also prescribed by law: eg. EIS has to include a chapter on predictable landscape changes).

15 Undoubtedly, landscape studies have gained ground recently in higher education. Landscape ecology teaching and research has been traditionally strong at departments

of physical or applied geography in Debrecen, and Szeged Universities, and became more prominent also at Pécs and Budapest in recent years. There are also expressedly interdisciplinary specialisations; such as training teachers and researchers in environmental sciences, agricultural-environmental experts, etc. Lecturers often contribute to several undergraduate and PhD. programmes. Contributions are made by Hungarian lecturers to education in the institutions of Hungarian minority abroad, eg. in Komarno (Slovakia), Beregovo (Ukraine), Oradea and Cluj-Napoca (Romania). It is often personal contacts on which international collaboration is based but bilateral Academy and university frames are of increasing importance. Landscape topics are linked to environmental protection and sustainable land use projects, including EU programmes (Fifth Framework, INTERREG), bilateral contracts (such as the Bavarian-Hungarian Scientific Framework). It is regrettable that the ERASMUS education network only seldom develops into scientific collaboration.

16 Co-operation is most evident with ecologists, pedologists and human geographers and usually with experts of environmental protection. Landscape planning, however, is mostly practised by landscape architects. *Scientific collaboration* is most common between universities and research institutes of the Academy of Sciences. Priority projects are concentrated in the institutes of the Academy but over the past 10 years more projects were launched at the universities too. The primary source of financing is the Ministry of Education. Recently, it is viewed as an advantage or even a precondition if a consortium including both research institutions and economic partners, i.e. private, or state companies in forestry, land management, mining, water supply, waste economy etc. is formed. It is increasingly common that *local governments* provide contracts for elaborating development concepts, surveying local natural resources or developing them for recreation purposes (Csorba & Novák, 2002). There are examples that planning companies (e.g. TOTAL Ltd. Pécs), undertaking planning for land reclamation, waste disposal etc., establish co-operation with landscape researchers (Schweitzer, 1996).

17 The positions of landscape ecology tend to improve. A major issue today is how the spatial pattern of physical potentials can be harmonised with the spatial distribution of social demand.

The most widespread version of the landscape classification of Hungary

18 Landscape mapping in Hungary presents ecologically homogeneous basic units. In addition to physical landscape factors, land use and vegetation cover are also emphasised. The broadest classes in the hierarchy are characterised by climate and topography, while minor distinctions are made according to soils, water availability and land use (see table 1). The attached map (Fig. 3) is a simplified version with only 14 instead of 40 types (Csorba, 1995; Pécsi & Somogyi, 1983; Pécsi, Somogyi & Jakucs, 1971), only macro- and mesoregions are shown.

Table 1. Main landscape types of Hungary (see also Fig. 3).

A.) PLAIN WITH MODERATELY CONTINENTAL CLIMATE; LANDSCAPE TYPES DOMINANTLY USED BY AGRICULTURE	I. 1-4	Alluvial plain; cultivated grassland with high groundwater table and hydromorphous soils
	II. 5-7	Alluvial plain; cultivated grassland predominantly with groundwater table at medium depth and meadow chernozems
	III. 8-10	Loess plain in basin position; cultivated grassland with chernozems
	IV. 11-14	Alluvial fan with blown sand; cultivated grassland with mosaic of vineyards, orchards and forests; medium or deep groundwater table
	V. 15-17	Alluvial fan on basin margin, cultivated grassland of dense drainage network; mosaical remnants of Quercetum petreae-cerris forests chernozem and forest soils
B.) EROSION HILLS; LANDSCAPE TYPES DOMINANTLY USED BY AGRI- AND SILVICULTURE AND LOCALLY BY INDUSTRY	VI. 18-21	Piedmonts and hills dissected by erosion-derasion valleys; cultivated with grassland and mosaical vineyards and orchardsand Quercetum petreae-cerris forests and deep groundwater table (In the Transdanubian Hills under moderately warm and submediterranean and in the North Hungarian Mountains under moderately cool and subcontinental climatic influence)
	VII. 22-25	Independent hilly regions dissected by erosion-derasion valleys; mostly cultivated grasslands with deep groundwater table, vineyards and major remnants of mixed forests
	VIII. 26-28	Smaller hills in intermediate basins; cultivated grasslands with remnants of Quercetum-petreae-cerris forests and deep ground-water table (under subcontinental or subatlantic climatic influence)
C.) FORESTED LANDSCAPE TYPES IN MOUNTAINS OF MEDIUM HEIGHT	IX. 29-30	Low mountains predominantly under subcontinental climatic influence; Quercetum-petreae-cerris and Querceto-petreae-Carpinetum forests (below 650 m a.s.l.)
	X. 31-32	Low mountains under additional subatlantic and submediterranean climatic influence; Quercetum-petreae-cerris and Querceto-petreae-Carpinetum forests
	XI. 33-34	Low mountains with forests mainly under subatlantic climatic influence
	XII. 35-36	Mountains of medium height under cooler and humid climate with Fagetum silvaticae hungaricum forests
D.) SPECIAL LANDSCAPE TYPES	XIII. 37-38	Major valleys within various hilly or mountainous landscape types
	XIV. 39-40	Lake and peri-lacustrine type

