

GIS-ANALYSIS IN THE RECONSTRUCTION OF AN EARLY MEDIEVAL LANDSCAPE. THE UPPER LUSATIAN CASE-STUDY

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ABSTRACT

GEORGE INDRUSZEWSKI

GEISTESWISSENSCHAFTLICHES ZENTRUM GESCHICHTE UND KULTUR
OSTMITTELEUROPAS E.V. LEIPZIG AND NATIONALMUSEETS
MARINARKÆOLOGISKE FORSKNINGSCENTER, ROSKILDE

The GIS-software has been used as a main tool in reconstructing the early medieval landscape in the Upper Lausitz (Saxony, Germany) territory. Quality cartographic data (Landesvermessungsamt Sachsen) was used to produce GIS-based (ArcView) 2D maps of natural and man-made features tied afterwards to a relational database of non-spatial attributes containing archaeological, historical, and linguistic data. The preliminary work included also the elaboration of a DEM (ArcView, ArcInfo, ArcGIS) used to further the reconstruction and the analysis of landscape themes. GIS was used as a working platform onto which spatial statistical analysis and more common GIS-based spatial analysis (viewshed, line-of-sight, distance, proximity, etc.) were integrated with satellite imagery and other photo documentation. The results, so far are encouraging us to plead for the scientific benefits and potentials of GIS-based analysis and reconstruction of early medieval landscapes.

INTRODUCTION

Bautzen/Budyšin is considered the de facto cultural capital of the Sorbian minority in the larger region of the Sorbian/German Upper Lusatia, this perception being grounded mostly on decades of intermittent historic and archaeological research that underlines the central importance of this place for the region. The reconstruction of an early medieval landscape for this region focuses therefore, on the reconstitution of the multiple relationships between Bautzen/Budyšin as central place and the peripheral settlements during the early and the High Middle Ages. It takes in consideration the settlements around Bautzen/Budyšin and those on the Upper Spree Valley, those from the entire Upper Lusatia region, and those from the larger area including Northern Bohemia and Lower Silesia.

SETTLEMENT PATTERN: THE BUDIŠIN LAND

The temporal variation of settlement pattern constitutes an important element in the process of landscape reconstruction, inasmuch as it emphasizes matching of information from various sources: archaeological, historical, and linguistic. The digitized place-names, representing either the site of the local church or the core of the village or hamlet, constituted therefore not only the geo-referenced place-name but also the presumed core-location of the earliest settlement or a core-settlement area for street (Strassen-, Gassendorf) or forest hamlet (Waldhufendorf) village type. Slavic place-names seem to cluster in an area along the Lusatian Land (Upper Lusatian Gefilde), the Upper Neisse Valley, and the Upper Elbe Valley. Historically, these clusters are also the earliest that appear in the written documents. Archaeological evidence about medieval settlement traces and the oldest core of existing villages seem also to refer to the same clusters, except the one on the Upper Elbe Valley. From a physical point of view, the core-region known in

German as the 'Lusatian Gefilde' (Lusatian Land) is bordered by the heights of the Lusatian Highlands in the South while a wide stretch of inhospitable flatland covered by marshy areas and forest lies to the North. The two major physical elements of the landscape, the mountain range and the river and creek network, running on two different axes, create invariably a natural network of landscaping 'nodes' where earliest habitation sites are concentrated. The aspect mapping shows most of the Upper Lusatia divided in two halves with the southern half with hill faces oriented alternately to north and south and a northern half with flatlands oriented northward. Onto this northern half most of the earliest settlements are located. On

