XXII SJEZD
ČESKÉ GEOGRAFICKÉ SPOLEČNOSTI
OSTRAVA 2010

Transnational ecological networks in Central Europe – history in lost green landscapes

Transnárodní ekologické sítě ve střední Evropě

Hana SKOKANOVÁ, Marek HAVLÍČEK

Silva Tarouca Research Institute for Landscape and Ornamental Gardening, Pub. Res. Inst., hskokan@email.cz

Abstract

The contribution introduces European project Transnational Ecological Networks in Central Europe which deals with protection and restoration as well as ecologically-sound development of lost green landscapes and their degraded networks in Central Europe. The development and implementation of strategies supporting transnational ecological networks cover five topics: the assessment of ecological networks in Central Europe, the history of landscapes, ecological values and threats, awareness raising and promoting and putting forth green bands in Central Europe towards the public. Four project regions in the borderlands of the Germany, Czech Republic, Austria, Hungary and Slovenia are studied.
Results from the connectivity of ecological networks (in the sense of special protected areas and NATURA 2000 sites) in three focal areas (Lower Dyje River, Bílé Karpaty and Beskydy) are presented, as well as partial results from the landscape changes of the first two regions.

Keywords: ecological networks, connectivity, land use changes, Czech Republic, TransEcoNet
Klíčová slova: ekologické sítě, konektivita, změny využití krajiny, Česká republika, TransEcoNet

1. Introduction

Protected areas, like national parks, nature parks or biosphere reserves, are often isolated "islands" for the protection of the world's biodiversity. They are separated by less or unprotected landscapes, traffic corridors or settlements. Often animal and plant species dispose of less space for migration, dispersion and reproduction than necessary (http://www.transeconet.eu/). To preserve natural and cultural heritage in the long run, an international project Transnational Ecological Networks in Central Europe (TransEcoNet) seeks to find solutions for better connection of protected and less or unprotected landscapes across national borders.

TransEcoNet was launched in 2009 under the CENTRAL EUROPE Territorial Cooperation Programme. It follows similar projects that were implemented in the past (e.g. NPIS – National park – Information systems for cross-border regions, SISTEMaPARC Spatial information systems for transnational environmental management of protected areas and regions in CADSES) and cooperates with other initiatives dealing with similar problems like Green Belt, Carpathian Convention, Pan-European Ecological Network Programme or Carpathian EcoRegion Coordination. 16 partners from Germany, Poland, Czech Republic, Slovakia, Austria, Hungary and Slovenia work on the project; however, almost 40 institutions contribute to some extent. The lead partner is Technische Universität Dresden. From the Silva Tarouca Research Institute for Landscape and Ornamental Gardening, researchers from departments of GIS Applications and Landscape Ecology participate in the project.

The main aim of the project is to develop and implement transnational management strategies for the protection and sustainable development of ecological networks along national boundaries of countries from Central Europe. This aim is fulfilled through four work packages (WP) that interconnect – Eco-topologies (inventories of existing transnational ecological networks), Histories (evaluation of landscape history of ecological networks), Ecologies (assessment of ecosystem services and biodiversity) and Identities and Strategies (Awareness raising and promotion of ecological networks).

The project is carried out in four transnational project regions that are further divided into focal areas:

1. Northern Region, with focal areas Elbe sandstone mountains (DE/CZ) and Karkonosze (PL)
2. Central Region North – focal areas Lower Dyje River (CZ), Northeastern Weinviertel (AT), Bílé Karpaty (CZ) and Beskydy (CZ)
3. Central Region South – focal areas Neusiedler See – Seewinkel (AT) and Fertö-Hanság (HU)
4. Southern Region – focal areas Southern Burgendland (AT), Örség (HU), Pomurje (SI) and Kozjanski regional park (SI)

In this contribution partial results about connectivity of ecological networks in focal areas Lower Dyje River, Bílé Karpaty and Beskydy (one of the results of WP Eco-

topologies) as well as about landscape changes in the first two focal areas (WP Histories) are introduced.