Figure 3. Main landscape types of Hungary.

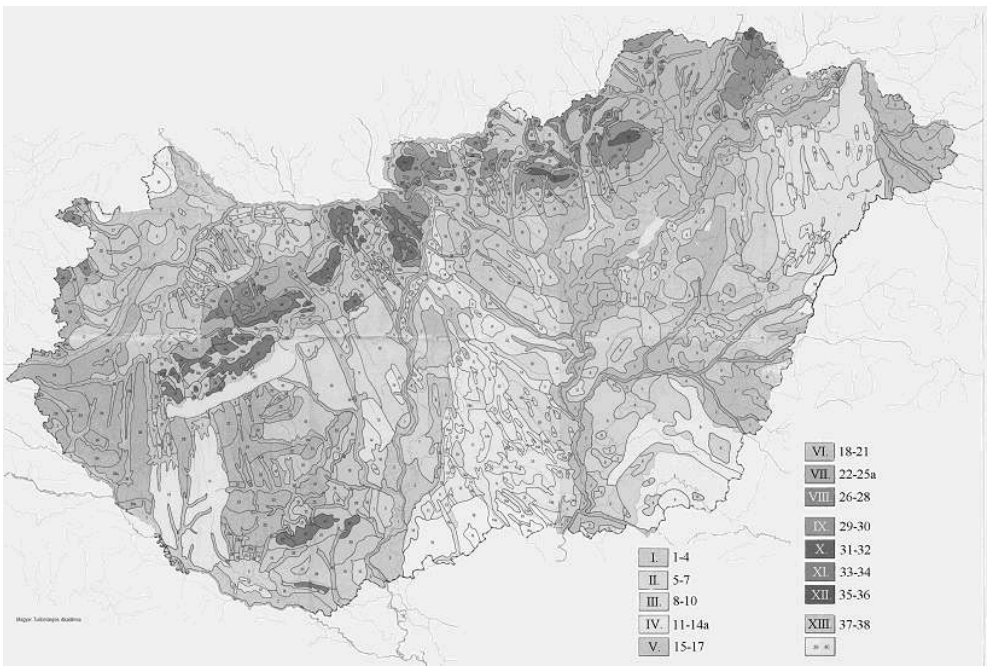


Table 2. Stages of the land use development of the most characteristic landscape types of Hungary.