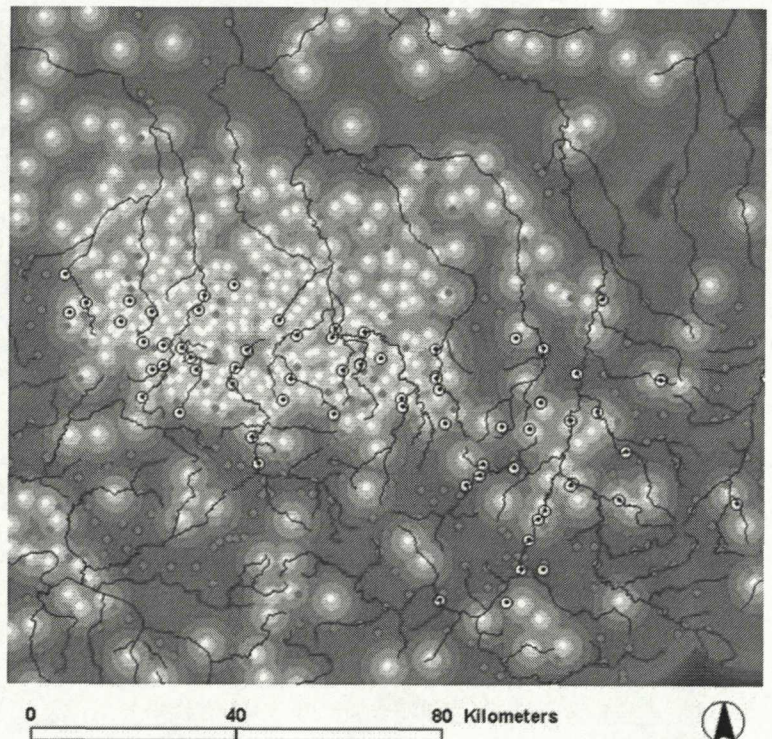


Figure 1 Distance mapping for Slavic (light dots) and German (dark dots) settlements. Black dots on white circles represent early medieval forts

the other hand, the eastern part of the region shows more randomly patterned terrain around the Upper Neisse Valley, acting as a north-south divider. The central part of the Upper Neisse Valley was occupied by earliest settlements in the area, and this cluster is separated from the main one by an uninhabited ridge located between the Black and the White Schöps Creeks. The overall settlement theme laid onto a DEM-model shows Slavic settlements concentrating at elevations lower than 300 m. One could conclude at this stage that Slavic settlers have avoided the Highlands at all times and that the German colonists did not have other choice but to settle on what was a free land zone in the 12th c. However, after place-names classes are summarized and plotted in relation to the mean elevation of the elaborated DEM, it seems obvious that both Slavic and German patronyms tend towards the 200 m elevation level, while possessives differ to some extent: the Slavic stop at the 220 m elevation, while the German ones reach the 280 m elevation. Assuming that patronymic place-names are the earliest settlements in the region, then both Slavs and Germans regardless of their arrival date in Upper Lusatia chose to settle at lower elevations expanding afterwards in the highlands. This is confirmed also by the convergence between Slavic place-names and the Bauernweiler/Rundweiler (peasant/round hamlets) village type distribution.¹ Distance mapping of Slavic place-names shows settlements clustered in the Lusatian Valley within a distance ranging from 2 to 4 km (Fig.1). This seems to come close to Timoščuk's results from Ukraine where intra-cluster distances between Slavic settlements were calculated at less than 2 km (Kobylnski 1997:108). These aggregate in what can be called a settlement unit or cell (Kobylnski 1997:109). Density mapping, on the other hand, identified three distinctive and different types of clusters: the westernmost one appears as an agglomeration around Coblenz, Dahren, and Passditz, the middle one being in fact an encircling band around Bautzen/Budyšin, while the easternmost cluster is linear on a east-west axis. Less dense agglomerations are spotted on the Upper Neisse Valley between Jauernick, Tylice, Reczyn, and Tauchritz, between Kamenz and Wittichenau, around Litschen, and on the Upper Elbe Valley between Krippen and Dorf Wehlen. These clusters could correspond with a higher hierarchical territorial unit, the so-called opole, pogost, zupa (Kobylnski 1997:109). Proximity mapping with ethnic affiliation as identity field for cells shows the degree of nearness between Slavic place-names and also that the direction of penetration of German place-names is from the southwest for both Slavic clusters. Spatial statistics such as Quadrat Analysis are applied to detect how settlement density changes over space. In order to discern this, the test compares the given point distribution with a theoretical random pattern (Quadrat analysis results with qsize = 1/2 n: 458, Lambda - 1.94805, Variance - 1.94805, K-S Dstat -