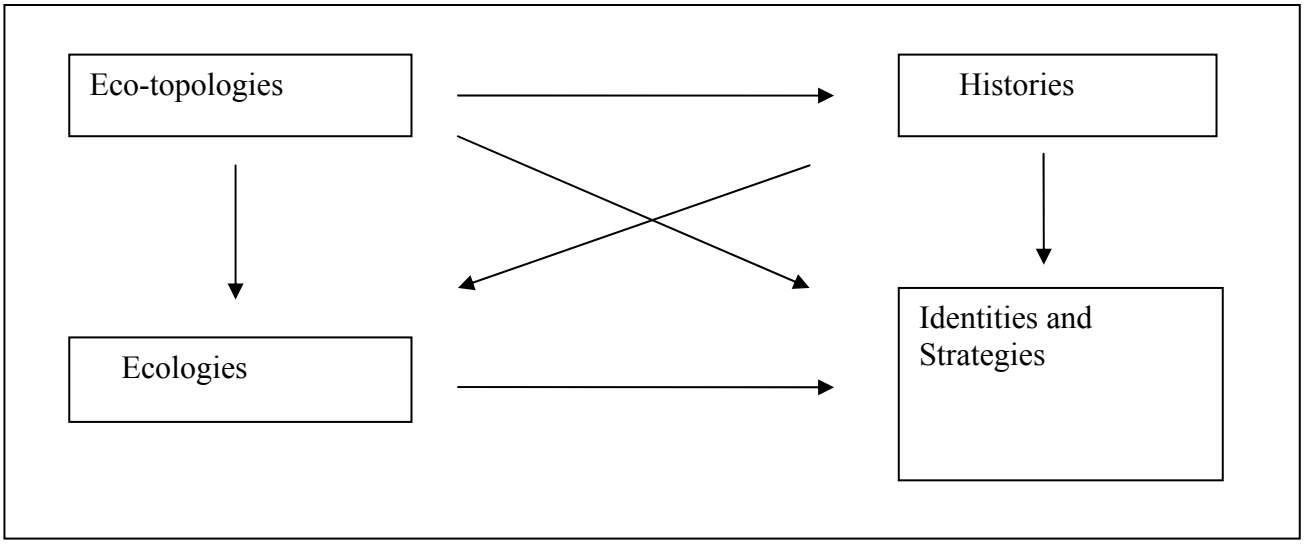

Fig. 1 Work packages and their interrelation (source: authors)

2. Study areas

Focal area Lower Dyje River is situated in the South Moravia along the borders with Austria and Slovakia, Bílé Karpaty in the South-eastern Moravia along the borders with Slovakia and Beskydy in the Northern Moravia and it also borders with Slovakia (Fig. 2).

