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The numerical analysis of a lost old-days manuscript map

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Summary: The paper presents one of the Polish 19th century maps, made by E. Raczyński, covering the Poznań Department (Great Poland). The original of the map was destroyed during World War II and only some photocopies for analysis and description of the map are at our disposition. The analysis was made by two systems: MapAnalyst and ArcGIS, to determine the scale as well as the rotation and the correctness of six of the map sheets. The map appears as very detailed and quite precise material for the environmental analysis of the region. It can be used for determining the evolution of the forest, communication, settlements and the document of the Netherland colonization in Poland in the beginning of the 19th century.

The Raczyński map

One of the most interesting cartographic initiatives at the beginning of the 19th century was the elaboration of “A Topographic Military and Statistical Map of the Parts of Great Poland that today compose POZNAŃ DEPARTAMENT, published by Edward Raczyński, the Poznań Representative at his own cost, revised in the years 1807-1812”. The scale described on the map is: One German Mile contains 20,000 Rhein Miles.

The initiative was carried forward by one of the most prominent Poles of the 19th century, Count Edward Raczyński (1786 - 1845). He was the founder of the Public Library in Poznań (Raczyński Library), known as a protector of science, interested in cartography. During the Napoleonic campaign in Poland 1807 Raczyński became acquainted with French military cartography and engaged French military engineers for the work on the topographic map of 14 districts of Poznań Department (Great Poland).

The works were unfinished and only 9 districts were been mapped (Śrem, Poznań, Międzyrzecz, Oborniki, Babimost, Kościan, Leszno, Krobia i Wągrowiec). Sheets of the manuscript map were preserved in Raczyński’s Library in Poznań up to the second world war. During the war the Library was destroyed by fire and the maps were lost. But in the 1930’s the map was the subject of research of prof. S. Pawłowski from Poznań University, who made photographic copies of some sheets. They are currently preserved in the Department of Cartography, University of Wrocław.

The map properties

All information about the Raczyński cartographic works has also been lost, so we have to reconstruct some of their properties. The map of Poznań Department was made for military purposes and it is of military character. The content consists of rivers, forests, settlements and roads, terrain relief and many objects of orientation (Fig. 1). The map was drawn in different colours, but the photocopies are black/white and the colours are invisible, especially the blue one. The information about the number of inhabitants was added to some villages. The content is limited to the boundaries of districts but not all boundaries are marked on the maps. It is because the map has a character of the first version, not prepared for printing.
No cartographic coordinates are marked and we can only admit it could be one of the French projections, because the map was made by French cartographers. All sheets are rotated about 16° - 17°. The scale is different on different sheets, between 1:162 000 to 1:167 000.

Some geometric characteristics of the map were obtained using the MapAnalyst software. It showed the rotation of map sheets (15° to 17° in NW direction) and a scale, different on individual sheets, between 1:162 000 to 1:167 000. But the distortion grid is regular, showing the map was made on a basis of a projection (Fig. 2).

The georeferencing and the determining of the correctness of the localization of elements has been done in ArcGIS. The georeferencing of photocopies of manual made maps cause some problems, connected mainly with the deformation of paper (the maps and the photos), the lack of coordinates and the schematic design of settlements (Fig. 3). So the georeference can be made only with an approximation.
Other problems occur when trying to characterize his map caused by the poor quality of photos of different brightness and acuteness that make many signs illegible. The georeferencing with the contemporary maps was made using the towns and some villages. Then the course of meridians and parallels taken from the topographic map was verified. Despite the estimated referencing the course of coordinates occurs almost the same as on the topographic map. Also very little differences in location of towns in comparison with the topographic map can be observed. As we can see on Figure 4, only five towns show some differences in location. Villages show greater deviations (Fig. 5) about 500m. Some differences concern rivers, lakes forests and roads as well. The main rivers and roads were measured more precise than the smaller objects (Fig. 6).

![Figure 3: The schematic design of settlements (town Leszno).](image_url)

![Figure 4: The comparison of towns’ location on all sheets. The red points and names are taken from Raczyński map, the black ones from the topographic maps.](image_url)
The closer analysis of Raczyński map allows determining the evolution of natural environment and the colonization. Putting the line of Warta river taken from the topographic map on the Raczyński map sheets (Fig. 7) shows that the course of the river on the map is quite similar. It can mean that the river has not changed very much during 200 years. The comparison of forests shows the greater changes. Many smaller woods were cut out completely or in some parts but the greater stretch of forests remain almost in the same boundaries (Fig. 8). One can obtain very interesting information about the Netherlands settlements in Great Poland during the 19th century. On the Raczyński map we can observe many small dispersed villages named “Hol” (Fig. 9). Today the names are only the Polish ones and the contemporary maps do not show the provenience of the colonization.

The geometric properties, despite the difficulties with georeferencing the Raczyński map can bear witness to its very high quality. It can serve as an important source to the investigation of the region history and evolution of the area’s environment.
Figure 7: The blue line marks the part of Warta river near Międzychód, taken from topographic map, put on the sheet of Raczyński map.

Figure 8: The comparison of boundaries of forest on the Raczyński map with the topographic map.

Figure 9: Dutch settlements on the Raczyński map.
References


