

# Cartographic visualization of tourist expanse based on remote sensing and GIS

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**Abstract.** The research issue refers to elaborating a natural and touristic map with the use of remote sensing techniques and Geographic Information Systems. The concept of the map assumes applying geocomplexes to present the complexity of the natural environment of Narwiański Park Narodowy [the Narew National Park]. They constitute the background for presentation of touristic contents and elements of topographic substance. While accomplishing the project, the ESRI ArcGIS 10.0 software was used. The elaborated map is also an open data base which may be updated according to the user needs.

**Keywords.** geocomplexes, landscape map, touristic map, Geographic Information Systems, the Narew National Park.

## 1. Introduction

Tourism is the phenomenon allowing for realization of the need for rest and regeneration of a man's power. A tourist is more and more educated, thus he has a need for wide natural and cultural information on places which he wants to see on his own. The concept of the elaborated natural and touristic map includes complex knowledge on natural values and touristic attractiveness of the area under research. The natural environment was visualized on the map with the use of spatial physical and geographical units – geocomplexes. They are defined as „relatively compact section of nature, constituting an entirety thanks to processes occurring in it and interdependence of components building it“ (Barsch H., 1979). To main components of the natural environment of the Narew National Park included were: terrain sculpture, geological structure, soils and terrain cover modified by man's activity.

The goal of the study is collecting materials, their analysis and the accomplishment of the natural and touristic map of the park together with the protected terrain zone in the scale of 1: 30 000.

## 2. Methods

Works on the Narew National Park map covered four stages (picture 1). Three of them were elaborated parallel, obtaining three separate field layers: landscape, touristic and elements of topographic contents. The last part of the job was binding all prepared field layers and preparing them for cartographic presentation.

While realizing the first stage, materials were used, as follows:

- [1] Digital Terrain Model (DTM) elaborated basing on the contour drawing and altitude points obtained from the topographic map in the scale 1:10 000 (Wołk-Musiał E., Zagajewski B., 2001). On this basis generated was a map of terrain falls where distinguished were flat terrains (of the 0-2 % slope), mild slopes (2-10 %) and steep ones (above 10%);
- [2] *Geomorphologic Map of the Narew National Park together with the protected terrain zone in the scale 1:25000* (Wołk-Musiał E., Kanigowska M., 2011);

- [3] *Detailed Geological Map of Poland in the scale 1:50 000 – sheets: Choroszcz (338 / N-34-106-D) and Łapy (N-34-118-B), which were obtained from IKAR Geoportal (<http://ikar2.pgi.gov.pl>).*
- [4] *Map of Types of Soils of the Narew Landscape Park 1:25 000 made accessible by Katedra Geografii Fizycznej, of the Silesian University, Sosnowiec, 1988.*
- [5] Air colour images in infrared (spectrozone) taken on 24.08-25.08.1997 by POLKART (1:10 000).
- [6] Ortophotomap – [www.geoportal.gov.pl](http://www.geoportal.gov.pl)

The second stage assumed working out touristic contents. In this phase used were materials originating mainly from the GIS portal - the Upper Narew Valley, and a touristic map *The Narew National Park and the countryside (1:50 000)*, these are the data, as follows:

- natural values – vector layer with fauna and plant communities, monuments of nature, observation points ;
- communication base – natural and didactic paths, touristic trails;
- touristic implementation – accommodation and gastronomy facilities.

In the third stage obtained were elements of topographic substance. The source for elaborating a subsequent vector cover upon the landscape map, is:

1. *Topographic map of Poland (1:50 000) in the 1965 scheme.* An interesting excerpt was taken from Geoportal ([www.geoportal.gov.pl](http://www.geoportal.gov.pl)).

Information used from the source material is: settlement network, communication network, and the river network.

### 3.Results

Analysis of the landscape layer. Main constituent layer of the landscape map – types of the terrain sculpture - was worked out based on digital layers; a map of terrain falls and a geomorphological map – using classification elaborated for glacial terrains.

Subsequently, the digital layer of the map of sculpture types with surface formations was cut obtaining homogenous polygons which were supplemented with the types of soils adherent to the given polygon. The effect was obtaining a map of geocomplexes, where the list includes 18 separations

### 4. Cartographic elaboration of the natural and touristic map

Project of the landscape map assumed creating spatial data base which may be further presented as a map using cartographic methods of presentation. The concept of the data base was thought of in such a manner so that to allow a potential user a free display of constituent maps (e.g. types of terrain sculpture, geocomplexes, touristic cover). The key idea was creating one graphic file with the developed table of attributes. Acting on one file has many advantages (if it refers to the organization of work, an imprint itself, or data export), as the user beginner has less chance to lose any information acting on one set than on many.

