

SELECTED POSSIBILITIES OF DATA EXCERPTION FROM THE DATABASE OF HISTORICAL ATLASES

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ABSTRACT

A large database of more than 400 existing historical atlases released after 1950 was created as a result of an extensive analytic research within the preparation of cartographic works on the Czech Historical Atlas. The database was published in the form of a web application that allows the user to reveal and analyse associated information about historical atlases across interactive dashboards. To improve the information value of the database, the authors decided to arrange further possibilities of data excerption with the use of specialized data visualization methods that may reveal additional information and new phenomena which are not clearly visible from the database itself. The performed analyses supplement the paper in the form of diagrams and charts and present the data from various perspectives with the focus on similarities and differences between the cartographic and the thematic content of the historical atlases in the publishing countries, the changes in the thematic focus of the atlases or changes in the use of methods of thematic cartography in atlas works over time. The authors also deal with relations between the thematic focus of the atlas and the applied methods of thematic cartography. All analyses are performed on the sample of 88 atlas works.

KEYWORDS

Historical atlas, Database, Web Application, Data visualization, Czech Historical Atlas

INTRODUCTION

During an extensive analytic research within the preparation of cartographic works on the Czech Historical Atlas, a comprehensive database of historical atlases was created. Information about more than 400 atlases was collected within the research. In addition to the standard bibliographic description, the researchers fed the database with detailed information on the content of the atlases that are not available in any library catalogue. Even though the database does not cover the whole world production of historical atlases after 1950 (and it was not intended to do so), the team believes that more than 400 items comprise a sufficient and representative sample of the overall production. Thus, it was decided to make the database available to a broad public and publish it as a complementary web application to the Czech Historical Atlas web portal that is currently being worked on [1] [2]. Although the database in the form of a web application allows users to reveal and analyse associated information about historical atlases across an interactive dashboard, the authors decided to further improve the information value of the database and arrange potential excerpts of data analysis with the use of specialized data visualization methods that might provide a possibility to look at the data from different perspectives and thus reveal hidden relations between the collected items of information about the historical atlases stored in the database.

DATABASE OF HISTORICAL ATLASES

Historical atlases and their characteristics were selected according to the methodology concept devised by Bláha and Močíčková [3]. On the basis of two criteria defining the time and geographical delimitation of historical atlases for the study, two students of the Czech Technical University in Prague collected information about selected Czech (Czechoslovak) and foreign historical atlases released after 1950. During the first phase, the students searched for the standard bibliographic description (title, author, publisher, country of origin, language, etc.) of more than 400 atlases in electronic catalogues of Czech and foreign libraries. In addition, each item was provided with information on the focus category of the atlas (e.g. politics, demography, military issues) and with a list of libraries in which the atlas is physically stored. Due to the geographical delimitation of the studied atlas works, the database consists mainly of the atlases of Czech (106) and German production (97), followed by the atlases from France (65) and the United Kingdom (47), which account for more than three quarters of the database.

In the second phase of the research, the atlases, that were physically available to the researchers in the collections of Czech libraries or obtained through the international interlibrary loans from foreign library collections, were further examined in detail and partially digitized. The detailed examination of 88 selected atlases (out of 409) involved searching for detailed information on the content of the atlas (e.g. the chronological and geographical determination of maps) and evaluation of the map categories and applied methods of thematic cartography according to specialized literature, e.g. [4] [5]. Subsequently, the database was filled with digitized images of the cover, the front page, the content and the map excerpts from all selected atlases. To complete the database, digitized images of the covers of the remaining atlases were found using the web.

WEB APPLICATION

The web application is based on the existing database application for publication created with Keshif, a Javascript library providing an automated web-based interface for tabular data exploration that can be integrated or used as a web service [6]. The source code of the sample application was customized for the purpose of the database of historical atlases with basic web development technologies (JavaScript, HTML, CSS) with the use of selected JavaScript libraries, such as the D3 library, jQuery library, JSAPI.js or Moment.js. The mentioned libraries ensure the desired functionality of the application – they enable the transformation of data tables into visual graphics (D3.js) or the manipulation with date and time attributes (Moment.js). jQuery.js simplifies the manipulation of animations and AJAX, enabling dynamical changes of the content without the need for reloading the web page.

