

## **Spatial Information Systems for National Park Regions (NPIS) in the Central European Space (CES) - GIS-Concepts for monitoring and managing national park regions**

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Spatial information systems are of striking importance for analysing and managing the dynamics of regional landcover and landuse change. Protected regions have an important ecological value for preservation of biodiversity in environments dominated by different forms of human impact. Various national parks have been promoted during the last decades in the Central European Space (CES). On the one hand the official status of these national parks is very different and only few of them meet the IUCN criteria. On the other hand the specific national park regions differ in terms of geographical space and have to face different forms of impact caused by different parameters of pressure on the land. A lot of varieties of criteria, e.g. specific impact patterns, organizational constraints and methods of monitoring, managing and planning, have to be documented, analysed and harmonized.

The first step of this initiative focusses on the development and implementation of spatial information systems for selected national park regions in order to analyse the socio-ecological and socio-economic status of the regions, to investigate on specific mosaics of impact patterns on a local and regional level, to improve national park management issues and finally to build networks of both crossborder and transnational cooperation.

The establishment of a representative data base both in terms of spatial as well as thematic qualities is supported by the interdisciplinary application of technologies such as **remote sensing**, supporting landuse and landcover change detection (LUCC) as well as landscape structural analysis, **airborne laser altimetry** for generating highest-resolution digital terrain and vegetation cover models and **topographic information systems**, which allow for the calculation, maintenance, interpretation and

presentation of digital terrain models (DTM), e.g. slope gradient models, slope aspect models and perspective views as well morphometric parameters. The **topo-chronological analysis of maps and plans** for highlighting map-relevant aspects of landscape transition in a retrospective time scale beginning with the 18th century (regional maps) provides knowledge about the historical dimensions of landcover change. **(Digital) cadastral maps** support the large-scale level of investigations by allowing the synthesis of parameters of landuse and protection status with informations on ownership. Advanced methods of **terrain analysis** like vegetation mapping, socio-economic and socio-ecological inventories have to establish a network of reference informations.

**GISs** are used for the integration of the whole bunch of heterogeneous hybrid data (remote sensing, maps, statistics, DTMs, sampling), for the homogenization and maintenance, the analysis (multithematic analysis, e.g. for determining landscape structural parameters) and the presentation of data, as well as for multi-media data handling (virtual walks, integration of maps, videos and text).

Applying **informatics** helps to establish internet links between the national park information systems, to provide data transfer and exchange as well as networking, and to build facilities for storage of data and data products (e.g. CD-ROM).

In the frame of an EC-INTERREG project, two specific regions have been selected for establishing a set of case studies. These regions are characterized by landscape units representative for the Central European Space. The crossborder National Park Region Saechsisch-Boehmische Schweiz (Czech Republic, Germany) covers a region of 692km<sup>2</sup>. Vegetation cover of the two National Parks (97km<sup>2</sup> + 93km<sup>2</sup>) is dominated by woody layers (93%) over hilltops and hillsides of basalt and granit and by the steep sandstone cliffs and gorges of the Cretaceous period.

The National Park Neusiedler See - Seewinkel extends over an area of 69km<sup>2</sup> of the shallow steppe-lake Neusiedler See, its reed belt and areas east of the lake characterized by grasslands (puszta) and small shallow lakes with typical halophytic flore and faune over quaternary sediments. The National Park Region is identical with a large landscape-protected area covering the whole region of the Neusiedler See-Seewinkel. The Hungarian National Park Fertő Tó - Hanság covers 125km<sup>2</sup> of the Hungarian part of the lake, the reed belt and the former lowland moor of the Hanság.

By selecting these two regions we intend to collect a maximum of heterogeneous spatial data representative for national park regions within the Central European Space (CES), a subspace of CADSES. This gives us the opportunity to utilize the heterogeneity of the spatial data base to develop a highly efficient method of building and networking national park GISs in the CES.

**Spatial planning** in and around protected regions needs spatial information systems capable to handle large data bases both geometrically and thematically. Issues for managing interaction between primary and secondary zones as well as surrounding areas of protected or non-protected landscapes have to be supported by GISs.

Multi-scale approaches to regionalization in landscape ecology have to take into account micro-scale, meso-scale and macro-scale investigations. Like biotope networks in agricultural landscapes and networks of more or less protected areas at a regional scale the importance of transnational networks of national parks is increasingly recognized by national authorities.

Though EU agriculture policies partly are orientated towards a new perspective of intensive/extensive landuse strategies, the diversity of landscapes is still diminished by measures of land transformation which are driven by efforts to maximize productivity.

