VISUAL ELEMENTS AND STRUCTURES OF LANDSCAPES IN BRANDENBURG (GERMANY) – DEVELOPMENT OF AN IMAGE DATABASE AND PHOTO LIBRARY

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1. Introduction and project objectives

Terrestrial landscape and aerial photographs are an important medium for visual documentation or analysis in the context of landscape-related research and instruction.

There are a number of conventional photo archives at the Center for Agricultural Landscape and Land Use Research (ZALF) and at Polytechnic University of Eberswalde (Germany). The number of scientific investigation and research area landscape photos continually increases; recently, digital photos have also been added to these archives – the amount of photographic data is becoming unmanageable.

What kind of solution could be developed for more effective organization of these photo archives?

To address this problem, new methods for improving accessibility of scenic images of the German State of Brandenburg were investigated. It was looked up for new ways, in order to make these pictures from the landscapes of Brandenburg more accessible also for third-parties and the public. The federally supported research project "GRANO" ("Approaches for a sustainable agricultural production: Application for Northeastern Germany"), offered an opportunity to realize an organizational approach. An intensive collaboration of the local and regional participants (farmers, authorities, tourism initiatives etc.) forms the basis for the GRANO project.

The visualization of landscape statuses and scenarios mediates between expert knowledge and everyday life experience (see: Nohl 1996, Paar in: Kretschmer et al. 1999). To guarantee transferability of the experiences from this research project, it should be possible to edit the image data and create a portable, Internet-accessible archive.

This image database can be used - also beyond the concrete research project - for the following purposes:

- For the archiving and documentation of typical scenic elements and structures.
- For visual documentation, landscape monitoring and landscape modeling.
- For analysis and evaluation in landscape planning procedures (Environmental Impact Analysis, Land Use Planning, local "Agenda21" processes etc.).

The landscape image database can be used also as source for the production of image textures for 3D-visualization and could be applied for the storage of 3D-landscape objects or even digitized

landscape drawings.

According to these various intended purposes, the target group includes not only landscape plan-
ners, but in addition:
- Specialists in ecological landscape research and instruction, planning offices and other
  authorities.
- Rural tourism organizations and tourism consulting associations.
- Students.
- The interested public.

2. Systematics of visual landscape elements and structures

There are several systematics available for describing central European landscapes, landscape
elements and structures from different scientific areas: ecology, geomorphology and engineering
sciences etc. The range and quality of systematics developed for the State of Brandenburg are
thereby very different.
A good basis for the systematic classification of landscape elements and structures is the mapping
guidance for biotope types (Landesumweltamt Brandenburg 1995). This classification is the result
of research and discussions over many years. However, only a few biotope types are yet repre-
sented systematically by photographic examples.
The biotope types are important, but not the only components to describe the cultural landscape. A
second important group are historical landscape elements and land use forms (KHLE - Hallmann/
Peters 1993), such as lanes, stonewalls, field terraces etc.

LANDSCAPE

BTLE - misc.
built-up/ tech-
nical landcape
elements
e.g. electric poles

built-up
biotope
types
e.g. landfills

Biotope types
biotic/vegetation
pattern e.g. pineforests

built-up
KHLE
e.g. walls

biotic KHLE
e.g. heathers

KHLE - historical land-
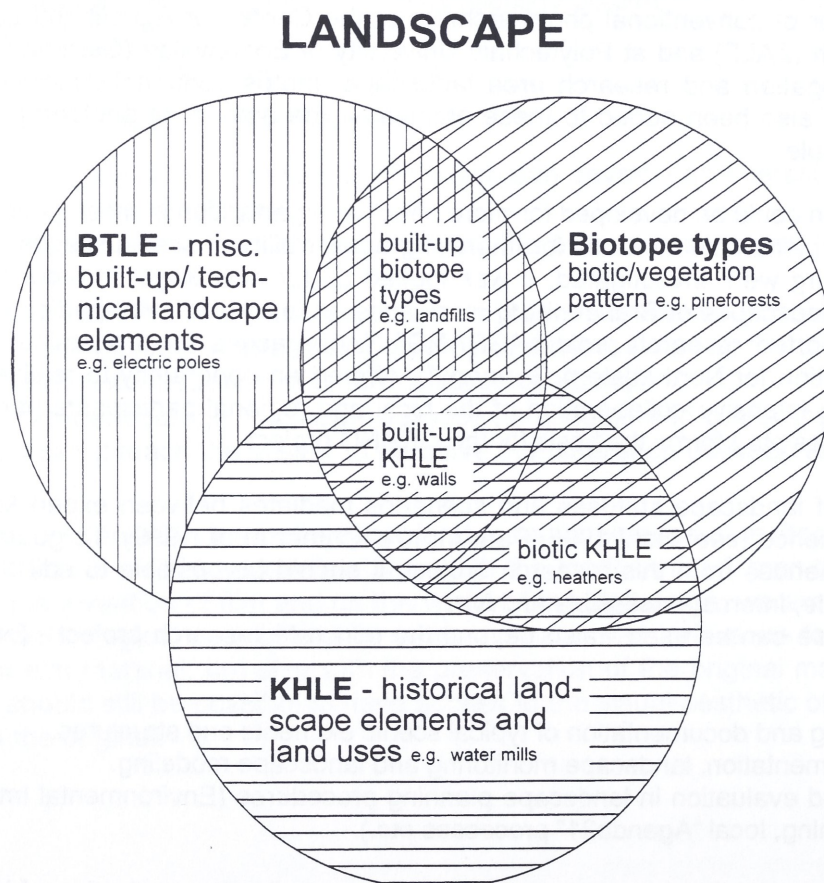scape elements and
land uses e.g. water mills

