Thematic Cartography and Databases Visualization

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Each cartographic work must show topographic or thematic information about the area and its parts, so that the means of expression used in it support its function and purpose. However, with the rise of digital technologies the cartographic work is, most often work with thematic content, increasingly just a routine CAD, respectively GIS output products without the professional cartographic supervision. Then, the resulting product is "only" a visualized database. If there is a need of a good quality printed output of such database, the possibilities of a print presentation come quickly into conflict, namely a commonly large database offer and cartographic model offer of the used software. This issue is discussed on the example of print-making and preparation of the Landscape Atlas of the Czech Republic.

***Key words**: Landscape Atlas of the Czech Republic, thematic cartography, visualization*

Introduction

In 2003 the Ministry of the Environment of the Czech Republic announced a commercial competition for a project called Landscape Atlas of the Czech Republic (further only CR). The project was carried out by the Silva Tarouca Research Institute for Landscape and Ornamental Gardening in Průhonice, headed by Mr. Ivo Tábor. Mr Ivan Sucharda from the same institute became the manager of the project. In the course of time the project saw several structural, organizational and a personal change, which was necessarily reflected in the costs, meeting deadlines and last but not least in the contents of the cartographic work. The SK/600/1/03 project called Landscape Atlas of the CR (2003-2008, MZP/SK) was eventually completed as late as in June 2010 [1]. It was funded by the National Funding Program of science and research within the Ministry of the Environment of the CR, and a considerable sum to support it came from the State Fund of the Environment.

The publishers are the Ministry of the Environment of the CR, Prague and the Silva Tarouca Research Institute for Landscape and Ornamental Gardening in Průhonice, the processor is Esprit Ltd., Banská Štiavnica and the printing and binding was made by VKÚ stock company, Harmanec. The chief editor of the Landscape Atlas of the CR and also the independent coordinator of the activities associated with the work was Mrs. Tatiana Hrnčiarová (Institute of Landscape Ecology, Slovak Academy of Sciences, Bratislava). About 300 specialists representing some 100 institutions of different kinds, including state and commercial ones, took part in the preparation of the Atlas.

It contains about 800 maps and a whole series of map sections, graphs, tables, photos and a certain amount of text in both Czech and English languages. Its hard cover dimensions are 610 by 507,5 mm and it weighs almost 9 kg.

The model for the Landscape Atlas of the CR was the Landscape Atlas of the Slovak Republic from 2002 and a lot of regional and national atlases of countries all over the world. It was aimed at producing a map document with graphs and images to show the landscape today and in the past and important landscape parts of the Czech Republic.

The Landscape Atlas of the CR consists of 8 parts:

1. Landscape – the object of study
2. Geographical position
3. Historical landscape
4. Natural landscape
5. Contemporary landscape
6. Landscape as heritage
7. Landscape as the environment for society
8. Landscape in art

A big majority of the map originals are made in the digital form as GIS data files composed over the standardized topographic background of 1:500,000 (a complete atlas double page), 1:1 mill., 1:2 mill., 1:3 mill., 1:4 mill. and exceptionally 1:1.5 mill. measuring scale, or as sections of larger scales (as the topic and purpose was).

Creating the thematic cartographic products

Thematic state map series of the Czech Republic are produced in accordance with the Government Decree No. 430/2006 Legal Code "About setting geodetic reference systems and state map work obligatory on the state territory and about the principles of its usage". They are made either in the Czech datum of Unified Trigonometric Cadastral Network (S-JTSK) based on the Basic Maps of the CR in measuring scales from 1:10,000 to 1:200,000 and on the Map of the CR in scale of 1:500,000, or in the World Geodetic System 1984 (WGS84) based on the Topographic Map in scales of 1:25,000, 1:50,000 and 1:100,000 and based on the Military Map of the CR in scales of 1:250,000 and 1:500,000.