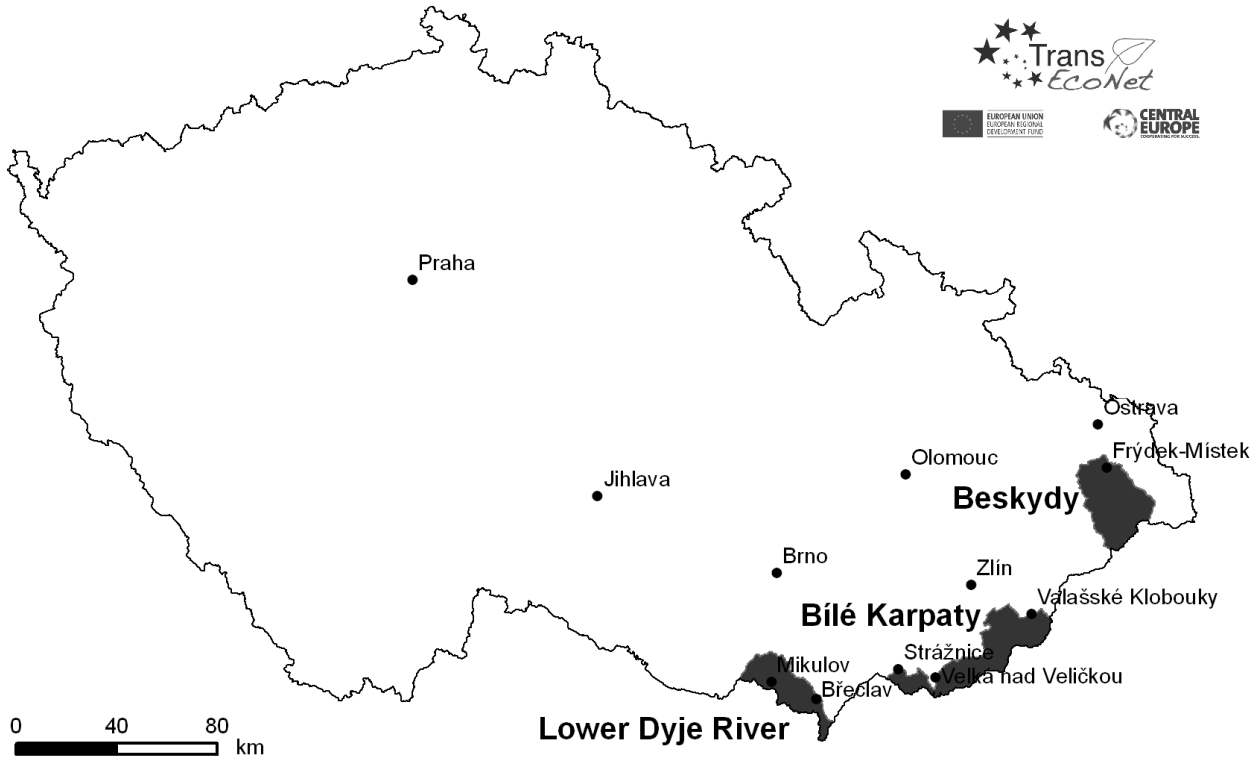

Fig. 2 Delimitation of focal areas
Sources: MŽP ČR, ČÚZK, authors

The focal area Lower Dyje River covers 429 km^2 and is includes the vast floodplain of the Dyje River and the surrounding undulating terrain of hills and uplands. Predominant rocks are limestones, sandstones, calcite claystones and quaternary sediments (Mackovčin et al., 2007). The main river is the Dyje fed by its tributaries Jevišovka, Jihlava, Svratka, Trkmanka, Kyjovka, Dunajovický potok and Včelínek. Further important water bodies are the fishpond systems of Lednické rybníky and the water reservoirs at Nové Mlýny. The focal area is a dry, warm region with an annual mean temperature of 9.8°C and an annual precipitation of 483 mm. While the hilly regions are covered by thermophilous fauna and flora alluvial forests appear in the floodplain (Neuhäuslová et al. 2001). The focal area shows a dense settlement structure and road network, especially the traffic corridor from Prague over Brno to Bratislava. The main agriculture is based on wine, cereal and fruit production.

The protected landscape Pálava comprises 19% of the focal area. The Biosphere Reserve Lower Morava includes the Pálava area and the eastern part of the focal area. There are further amongst others 25 scattered small-scale protected areas (6%), 26 NATURA 2000 sites (27%) and 2 Ramsar sites (28%) situated in the east and southeast.

The focal area Bílé Karpaty has a size of approximately 748 km^2 and is characterized by an undulating terrain with wide ranges, deep valleys and typical earth slides. The regional geology is dominated by a flysh formation containing sand stones, clay stones and calcareous tufa. The rivers Olšava, Vlára, Nivnička, Velička, Radějovka and the reservoirs Nivnička and Luhačovice are the main water bodies of the focal area with a prevailing mild climate (annual temperature between 6°C on the mountains and 9°C in the valleys) and an annual precipitation from 600-926 mm. Significant are local temperature inversions in the valleys (Mackovčin et al. 2002). The Bílé Karpaty can be considered as an agricultural region with emphasis on dairy production. The road and railway network is arranged to provide connections to the adjacent Slovak regions.