Fig.1: Relations and overlap between the three catalogs of the landscape image database

At the Polytechnic University of Eberswalde, a systematics of the historical landscape elements and land uses with a scope of several hundred "KHLE's" was developed (Peters/ Klinkhammer 1998). This is the second main catalog of the image database beside the biotope type systematics. There are overlaps between both catalogs (Fig. 1): Thus e.g. a Calluna-heather-landscape, created by a specific land use practice, is assigned to both the biotope types and the KHLE – systematics.

In one case the current vegetation and in the other case the historical land use (pastures with sheeps), forms the criteria. A window from the union catalog is represented in Fig. 2.

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▷ 🗀 ALLGEMEINE BILDDATEN
▷ 🗀 BIOTOPTYPEN BRANDENBURG
▷ 🗀 BTLE - sonstige bauliche/technische Landschaftselemente (Vorentwurf 04/1999)
─ 🗁 KHLE - Kulturhistorische Landschaftselemente und -nutzungen (10/1998)
  ▷     🗀 K0 SIEDLUNG - Kulturhistorische Landschaftselemente in Siedlungs- und Siedlungsrandbereichen, Siedlungsrelikte
  ▷     🗀 K1 HANDWERK UND GEWERBE - Elemente und Relikte des fruehen Handwerks, der Kleinindustrie und des Kleingewerbes
  ▷     🗀 K2 VERKEHR - Elemente des Funktionsbereichs Verkehr
  ▷     🗀 K3 WASSERBAU - Hochwasserschutz, Wasserbau und begleitende Anlagen
  ─     🗁 K4 LANDNUTZUNG - Elemente und Relikte der baeuerl. u. tradition. Landwirtschaft, des Gartenbaus, der Fischerei u. Forstwirtschaft
  ─        🗁 K41 Landwirtschaft
  ─           🗁 K411 Acker-, Wiesen-, Weide- und Heidelandschaften
  ─              🗁 K4111 Acker- und Wiesenlandschaften
  ▷                 🗀 K41111 historische Flurformen
  ▷                 🗀 K41112 Wiesen/ Weidegruenland
  ▷              🗀 K4112 Hutelandschaften/ Hutungen (extensive Weiden)
  ▷              🗀 K4113 Heiden (extensive Schafweiden)
  ▷              🗀 K4114 Terrassenlandschaften (Terrassierte Haenge)
  ▷           🗀 K412 Gehoelzbereiche und Einzelgehoelze in der offenen agraren Kulturlandschaft
  ▷           🗀 K413 Landwirtschaftliche Gebaeude im Aussenbereich
  ▷           🗀 K414 Kleingewaesser, landwirtschaftlich genutzt
  ▷           🗀 K415 Reliefstrukturen, die durch landwirtschaftliche Bearbeitungsprozesse entstanden sind
  ▷           🗀 K416 Sonstige Elemente in Acker-, Wiesen-, Weide- und Heidelandschaften
  ▷        🗀 K42 Forstwirtschaft
  ▷        🗀 K43 Fisch- und Teichwirtschaft
  ▷     🗀 K5 VERWALTUNG, VERTEIDIGUNG UND RECHTSSPRECHUNG - Grenz-, Verteidigungsrelikte, Rechtssprechung
  ▷     🗀 K6 FREIZEIT, ERHOLUNG UND ERINNERUNG
  ▷     🗀 K7 FEUDALE ANLAGEN - Burganlagen und Schloesser
  ▷     🗀 K8 RELEGION - kulturhistorische Landschaftselemente mit religioeser Bedeutung
  ▷     🗀 K9 BODENDENKMALE
▷ 🗀 SCHLAGWORTVERZEICHNIS
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Fig. 2: Window from the catalog-set of the image data base

Further components of the landscape apart from two systematics mentioned:
- Geomorphology,
- Atmospheric appearances (e.g.: clouds, rainbows),
- Contemporary build-up/technical landscape elements,
- Current land use forms,
- Individual plants,
- Humans,
- Animals,
- Means of transportation, and much more.

Key word systematics were developed for these landscape features to allow for reasonable system of archiving. Since a landscape photo frequently shows only one, but in actuality contains various side-by-side or consecutive (front, middle, background) picture constituents, an indexing of a picture under different catalogs or key words is not only permitted, but necessary for purposeful tracking.