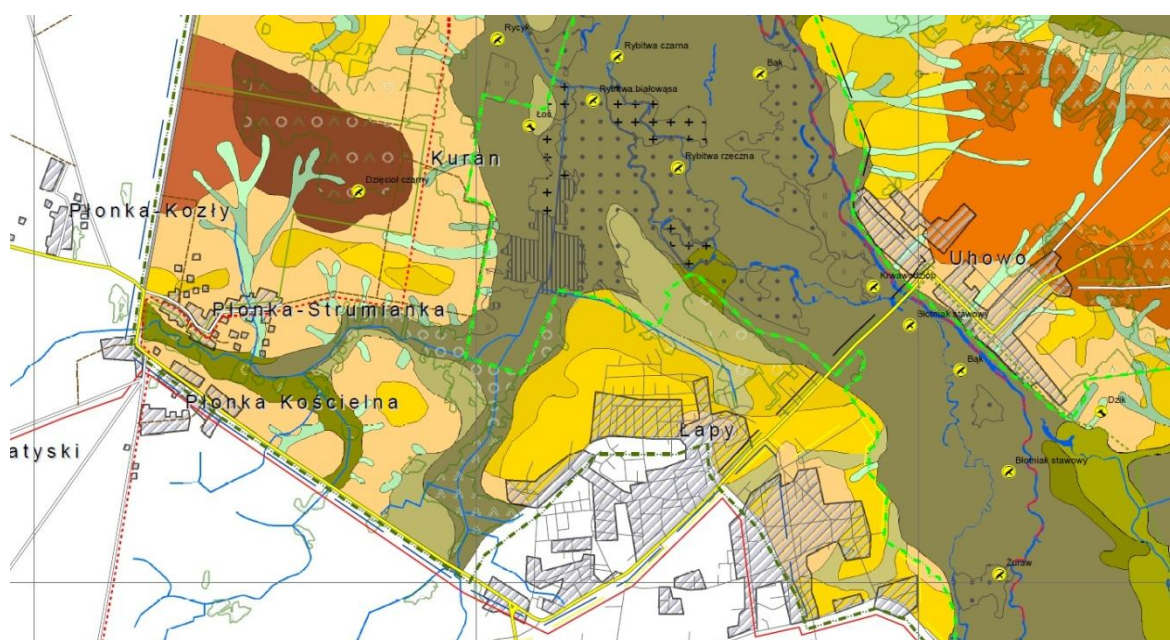
During the cartographic elaboration one assumption was observed: a map of geocomplexes was the background for layers with touristic and topographic elements. The background material (layer of geocomplexes) was presented with the method of reaches.

Vector covers – layer with elements of topographic and touristic contents was placed straight upon geocomplexes. Topographic elements were marked with methods of reaches and line and symbolic-picture signatures. Forests and localities were presented with the method of reaches using hatch patterns as a filling. Roads, railroads, park borders were presented with line signatures. Churches, railway stations, bus stops and petrol stations were marked with symbolic and picture signatures.

The layer with elements of touristic contents was presented with the method of reaches, line signatures and symbolic-picture signatures. Vegetation within the Narew National Park was marked with the method of reaches. The background was left colourless and hatch patterns were applied. Touristic trails and didactic paths were marked with line signatures. These signatures had to be additionally moved so that they do not collide with roads. Natural monuments, observation points, accommodation and gastronomy facilities were presented with symbolic-picture signatures.

## 5. Conclusions

The natural and touristic map under development is a synthesis of materials originating from various sources which undoubtedly influence the complexity and originality of its presentation. The final map contains large amount of contents which requires the process of generalization. Applying this cartographic method causes that the elaboration becomes more user friendly, though it loses minuteness. However, the elaborated final map, although saturated with lots of information, has remained legible. Vector covers do not impede readability of geocomplexes constituting the background for the touristic contents. Geocomplexes were presented with colours and traverse vector covers were presented with hatch patterns which do not interfere the image of vector layers (Figure 4).



**Figure 4.** Fragment of the natural-touristic map of the Narew national park. Source: own case study

## References:

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