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More often than the thematic state map series, which is directed by the corresponding department rules and methodic instructions, cartography deals with processing thematic maps and atlases for a wide range of branches like natural sciences, sociology, politics and other scientific specializations.

Based on the adopted topographic structure the "ad hoc" thematic maps present first of all the non-topographic objects and phenomena, i.e. those that cannot be located unequivocally and focused using geodetic methods. Even such means of expression are used that have a high degree of abstraction when these maps are produced. Therefore, while processing and reading thematic maps it is necessary, more often than with topographic cartographic maps, to carry out classification, evaluation and selection, to generalize information and work with such categories as induction and deduction, analysis and synthesis, analogy, hypothesis, correlation, causality and others.

In the field of creating thematic maps, a general standardization and unification of the means of expression in the cartographic language have not been accepted yet (unless within a single thematic area, e.g. forestry, pedology, geology and others) as it is the case in cartographic symbols of topographic maps. That means that before reading a thematic map the reader has to get acquainted with its legend first which may be very large and complicated. Not very unusual are quantitative excesses of a legend containing about 300 items (Fig. 1).

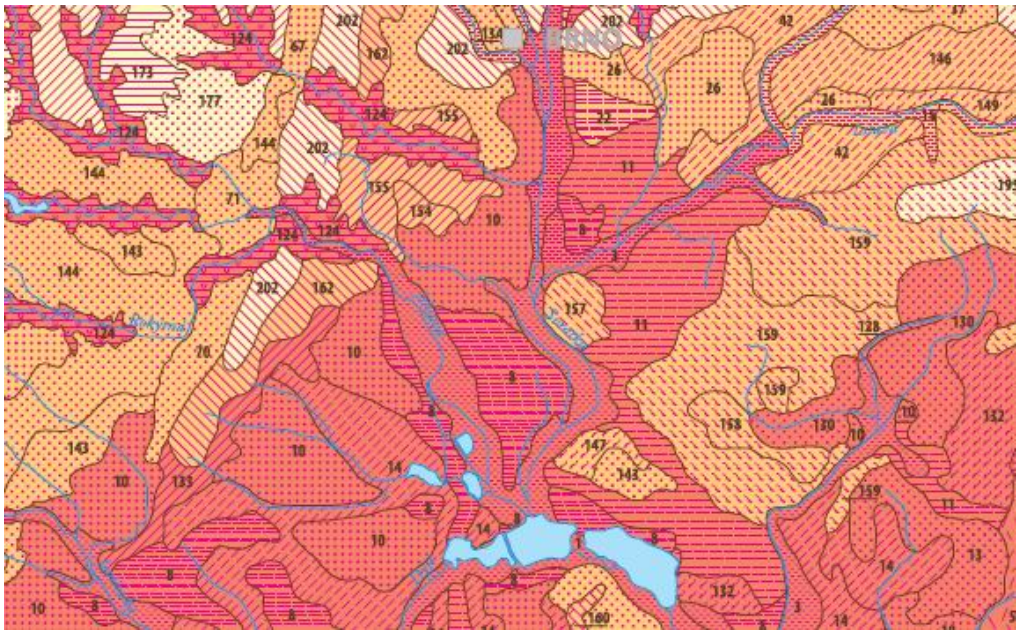

Fig. 1. Types of natural landscape, J.Kolejka (1:500.000, cut out) ***Chyba! Nenašiel sa žiaden zdroj odkazov.***.

With the growing importance of information technology (geoinformation systems, GIS) the thematic cartography sees a strong decline from geodesy, geography and (classical) cartography. Today the technology of cartographic production is almost entirely based on using computer technology and very often it slides into a trendy and modern technological stream - databases visualization. However, even cartographic production works with information stored in spatial databases (spatial geodatabases) and during its visualization the rules and conventional methodic techniques of classical analogue thematic cartography are preferred more consequently. This was also applied in the case of the Landscape Atlas of the CR which, however, as a thematic cartographic product comprising a wide range of topics from geology and geophysics over the common physical-geographical and socioeconomic topics up to the complex landscape ones, sometimes philosophically conceived topics, could not work exclusively with the databases of the project carrier´s organization, but it had to draw from the databases of the collaborating organizations and persons, as well as public databases (the internet).