The Protected Landscape Bílé Karpaty covers the whole focal area. It was declared in 1980 and got the status of a Biosphere Reserve in 1996. Its total area comprises 52 small-scale protected areas (1.8%) and 13 NATURA 2000 sites (28%).

The focal area Beskydy covers 674 km^2. It is characterised through floodplains of the Ostrava basin in the north and in the south through a high mountain range – part of the Western Carpathians – with deep incised valleys, structural terraces, block streams and pseudo-carstic formations (Weissmannová et al. 2004). In the mountains flysh formations are the dominating geology, built of sand and clay stones and slates; quaternary sediments mainly occur in the floodplain. The area is drained by rivers Ostravice, Morávka and Ondřejnice and there are also several water reservoirs (e.g. Šance, Morávka, Olešná and Baška). Mild climate with annual temperature about 8°C and annual precipitation of 700 mm in the northern floodplains turns into cold climate with annual temperature of 3°C and annual precipitation of 1400 mm in the mountains. The forest vegetation is marked by beech forests with firs and spruce forests in the mountains, floodplain forests with ash and alder in the northern floodplains (Neuhäuslová et al. 2001). Nearly 111.000 people live in the focal area in altogether 31 settlements, mainly in the industrialized northern floodplain. Prevailing industries are machinery, coal mining and food processing. In contrast the mountain ranges serve as a recreational area for the industrial Ostrava region. The infrastructure provides connections to both Slovakia and Poland.

More than 50% of the focal area is designated as Landscape Protected Area Beskydy declared in 1973. There are 37 small scale protected areas covering only 2.2% of the area and five NATURA 2000 sites (54.4%).

3. Methods

Within the TransEcoNet project the term ecological networks is related to the network of NATURA 2000 sites and protected areas with IUCN classification. For the purposes of connectivity analysis in the above mentioned focal areas, only small scale special protected areas and NATURA 2000 sites were considered.

The connectivity analysis is based on the methodology developed by project partners from Dresden (Neubert et al. 2010). It uses a nearest neighbour analysis performed with the software vLATE and is divided into two parts according two different methods. In the first method protected areas are analysed according to the identification of the nearest neighbour – single isolated protected areas can be identified as either stepping stones (between 500 and 5000 m distance) or satellites (above 5000 m distance). In the second method the protected areas are buffered (250 m) so the areas that are within a 500 m distance are clustered and then the nearest neighbour analysis is performed. This method detects isolated groups of protected areas and minimise effects of objects which only have a single neighbour but are distant to others.

Landscape changes were researched on the basis of old topographic maps at medium scale from six periods: 1836-1852, 1876-1880, 1932-1945, 1952-1955, 1988-1995 and 2002-2006. Nine land use categories were distinguished: arable land, permanent grassland, orchard, vineyard and hop-field, forest, water area, built-up area,

recreational area and other area. Beside changes in the proportion of land use categories, also landscape change trajectories were identified. These were based on three indices – turnover, similarity and diversity according to Swetnam (2007). On the basis of these indices, six trajectories can be distinguished: stable, quasi-stable, stepped, cyclical, dynamic, and with no clear trend (NCT).

4. Results and disscussion

4.1. Connectivity analysis

When applying first method of the connectivity analysis, the majority of protected areas lie within the distance of 500 m in all focal areas, as is clear from the Fig. 3. This does not necessarily mean that all protected areas are interconnected but rather that there can be several parts of one protected area, as is the case of Dunajovické kopce in Lower Dyje River or Bílé potoky in Bílé Karpaty or Palkovické hůrky in Beskydy. Areas considered as stepping stones, i.e. in the distance between 500 and 5000 m, are less numerically represented. A satellite (with the distance larger than 5000 m from other protected areas) can be found only in Bílé Karpaty in the northwest.