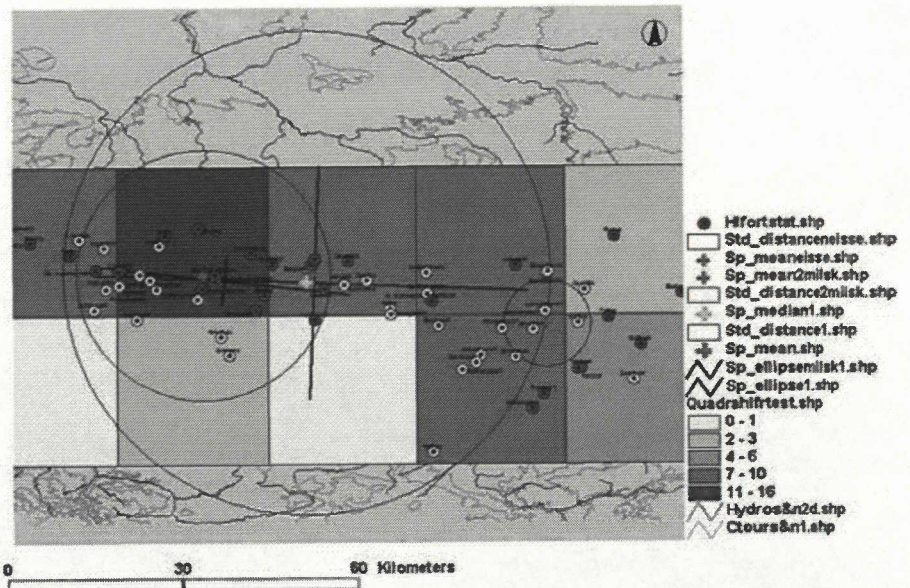


Figure 2 Quadrat Analysis on forts divided into earlier (dark dots) and later (light dots) than 10th c. AD

0.370782, Alpha level at 0.05 - QA critical value is 0.04533). This value differs significantly from the calculated K-S absolute difference of 0.370782 between the dispersed and clustered patterns, and we may therefore conclude that Upper Lusatian settlements do not distribute in a dispersed manner. The Nearest Neighbour Analysis (NNA) is applied to the same dataset in order to check the result of the first performed test. The NNA test gave (Nearest neighbour analysis: Observed Neighbour dist: 2.06481, Expected n dist: 2.09557, N. neighbourhood R Statistic: 0.985324, StD Zr Score: 0.842362) $R = 0.985324$ which confirms the earlier result, by indicating that the settlement pattern has a tendency to cluster and is farther from dispersing. The preliminary results in the elaboration of a Predictive Model for Slavic Settlements in Upper Lusatia show that not all variables are sensitive to settlement location. The slope degree is indifferent to settlement location, these being located on both flat and steep areas. Closeness to watercourse does not influence settlement selection, many settlements being spread randomly between two riparian zones. The soil type variable seems to be related to settlement location with Slavic toponyms located on loess and clayey soils.

BAUTZEN - ZENTRALORT?

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Historical information, coupled since the beginning of the 20th century with archaeological evidence, affirmed the role of Bautzen/Budyšin as the most important political, cultural, and economic town in Upper Lusatia. During the course of history, the town knew several phases of urban development, expanding eastward from a core settlement area located somewhere between the St. Peter & Paul Cathedral and the Ortenburg Castle. Situated at a natural crossing/ford over the Spree River, and commanding the via regia trading route that connected Western Germany with Silesia and Eastern Europe the town was first mentioned by Thietmar of Merseburg as 'civitas Budusin' in 1002 and in 1004 as 'urbs Budusin' as being of strategic importance for both German and Polish military interests in the region (Thietmar Chron. 230:9 and