If, for just this moment, I disregard the fact of copyright, there has often been a serious problem of converting the received databases into the required data structure to enable a graphic data presentation of good quality. Namely, the data offered from the spatial databases were different from each other in:

- both geometry and attribute parts with their level of distinguishing,
- quality and their reliability, i.e. space homogeneity of their quality and homogeneity,
- spatial security,
- topicality,
- degree of usage in technologies of producing thematic maps, i.e. in the amount of work which has been needed to transform them into the state of usefulness,
- price,
- reliability of the data owner, including the possibility and his willingness to continue collaborating on the cartographic work.

In accordance with the general theory the supplied data in the spatial databases were meant, first of all, either for cartographic production or general geo-information technology. While in the first case the data may be definitely, already in advance, assigned graphic attributes in which, in a cartographic depiction in a certain map scale, the quality and quantity of the phenomena are presented, the latter case would usually contain more information than necessary for a map production, however often more information than it is bearable for the scale and type of thematic map. The first case would usually lead to producing more or less complex (pseudo)cartograms and cartodiagrams, and dissentious situations came about only when selecting the color scale (kinds and types of hachures) as well as the number and size of legend intervals. In the latter case it would be necessary to analyze the data from spatial databases, adjust them, select their required range and assign them such cartographic means of expression that their graphic presentation would correspond to the requirements of the thematic map fullness in terms of symbols, graphics and information.

Fig. 2. Monasteries, K. Kuča (left, 1:1.000.000, cut out) and Landslides, D.Čápová a kol. (right, 1:1.000.000, cut out) [1].

Both the above mentioned types of geospatial databases make me open a discussion over the topic of the relationship between the thematic cartography and databases visualization. As I find myself on the level of producing the analogue cartographic work I am going to release, in my further reflections, undoubtedly favorable digital cartographic pieces of work which make it possible to apply modern forms of visualization of topical databases (scientific visualization [2], dynamic geo-visualization [3] and others) into interactive electronic cartographic outcomes, including those using the advantages of context cartography.

A lot of institutions and individuals with different cartographic experience have taken part in the preparation of single atlas pages and maps. Often for the first time they were made to present spatial localized data in form of the analogue thematic map for wide public, i.e. also outside their professional sphere in which they would normally work. While ignoring various terminological, graphic and other branch standards, which would complicate the work of finding compositional and content purity of atlas pages, or its thematically differentiated parts, we will only note those problems which are brought about by the hard confrontation of traditional (analogue) thematic cartography and the visualization of digital spatial databases. It is first of all the effort of authors to note absolutely everything offered by their often unique database, or perhaps their own or rather commercial computer program for processing the data. In order to make a compromise, the cartographer´s "ego" comes (see examples Fig. 2). The measuring scale, set in advance, of the analogue outcome has often caused a mass marginalizing of cartographic symbols from the object position fixed by coordinates in the database, or rather, while keeping the object position, to a selection of such symbols which mostly could not facilitate the identification of occurrence of single phenomena but just their territorial concentration, as a result.

Using digital technologies makes it possible to create, by combining databases and transformations of their values by means of various mathematical, math-statistical and empirical relationships, new synthetic and complex thematic layers which are often very far from the real world. However, neither the value of hypothetical thematic layer in a given spatial point, nor its practical impact, can be verified in practice. Such innovative accesses, which also appear in the contents of the Landscape Atlas of the CR, often get no support in discussions among specialists of different branches. Therefore the resulting thematic maps are rather a product of a computer program than the authors who only in the stage of the visualization are looking for an interpretation which even with a legend may not be generally comprehensible without an explanatory text (Fig.3).