The layout of the application is divided into 10 interactive dashboards as shown in Figure 1. The main dashboard panel contains a list of all 409 historical atlases, which are sorted by the year of publication in descending order. Along the main dashboard, there are 9 additional panels showing specific information about the atlas and the distribution of data in each category. In the main panel, the user can expand each record to show detailed information including the preview of the cover of the atlas. Some records also include links to the digitised images of the front page, the content or the map excerpts. The application allows the user to search an individual atlas by its name or any other keyword, or to select or filter the atlases by predefined attributes directly in side panels. All panels are fully synchronised and responsive and update their content according to the user's activity. The application also enables to dynamically highlight associated information across all panels only by a mouse-over, and thus simply reveal all information about the atlases [7].

Database of Historical Atlases Since 2nd Half of the 20th Century



Fig. 1 – The layout of the web application

METHODS

The main aim of this study is to present potential data excerpts that will further improve the information value of the database. The data excerpts are derived from the analysis of the records in the database of historical atlases acquired during the second phase of the analytic research (see above). The study focuses on the analyses of information about the thematic and cartographic content of the atlases. The analyses are performed from various perspectives with the aim to reveal the similarities and differences between the cartographic and the thematic content of the historical atlases in the publishing countries, or the changes in the thematic focus of the atlases or in the use of methods of thematic cartography in atlas works over time. Besides that, the authors also study the relations between the thematic focus of the atlas and the applied methods of thematic cartography and analyse which cartographic methods and their combinations are mostly used in historical atlases. All analyses are performed on the sample of 88 atlas works that were analysed in detail in the second phase of the research during the creation of the database.

Data processing

For the purpose of the study, it was necessary to generalize the original classification of selected attributes.

Publishing country

The original 9 classes representing the publishing countries of 88 atlases were grouped into four classes on the basis of the political and historical context. The generalized classification follows on from the second selection criterion of geographical determination that determined the countries whose cartographic production of the atlases would be examined [3]. The first group “Central Europe” is comprised of the member states of the Visegrad Group (Czechia, Poland, Slovakia and Hungary). The two other groups represent Western European countries that were divided according to the language of the atlases they have published – German (Austria, Germany) and English and French (Belgium, France, the United Kingdom). The last group consists of the atlases published in the USA.

Methods of thematic cartography

The initial classification that consisted of 16 methods of thematic cartography identified in the content of 88 atlases was generalized into 9 classes representing the basic groups of methods of thematic cartography – area-class maps “Ar”, isoline maps “Iz”, diagram maps “KDall”, choropleth maps “K”, figural symbols “Lb2”, line symbols “LI2”, specific methods “Sp”, dot (density) maps “Te” and time methods “čas”. The coding and the classification of the methods (as well as the coding and classification of the map categories) follow on from [3].

Data analysis and visualization

To present potential data excerpts, various visualization methods were applied according to the character of data. Some of the visualizations were made with the Google Charts API enabling the creation (and further customization) of various interactive chart types over structured data and their integration directly into the website. In addition, using the HTML5 and SVG technology for rendering charts, the chosen solution is cross-browser compatible and cross-platform portable, thus it is not so necessary to consider the end-user’s device.

Because of the time demands, the remaining analyses and the subsequent visualization were performed using the combination of GIS and graphic software (see below). All presented outputs serve only as examples of potential data excerpts and are planned to be further processed and customized to be embedded in an existing web application in the form of interactive charts that will enable the user to gain insights into the data in an effective and comprehensible way. The respective analyses and the applied visualization solutions are described below:

Cartographic content by publishing country / by thematic focus of the atlas

- For the purpose of this analysis, only individual occurrences of a feature (cartographic method / map category) were considered, not their combinations. Even if a feature occurred in more than one combination, it was taken as a single occurrence of that feature.
- As the best solution to visualize the similarities and differences in using cartographic methods (or map categories) in the atlas works in the publishing countries we opted for the Google Charts interactive Sankey diagram, that is suitable to show many-to-many relations between two or more sets of values. In the diagram, the relation is symbolised by a line whose width is proportional to the represented quantity.
- There were two main aims of this visualization – to show the similarities or differences between cartographic productions of the politically distant parts of the latter-20th-century Europe and, in addition, to try to evaluate the hypothesis whether the atlas production of Austria is more related to the overall Western-Europe cartographic production or whether there is a remainder of the relation to the pre-20th-century Austro-Hungarian cartographic school, which might relate Austrian atlases closer to the Czech(o)Slovak or Hungarian production.