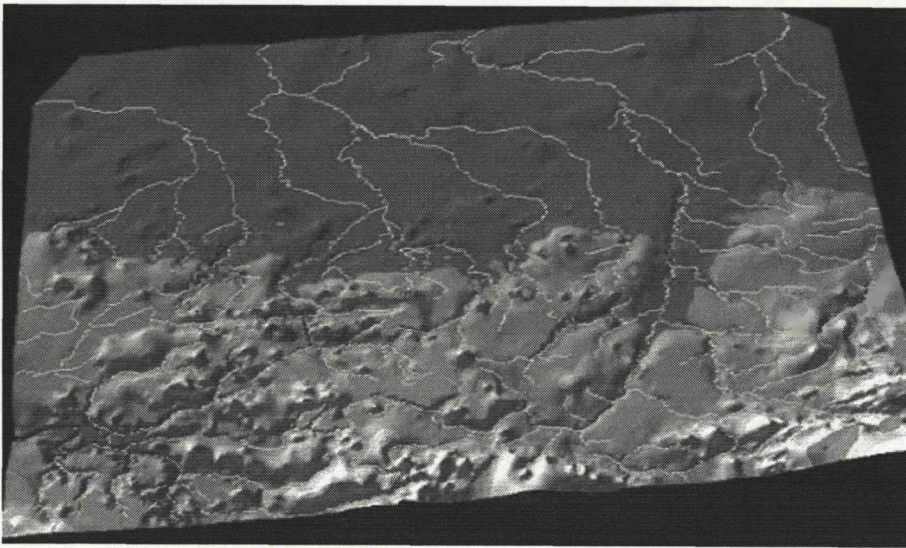


Figure 3 3D DEM of Upper Lusatia (red dots represent locations of early medieval forts)

292:14). These premises created the idea of Bautzen as Zentralort, a place destined to be the seat of the feudal power and the converging point of the entire region. D. Scholze stated that before its first mention in the written sources, a stronghold was erected on the high ground surrounded by the meander of the Spree (Scholze 2002:30). This stronghold would have been, according to K. Blaschke, the tribal seat of power of the Milzeni, transformed subsequently into a ducal stronghold of the entire Lusatian Land (Blaschke 2002:46).

Archaeological investigations started in Bautzen/Budyšin inner-city as early as 1906 when W. Frenzel found on the Castle perimeter (Ortenburg) Bronze Age, Slavic, and German ceramic material and subsequently carried out in conjunction with construction and renovation works (CAQ 1985:123, Sczech 1999:98). The results indicate that under the present Baroque Castle the ruins of 12th-century medieval fortifications overlay a Bronze Age earthen rampart while a 10th-century AD Slavic settlement was found extending south and east of the Ortenburg (Sczech 1999:98). The dilemma arising from this situation is not only practical but also theoretical. Was the landscape of the Milzeni really structured around a central place of power, such as Bautzen/Budyšin, or is it a wishful theoretical construct propagated by modern research based heavily on historical tradition (text-driven archaeology case)?

STRONGHOLDS: THE VISIBLE LANDSCAPE OF THE PAST

A total of 74 strongholds were plotted on the GIS map, 68 being mapped with the help of a GPS receiver during the 2001/2002 field work. With very few exceptions most of them belong to the category of earthen ramparts with one or two fortified precincts and one entrance usually on the right side of the compound. From the ensuing mapping it can be clearly observed that early medieval strongholds appeared sometime during the 8th century AD in several places between Kamenz and the Spree, north from Bautzen/Budyšin and Löbau, and east of Neisse Valley between Görlitz/Zgorzelec and Luban. 9th-century strongholds trans-

formed the initial random distribution into a cluster distribution: one located in the Lusatian Land and the other in the Neisse Valley and the 11th -12th -century fortifications accentuated the clustered pattern showing this time a clear tendency to fortify towards southwest in both clusters. The location of the latter in the Lusatian cluster between Bischofswerda and Göda corresponds also with the axis of one of the main trading routes through the region. Under Czech suzerainty forts were built not to defend the southwest corner anymore, but to reinforce the eastern and the northern flank of the Lusatian Land. Simple statistical measures of centrality such as spatial means and the corresponding stan-