Especially the non-member CES-countries have to face these impacts and have thus to be supported in protecting already categorized regions or selecting regions which should be protected as soon as possible. Short-term acting and re-acting needs a high value of information support.

Actually national park administrations are building concepts for GIS-based spatial management in very different ways, with different motivations and with different progress. Monolithic approaches are common and thus only related to specific national parks. Bilateral concepts in the sense of connecting attempts to harmonize and standardize GISs on a crossborder level are rare. The Czech-German and Hungarian-Austrian crossborder links are thus of great importance and can serve as key initiatives for transnational cooperation in the CES. The chance to compare and harmonize two GIS concepts in a second degree level of transnational cooperation is created by the N-S-transversal German-Czech - Austrian-Hungarian link.

We thus focus on the completion of inventories of national parks based on the different status of the two selected National Park GISs. By choosing the National Park Region Saechsisch-Boehmische Schweiz and the National Park Region Neusiedler See – Fertö To we meet several requirements of implementing GIS into spatial development strategies in and around protected regions via transnational cooperation in the Central European Space. On the one hand both parks are connected with similar protected regions in the non-member CES-countries Czech Republic and Hungary, on the other the two crossborder regions cover an enormous variety of landscape units. Fortunately we can therefore handle a large heterogeneous spatial data base when building and harmonizing GIS-based spatial development strategies for regional planning in and around national parks in Central Europe.

National and transnational crossborder research on national park information systems is highly correlated to the tasks of the INTERREG

programme. Interaction between activities at local and regional levels and the two fold transnational concept will highly increase the efficiency of building and linking spatial information systems.

Socio-economic and socio-ecological conditions are still different in member and non-member countries of CES. Protection of the environment in general and of national parks in particular is a common task with strong transnational components. The transnational cooperation opens a new dimension for operationalization of crossborder spatial information systems of national parks. Existing transnational networks can thus be strengthened and established in terms of sustainable profit for both member and non-member partners. Category-1-classified border regions of member countries are additionally supported to protect and manage their regions of natural beauty and to increase the ecological but also economic (touristic) value of the regions when connecting crossborder national parks by homogenizing management and planning strategies.

**Innovation** is achieved by linking crossborder national park management and planning issues by means of standardized spatial information systems. Recent communication technologies allow high-level data exchange of vector- and/or rasterbased map and image data. Especially actual developments in facilitating GIS-data exchange, explicitly known under the terms OpenGIS and Interoperability, will be integrated. This gives way to a new quality of transnational on-line information support, which meets the requirements both driven by ecological aspects as well as by guidelines of regional and transnational planning. On the one hand scientific and management demands can be supported efficiently, on the other hand data can be treated for presentation and thus for raising of people's awareness by supporting multi-media tools for thematic and topographic 4D-visualization of national park landscapes. People, who are more or less concerned, can thus be motivated to familiarize with problems, constraints and ecological and economic advantages of living in and around national parks and national park regions respectively. People on both sides of the borderlines can be motivated to meet, discuss and get used to re-define the regional identity, which has been spilled by the political transitions in the CES during the 20th century.

As a **result** spatial information systems, which are - in the presented case - particularly developed for national park issues, can also serve as key systems for building transnational environmental information systems in the CES, later in the CADSES and the European Space. The two fold approach additionally serves as a guideline for not only managing connected transnational regions but also for linking the mosaic of CES-National Parks. The status quo of and the needs for the development of protection strategies can for the first time be evaluated in an objective sense both in terms of multithematic as well as spatial topographic (geometric) accuracies. Policies of west-east transnational spatial development strategies can thus be supported in a long-term sense.

It is evident, that spatial planning in local, regional and continental scales has to integrate environmental protection of spatially and thematically well-defined regions. In addition the quality (IUCN-criteria) and quantity (number) of protected areas is evidently not satisfying the minimum multiscale standard of ecological demands. Thus homogenized networks of spatial information systems covering national park regions as well as regions of other protected areas will be of highest value for codifying protection of additional areas on an European level of decision finding.

Following the criteria of the IUCN, national park administrations are obliged to provide local and regional multilevel management plans. NPIS will produce standardized levels of management plans for the specific national parks and national park regions, for their crossborder relatives and will thus establish a new perspective of adjusting and homogenizing management of CES-National Park Regions in perfect correspondence with the transnational guidelines of the INTERREG programme.

Spatial information systems of national park regions (NPIS) and their networks are furthermore based on a **transsectoral** approach both in terms of the collection, integration, maintenance and analysis of multithematic data as well as in terms of supporting multipurpose planning for a well-balanced and sustainable ecological and economic spatial development of transnational crossborder regions of outstanding natural and cultural value.