Historical period / landscape types	prehistoric times* (800 000 BC)	Romans W of the Danube (15 BC to 395 AD)	Migrations and Middle Ages**	Ottoman occupation (1526 to 1686)	Habsburg autocracy (1686 to 1850)	dual monarchy and industrialisation (1850 to 1945)	socialist period (1945 to 1989)	democracy (since 1989)
major flood plains	episodic human impacts	minor river regulation	seasonal floodplain economy, grazing	forest clearance, reduced human impacts, occasional refuge function, stock breeding	forest clearance, intensive fishery, stock breeding, differentiated floodplain economy, transport problems	river regulations, stabilised transport, intensive cultivation and settling in flood-free areas, railway constructions	land amelioration, irrigated cultivation	reduced agricultural function, recreation, nature conservation, ecological farming
loess regions	permanent settlement, cultivation	forest clearance, arable farming	open agricultural landscape, arable farming	in the Great Hungarian Plain: large fallows, depopulation	intensive cultivation, open agricultural landscape, giant villages, market towns	intensive arable cultivation, mechanisation, croo improvement, shelter belts, scattered farmsteads	large-scale mechanised and irrigation farming, chemicals, farmsteads abandonment	land privatisation, intensive cultivation
sand regions	episodic impacts	moderate impacts	forest use, moderate impacts	Reforestation, deflation on fallows	forestry, Robinia plantation against deflation, mixed farming	Robinia and pine plantation, viticulture, small villages	Overemphasised large-scale farming, backward areas	land privatisation, soreading fallows, backward areas
foothills	earliest permanent settlement	towns, roads, differentiated mixed farming, viticulture	intensive land use, international routes, towns	stagnation, locally reforestation, fortification	booming viticulture, differentiated agricultural landscape, first industrial plants (metallurgy, food processing)	differentiated agricultural-industrial landscapes, railway constructions, soil erosion	Overemphasised large-scale farming, industrialisation, agglomerations	land privatisation, viticulture, foreign capital, recreation function, developing infrastructure
hills	little impact	moderate impacts, stock breeding	forest clearance, increasing mixed farming	Reforestation, depopulation	forestry, mixed farming,	forestry, differentiated farming, S-Transdanubia: oil industry, small villages	large-scale mixed farming, slow settlement development, backward infrastructure	differentiated growth, stagnating agriculture, afforestation, forest privatisation
hills in basins	minimal mixed farming	forest clearance, cultivation, stock breeding	increasing human impact	Reforestation, stable economic structure	intensive mixed farming, coal mining	intensive mixed farming, coal mining, industrial plants, dense settlement and infrastructure pattern	uncompetitive large-scale farming, coal mining	differentiated development, retreating agriculture, recreation
mountains	episodic life, Pleistocene cave culture, mining	forest clearance, mining	forest use, locally major mining, settlement	refuge, mixed farming in clearings	intensive forest clearance, booming mining and metallurgy, manufactures	exaggerated forestry, recreation	centrally planned forestry, slow improvement of infrastructure, recreation, nature conservation	state forests, nature conservation, recreation, ecotourism

* oldest Paleolithic site: Vértesszőlős, foothills of Transdanubian Mountains
** Hungarian occupation of Carpathian Basin in 896 AD; Christianity from 1000 AD.

Expected land use changes in Hungary

19 In this very exciting period of landscape research land use changes are remarkable and, at the same time, methodology becomes more and more sophisticated through the application of remote sensing and computer processing. The changes are chiefly rooted in the land privatisation of the 1990s, when 56% of land came to be cultivated by individual farms, 26% by co-operatives (rented from owners) and the proportion of state-owned land fell below 18% (Csorba, 2000). Unfortunately, the major changes in ownership were not followed by the emergence of economically desirable property sizes. Cultivation on the present-day farms of 4,5 ha can only be profitable if vegetables or flowers are grown. Only 10% of private farms is above 100 ha, the lower limit of stable profit making.

20 The *aesthetic qualities* of the landscape are increasingly appreciated. A contributing factor was the declaration of the Hortobágy and Lake Ferto cultural landscapes World Heritage sites (2000 and 1999, resp.). Environment-friendly land use, the formation of a landscape pattern meeting nature conservation and ecological requirements increasingly gains public approval. The National Ecological Network and the National Agricultural Environment Programme receive great publicity. The Environmental Protection Act and the Nature Conservation Act came into force in 1995 and 1996. Over ten years the area of nature reserves almost doubled. In Europe 11% of protected areas is considered a favourable proportion. In 2002 the tenth National Park was established in Hungary. This is especially important since three-quarters of the area of Hungary is used for agricultural purposes and there are practically no intact lands in the country.

As opposed to the previous decades, the number of natural, cultural and landscape monuments declared protected to the effect of local initiation has grown spectacularly.

21 In Hungary, areas are taken as the most important landscape values which are remarkable as geological-geomorphological sites (e.g. the volcanic cones and buttes of the Tapolca Basin), most beautiful in their formation (e.g. the *puszta* in the Hortobágy, the alkali lakes of the Great Plain), preserve the image of the natural landscape over a large area in a relatively intact state (e.g. Northern Tisza Region) or receive a distinctive role from the aspect of water management (e.g. karst regions - within these legal protection is ensured for all caves as sensitive environmental indicators, marshes, lakes). Even in European terms there are very valuable riverside floodplain, alkali, loess puszta and sand ecosystems in Hungary.

22 The above processes are occasionally opposed to land use *changes predictable* for the time after the *EU accession*. While the physical potentials favour intensive farming in Hungary (low relief, 1 million hectares of chernozem soils, long duration of sunshine, dense infrastructure etc.), the European Union prefers the extension of recreation and nature conservation areas. It is calculated that in the forthcoming 5-10 years the conversion of pastures into forests, poor arable into pasture and intensive arable into extensive arable will affect 2 million hectares of land. These changes may involve major landscape transformations. There are efforts to protect the landscapes of Hungary from these drastic transformations and they are conceived as landscape protection. The typical landscape of Tokaj with its vineyard terraces as well as foothill orchards and hill ploughlands are part of the national identity. It would be a sin to convert chernozem areas into golf courses. It is the importance of such identity that is emphasised in the European Landscape Convention issued by the European Council on October 20, 2000 (http://conventions.coe.int/treaty/EN).