dard deviations were calculated for the fort group as a whole and for each of the fort clusters. Both the spatial mean and the spatial median for the entire group are located at Belgern, this being the central point of the entire region. This characteristic seems related to the political conditions in the High Middle Ages, when the Czechs controlled the entire region. If the whole region is split into the Lusatian and the Neisse Valleys, then the spatial mean for the Neisse cluster falls between Jauernick and Landskrone, while the mean for the Lusatian cluster falls west of Bautzen/Budyšin. A Quadrat Analysis carried out on fort distribution shows a linear agglomeration for the Lusatian Valley with a tendency to cluster in the Bautzen/Budyšin quadrat (11-16 forts), while radial-like dispersion is to be seen on both sides of the Neisse Valley (Fig.2). On the other hand, line-of-sight calculations indicate that observers based at almost all of the forts from Lusatian cluster would have no visual contact with each other. The opposite holds true for the Neisse Valley where observers at Landskrone can visually contact most of the surrounding forts. The analysis can be carried further through the elaboration of a DEM for the entire region (Fig.3). On the 3D model one can readily visualize which forts are commanding the view, and which can be visually connected from a specific location. With patronymic settlements plotted, the Lusatian Land emerges as a cluster of settlements surrounded by a stronghold ring, whereas the Neisse Valley shows radially dispersed strongholds intermingled with settlements that cluster towards Landskrone. The 1-km buffering of the core-area settlements coupled with the 3-km buffering of the earliest strongholds shows that settlements aggregate in smaller units that aggregate in turn around a stronghold to form a stronghold territorial unit with a radius of ca. 5 km (Burgwallbereich, okreg grodowy, pole, laukas, campus). Subsequently, these units aggregate further into stronghold clusters (opole, pogost, zupa), covering areas up to 20 km while the distance between stronghold units in the Milsca Valley is well under the average estimate of 10 km (Kobylinski 1997:109).

Geographical Information System

CONCLUSIONS

The spatial coverage of the earliest 152 patronymic settlements corresponds with that of strongholds erected earlier than the 10th c. AD. The buffering of 3 km radius of hillforts theme shows that forts are networked according to local hydrography and that the Milsca Valley took shape out of numerous valley settlements (family nests or settlement units/cells) aggregated around each of the several strongholds located on the valley's watercourse (pole-laukas-campus). An extended valley-wide community consisting of stronghold groups (opole-pogost-zupa) was established in the Milsca Valley (Gau Milska), while the Besunzani Valley (Zagost) continued to forge its radial pattern initially without Landskrone as the centre place (Zentralort). No central places (Zentralort) are envisaged for this period. Forts served, in this

stage, as places of social prestige and exchange with the outsiders and less as defensive works. As a direct result of the German-Polish Wars in the region during the 10th-11th centuries hilltop strongholds appeared² and forts were built towards southwest as an attempt to stop not the invading armies but the colonization waves started with the process of land gratification to the Bishopric of Meissen (Knebel 1965:23, Cod. Dipl. Lus. Sup. I:25). Bautzen/Budyšin and Landskrone³ emerged now as strategic locations for both German and Polish warring parties, transforming the region in a centre-and-periphery structure. From now on Bautzen/Budyšin was to become the centre of the medieval Upper Lusatia, while Landskrone receded and eventually disappeared before the newly founded trading centre Goreliz (Görlitz/Zgorzelec).

¹ Small villages consisting of few households spread around a central point or at random (cf. Blaschke, HAS, 2002).

² Elstra, Schmölln, Naundorf, Hochstein, Binnewitz (exception), Rothstein, perhaps Löbauerberg, Schönau a. E.

³ Details about Landskrone and its role in the German-Polish conflict see Von Richthofen 2002:5.

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