A big amount of thematic information is only available in grid form. When connecting it to the analogue topographical background it is very difficult to face the grid information related to a line element (e.g. water surface), considering the pixel size, to produce a vector image of the line element. A lot of problems come up with positioning the grid on the map face, with setting the areas and also creating the legends. While visualizing this sort of data and simultaneously generating the legend, a rare phenomenon may appear in the legend but it cannot be identified graphically on the map face in view of the measuring scale.

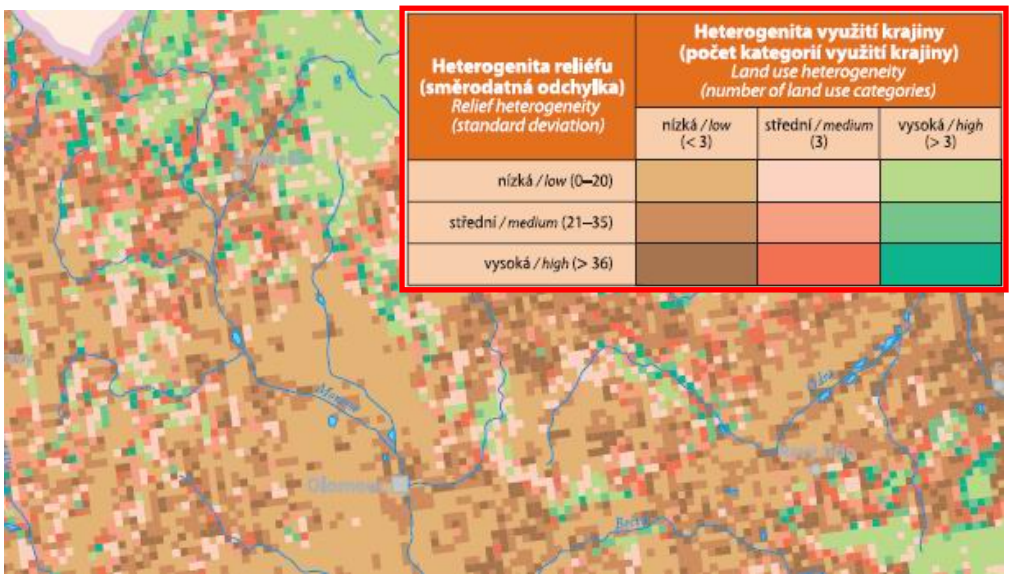

Fig. 3. Relation between the primary and secondary heterogeneity of the landscape, T.Chuman and D.Roportl (1:1.000.000, cut out) [1].

Conclusion

A lot of cartographic problems coming up from the need to transform the professional spatial databases into analogue thematic cartographic work had to be solved while producing the Landscape Atlas of the CR. The above mentioned examples only represent their very narrow sample.

The time it takes between acquiring the thematic information and printing the analogue thematic cartographic work is relatively very long and it is too long for thematic atlas work (almost 7 years for the Landscape Atlas of the CR). Is the potential user going to wait patiently for the whole procedure of creating and producing a map of very good cartographic quality to be completed while they may more or less guess the information which is obsolete at that moment in the given point of the map field (due to the interval legends or small measuring scales for spatial identification), or are they going to be happy with a presentation of precise thematic information as for the position and contents in digital form while no more or no higher requirements on their cartographic literacy will be placed? I am afraid that the latter is the way of the present day and probably also of near future. The classical thematic cartography, as it seems today, will give way to the unrivalled and more operational, topical and precise databases as well as the sophisticated computer programs which can display places according to the information gained from them as the users would like it. Still I am convinced that the representative and studying role of thematic cartography will be even in far future irreplaceable and its pieces of work will give information not only about the level of the depicted topic but also through the printed maps and atlases about the cultural and technological standards of the society which created them. This is what the team had in mind when they participated in creating and producing the Landscape Atlas of the CR too [4].

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Translated by L.Matulová

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