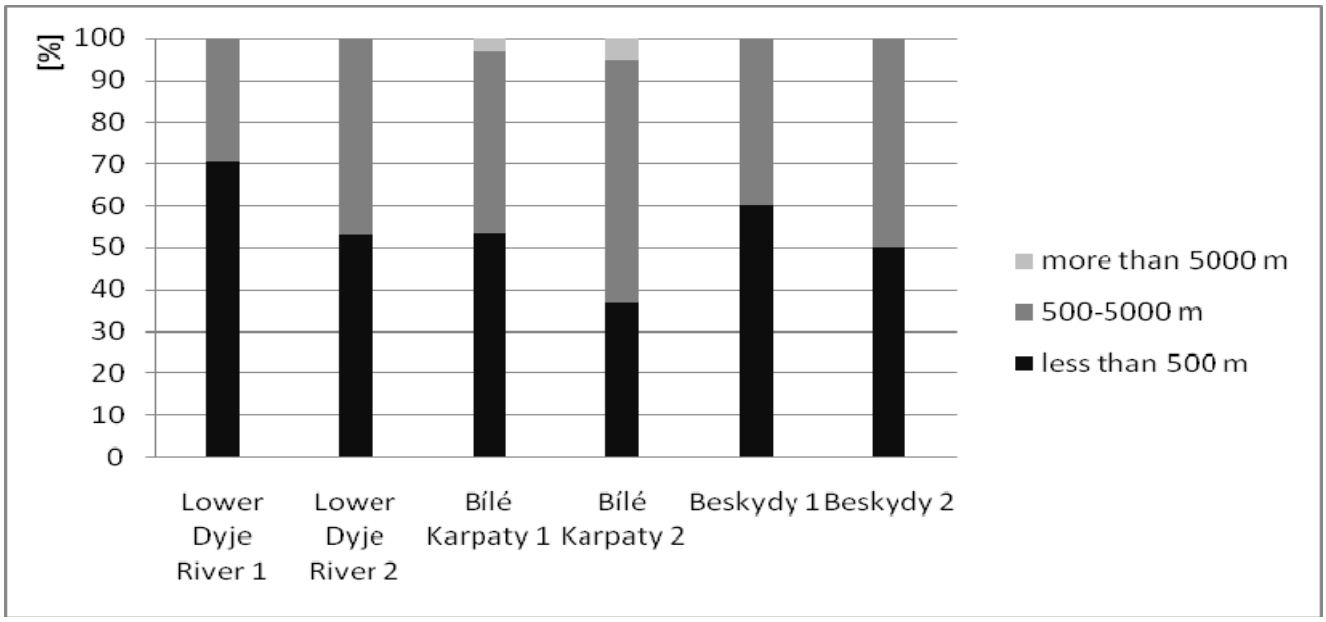

Fig. 3 Difference betwen connectivity analysis without (1) and with buffer around protected areas (2) (own calculations)

The situation changes if we use the second method which eliminates to large extent areas within the distance of 500 m. Thus the number of protected areas that can be considered as connected decreases and the number of stepping stones increases. This is remarkable especially for Bílé Karpaty. This state better reflects the real isolated protected areas that should be connected to other.

4.2 Landscape changes

Lower Dyje River focal area represents intensively used agricultural land while Bílé Karpaty represents more or less marginal hilly area. This is reflected in land use in both focal areas – while in Lower Dyje River arable land dominated throughout the researched period and peaked in the 1950s, in Bílé Karpaty, arable land dominated only in the 19th century (yet, the peak in the proportion of arable land in this focal area was also in the 1950s, presumably due to the collectivisation in agriculture) and since then the majority of the area has been occupied by forest, which area continually increased till present (this is another difference between the two focal areas, as in the case of Lower Dyje River the area of forest remained more or less the same). The third most widespread land use category in both focal areas is permanent grassland. This category also experienced different development: in Bílé Karpaty the smallest area was covered by permanent grassland in the 1950s. Since then there was a significant increase, especially in the last ten years, and nowadays the category occupies more than 24% of the focal area, which is more than at the end of the 19th century. In Lower Dyje River, proportion of permanent grassland decreased to its minimum in the 1990s. Also here the tendency to grass land during last ten years was noted but the increase in the proportion was not as significant. This is caused by the character of the landscape as well as location. Minimal proportion of permanent grassland in the 1990s in Lower Dyje River was caused by construction of water body Nové Mlýny and its consequences – not only large parts of permanent