23 On the other hand, land evaluation, landscape conservation, management, and planning acquired great prestige through the regulation that for successful EU applications in matters of environmental protection and rural development short, medium, and long-term environmental development projects have to be elaborated by the local governments of settlements, settlement groups or microregions. This circumstance is perceived to add to the significance of landscape research and to increase the opportunities of geographers specialised in this field (Lóczy, 2002).

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ABSTRACTS

Both the study of landscape types and investigations of the interactions between landscape factors have a long tradition in Hungarian landscape geography. Major achievements in landscape synthesis were the two-volume Inventory of microregions in Hungary. In the various schools of landscape geography fundamental research is directed at investigations of landscape pattern, landscape sensitivity, geo-ecological mapping and urban ecology. The major trends in applied research are the optimisation of the exploitation of resources, evaluation of hazards related to land use types, including flood hazard, practical issues of landscape rehabilitation. Historical landscape development is also a common research topic. In Hungarian higher education landscape research is deeply rooted in the geography departments at the universities of Debrecen and Szeged and recently established at Budapest and Pécs. Collaboration with experts both home and abroad and also between disciplines is gradually developing. It is more and more common that scientific results find the way to practical utilisation.

In der ungarischen geographischen Landschaftskunde haben Landschaftstypologie und Untersuchungen der Wechselwirkungen zwischen Landschaftsfaktoren eine große Tradition. Ein wichtiges Produkt der Landschaftssynthese ist das zweibändige Kataster der Kleinlandschaften Ungarns. Grundforschungen an den verschiedenen Schulen der Landschaftsgeographie konzentrieren sich auf die Landschaftsstruktur, Landschafts sensitivität, geoökologische Kartierung und Stadtökologie. Unter den angewandten Forschungen können die Optimalisierung der Naturressourcennutzung und die Bewertung der mit Landnutzungstypen verbundenen Risiken, einschließlich Überflutungsgefahr, sowie praktische Fragen der Landschaftsrehabilitation erwähnt werden. Die historische Landschaftsentwicklung ist ebenfalls ein häufiger Untersuchungs gegenstand. Landschaftskunde ist unter den ungarischen Hochschulen an den Universitäten zu Debrecen und Szeged tief verankert und neulich auch in Budapest und Pécs eingeführt. Die Zusammenarbeit zwischen heimischen und ausländischen Fachleuten und Fachgebieten entwickelt sich allmählich. Es kommt immer öfter dazu, daß wissenschaftliche Erkenntnisse den Weg zur praktischen Anwendung finden.

En Hongrie, la géographie du paysage connaît des traditions également riches en ce qui concerne la recherche des types de paysage et l'étude des rapports entre les facteurs constitutionnels du paysage. L'une des synthèses les plus importantes des recherches du paysage était l'ouvrage intitulé Le livret cadastral des régions en Hongrie, publié en deux volumes. Les différentes écoles de la géographie du paysage faisaient des recherches minutieuses dans les domaines de la structure du paysage, de la sensibilité du paysage, de la cartographie géo-écologique et de l'écologie urbaine. Les recherches appliquées visaient essentiellement à l'exploitation optimale des ressources naturelles, à l'étude des dangers de l'exploitation du sol ainsi qu'à la réhabilitation des paysages. La recherche historique du développement des paysages constitue également un thème intéressant. Dans l'enseignement supérieur de la Hongrie, ce sont les universités de

Debrecen et de Szeged dans les départements de géographie desquelles la recherche du paysage remonte à des traditions importantes, mais récemment la géographie du paysage devient de plus en plus importante dans les universités de Budapest et de Pécs aussi. Les liens nationaux et internationaux avec les sciences associées connaissent également un certain développement, et les résultats scientifiques sont de plus en plus utilisés dans la pratique même (protection des paysages, planification des paysages, évaluation des incidences sur l'environnement).

INDEX

Mots-clés: Hongrie, paysage, recherche, classification, histoire, changement d'affectation du sol
Schlüsselwörter: Ungarn, Landschaft, Forschung, Klassifizierung, Geschichte, Landnutzungsveränderung
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