3. Methodological and technical concepts of the image database and photo library

The digitalization and categorization of landscape photos from the extensive analog archives of the participating institutions is a time-consuming affair. Frequently, not all of the meta data necessary

for a database system has been documented. For the visual representation of visual landscape features, systematically photographing this data with digital cameras at different seasonal aspects proved a more favorable approach. For demonstration purposes, this methodology has been applied since October 1998 to selected areas of Brandenburg. In this context, photographic resources from other research projects, theses (diploma) and a subproject of a job-creation measure called "Creation of a Photographic Archives of Typical Elements of the Agrarian Landscape" will be extensively utilized. Archived material will be likewise entered when digitization and use of a picture are likely. The continuous supply of new image data is not a direct part of the project, but carried out by co-workers, who were entrusted with the conventional image files. Meta information of the landscape photos is entered into the image database. The original digital pictures remain on CD ROM. Only a preview image is generated and the file path to the original is managed dynamically.

First general image meta data such as picture rights, line of sight or time of day, has to be specified to the entry through predefined descriptors. The geographic reference is specified by means of a standard municipality key and the Transverse Mercator coordinates of the recording standpoints.

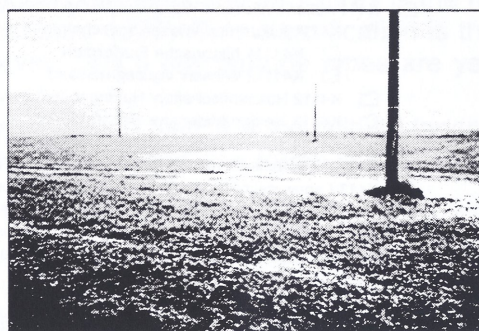**Datei**   **Mac OS**
            CD_D0014: D0001492.TIF

            Windows
            CD_D0014 (C:)\D0001492.TIF

Program PictureViewer
    Type TIFF   **Picture depth** Farbbild
File size 26,35 MB   **Resolution** 2700 dpi
Created 08.12.1998   **Height** 2495 pix
Modified 08.12.1998   **Width** 3689 pix

        Dataset

                Captured 17.03.1999
                Modified 05.05.1999

Status   **Caption Writer**
Pruefen   Biebrach, J. & Gelfort, R.

Name   **Categories**
d0001492 bestellter Acker   Photographer: Biebrach, J. & Gelfort, R.
                                        Copyright: ABM Fotoarchiv
Notes   Copyright_notice: bei Angabe der Bildrechte
                                        Year_month_created: 1998/10
Photographed_d: 29.10.1998   Daytime: nachmittags
Photographed_h: Line_of_sight: Nordost
Digital_source: SprintScan 35   Clouds: starke
Camera: Olympus OM-4   Municipal_id: 12064316 Muencheberg
Film: Agfa 200   B09130 Intensivaecker (LI)
Focal_length : 28mm   B10124 Energieleitungstrassen (PRE)
misc.: Winterraps_Brassica napus,
Wasserstauflaeche auf Schlag 17

Fig. 3: Example dataset from the image database

Hierarchically structured systematics for the entry of landscapes and landscape elements are entered into the database as categories. Each photo is classified by categories based on its components (Fig. 3). Besides an ID, each image data record receives a generally comprehensible caption name derived from a key word directory for landscape elements.
The software system used is the Media Asset Management System "Cumulus", from Canto Soft-

ware San Francisco, CA and Berlin, Germany. The network version runs on a SUN Solaris Enterprise server at ZALF and offers TC/IP access of Windows or MacOS Clients in the Intranet. Cumulus 5 (announced) will run on our Linux Web-server. Thereby, the photo library and database contents are accessible to external entities, such as universities, nature protection authorities etc., as well as the interested public and stake holders. Cumulus 5 supports ODBC, which enables connections to 3rd party databases.

The Cumulus client provides the practical opportunity to list and maintain the digital landscape images and to manage database queries.

Parallel to Cumulus, a Geographical Information System (GIS) serves for geographic-referenced and map-based database queries. The recording standpoints of the photographs are mapped in an "ArcView GIS" theme.

The landscape images can be assigned and analyzed with e.g. different landscape units or geomorphologic units through operations with other GIS themes. This service could also be offered through the free ESRI ArcExplorer in the Internet.

4. Outlook

Apart from the above-mentioned application purposes, there are also impulses at the European level for establishing digital landscape image databases.

There is a trend of diminishing the diversity of scenic characteristics to one *"European Union standardized"* landscape. In the draft of an European landscape convention, the member states are requested to identify their own landscapes and its features and to analyze the forces and pressures, which are changing them" in order to preserve the variety and unique characteristics of European landscapes (Council of Europe 1997). We would therefore recommend the use of digital image processing with respect to database and GIS technologies, because landscapes are suited to informative handling due to their relationship with the human imaginative power, cultural identity and aesthetics. Scenery is vital to ensure rural recreation and to deploy the potential of rural tourism in selected areas.

Internet-compatible image databases offer the ideal prerequisites to analyze similarities and differences between regional landscapes in comparative studies. The information exchange enabled through comparative landscape research could significantly support the preservation and sustainable land use of historical cultural landscapes. The results should be applied to the pending fundamental structural re-organization of the rural development policies (e.g. AGENDA 2000, environmental conditionality programs on agriculture).

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