grassland were flooded by this body but meadows and pastures were also ploughed and used as arable land.

In both focal areas more than 45% of the territory can be considered as stable. In Lower Dyje River the most stable are areas covered with arable land, followed by forests. In Bílé Karpaty the situation is opposite. Other stable categories include permanent grassland (4.5% in Lower Dyje River, 9.2 % in Bílé Karpaty), built-up areas, i.e. settlement cores (about 3% in both focal areas respectively) and very small areas used for viniculture. There are also stable plots of water area in Lower Dyje River, which are represented by Lednické rybníky pond system.

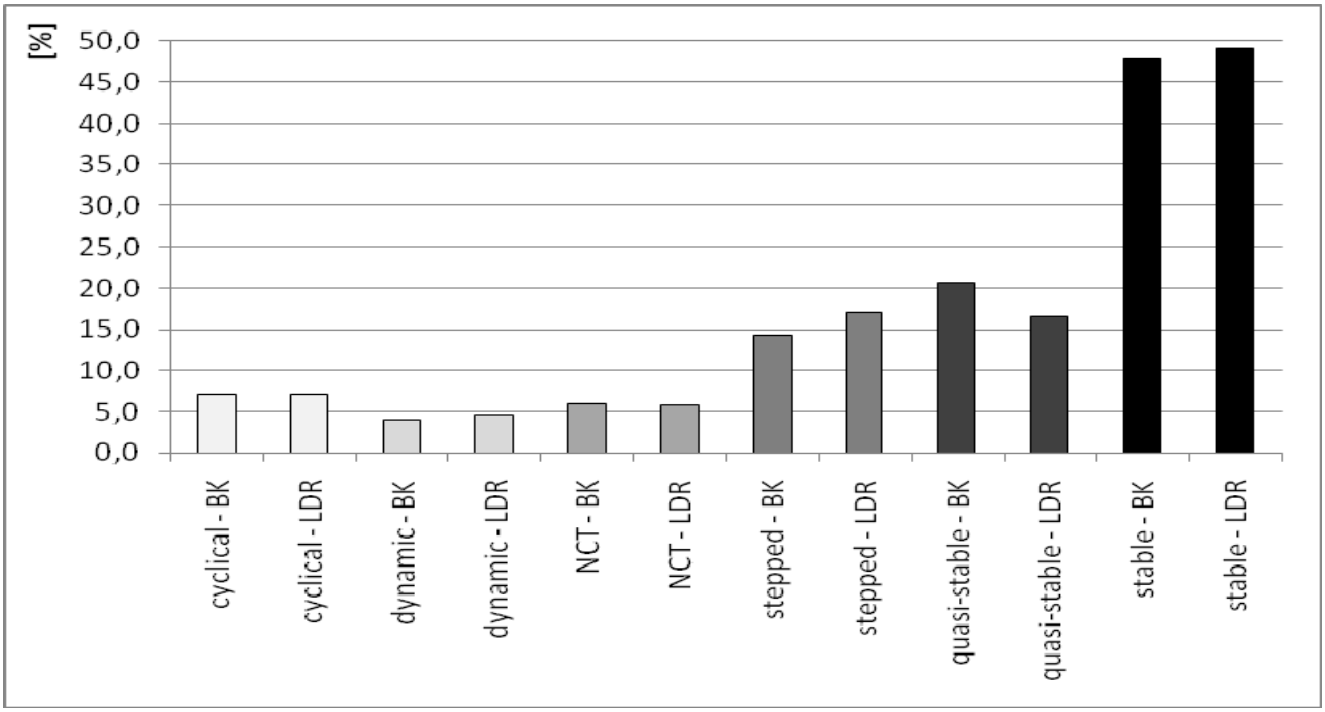

Fig. 4 Proportion of landscape change trajectories in Bílé Karpaty focal area (BK) and Lower Dyje River focal area (LDR) (own calculations)

Quasi-stable landscape trajectory, i.e. trajectory in which one land use category changed into another only once, is the second most wide-spread. It is more common for Lower Dyje River focal area. More than 13% of the focal areas experienced stepped change when land use category changed into another at some point in the past. In Lower Dyje River such trajectory was typical for change from permanent grassland or forest two water area (construction of the Nové Mlýny water body), from permanent grassland to arable land or from arable land to vineyard. In Bílé Karpaty the transitions were between arable land and permanent grassland or forest or from permanent grassland to forest or arable land. About 7% of the territory showed cyclical change in which two land use categories rotated during the researched period. In the case of Lower Dyje River, the rotation occurred mainly between arable land and vineyards, while in Bílé Karpaty the rotation was typical for permanent grassland and arable land. For almost six percent of the focal areas it is difficult to establish trajectories with clear trends (so called NCT trajectories). Dynamic changes are typical for the areas which experienced dynamic development – areas between Klentnice and Bavory or north of Dolní Věstonice in case of Lower Dyje River and areas west of Radějov and Bojkovice in case of Bílé Karpaty.

5. Conclusions

The contribution presents only partial results of the international project Transnational Ecological Networks in Central Europe. Further investigations will deal with e.g. analysis of gaps in the ecological networks, analysis of landscape changes in Beskydy focal area or analysis of landscape dynamism in the identified gaps. They will also concentrate on landscape functions in selected investigation areas that are more detailed than focal areas. All results should be published on project web pages and also in the form of articles and brochures that will be available to the public.

References:

http://www.transeconet.eu/

MACKOVČIN, P. et al. (2002): Zlínsko. In: MACKOVČIN, P. and SEDLÁČEK, M. (eds):

Chráněná území ČR, Svazek II. AOPK ČR a Ekocentrum Brno, Praha, 376 pp.

MACKOVČIN, P. et al. (2007): Brněnsko. In: Mackovčin, P. (ed): Chráněná území ČR, svazek IX. AOPK ČR a Ekocentrum Brno, Praha, 932 pp.

NEUHÄUSLOVÁ, Z. et al. (2001): Mapa potenciální přirozené vegetace ČR. Academia, Praha, 341 pp.

NEUBERT, M. et al. (2010): Inventory of existing networks. Report. Leibnitz Institute of Ecological and Regional Development, Dresden, 38 pp.

SWETNAM, R. D. (2007): Rural land use in England and Wales between 1930 and 1998: Mapping trajectories of change with a high resolution spatio-temporal dataset. Landscape and Urban Planning, Vol. 81, No. 1-2, p. 91-103

WEISSMANNOVÁ, H. et al. (2004): Ostravsko. In: MACKOVČIN, P. and SEDLÁČEK, M. (eds): Chráněná území ČR, Svazek X. AOPK ČR a Ekocentrum Brno, Praha, 456 pp.

The project is implemented through the CENTRAL EUROPE Programme co-financed by the ERDF.

Author´s addresses:
Mgr. Hana Skokanová, Ph.D.
Department of Landscape Ecology
Silva Tarouca Research Institute for Landscape and Ornamental Gardening, Pub. Res. Inst.
Lidická 25/27
602 00 Brno
hskokan@email.cz

Mgr. Marek Havlíček
Department of GIS Applications
Silva Tarouca Research Institute for Landscape and Ornamental Gardening, Pub. Res. Inst.
Lidická 25/27
602 00 Brno
marek.havlicek@vukoz.cz