Change in thematic focus / cartographic content over time

- As the time series of the year of publication was not continuous (some years were missing or some years occurred in the list more than once), we have decided to create time intervals that will continuously cover all years of publication preserving approximately similar numbers of titles within the particular intervals. The number and the range of the intervals were selected in order to cover similar numbers of titles.
- To visualize changes in the thematic focus of the atlas or in the use of methods of thematic cartography, the use of the Google Charts interactive area chart was chosen, showing a change in a trend over time.

Thematic focus of the atlas by publishing country

- The third example of the output stands for a simple diagram map with pie charts showing the relative proportion of particular thematic groups within the main areas of European historical cartographic production (see above). A separate diagram rendering the situation of the US cartographic production is attached for comparison.
- In compare to previous outputs, this example presents a statistical information over map background, using the spatial information of data. For this purpose, the original data were enhanced with the spatial information representing the geolocation of the publishing countries.

Combination of cartographic methods

- The set of analysed atlases may also be assessed from several purely cartographic perspectives. One of the most interesting is the evaluation of cartographic methods of expression (and their combinations) in one overall chart as brought in Figure 2.
- The nine aforementioned general classes were used in this rendition. For the purpose of this study, the time methods were not considered as a separate method of expression but as an attribute of other appropriate methods. For each method or combination of methods used, a single unit is found in the chart, which may be slightly confusing as this approach assigns different “weights” to particular atlases. In a global perspective, it enables to assess the database as a whole, though.

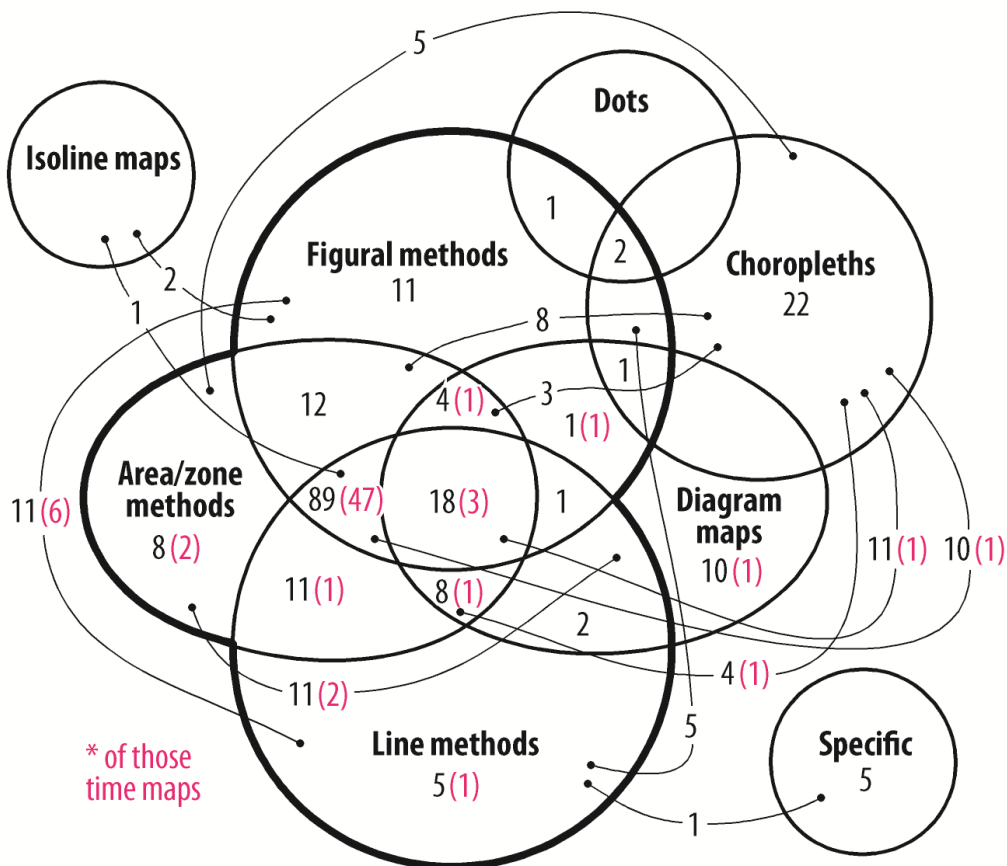


Fig. 2 – Combination of methods

DATA EXCERPTS

There exist only slight differences in map categories used in the historical atlases between the European and the US cartographic production (see Figure 3). Historical atlases published in Europe consist mainly of political/administrative maps or of maps depicting the location of point objects and the chronological sequence. The relative proportion of map categories that appear in the historical atlases closely corresponds to the relative proportion of cartographic methods used in them (Figure 4a).

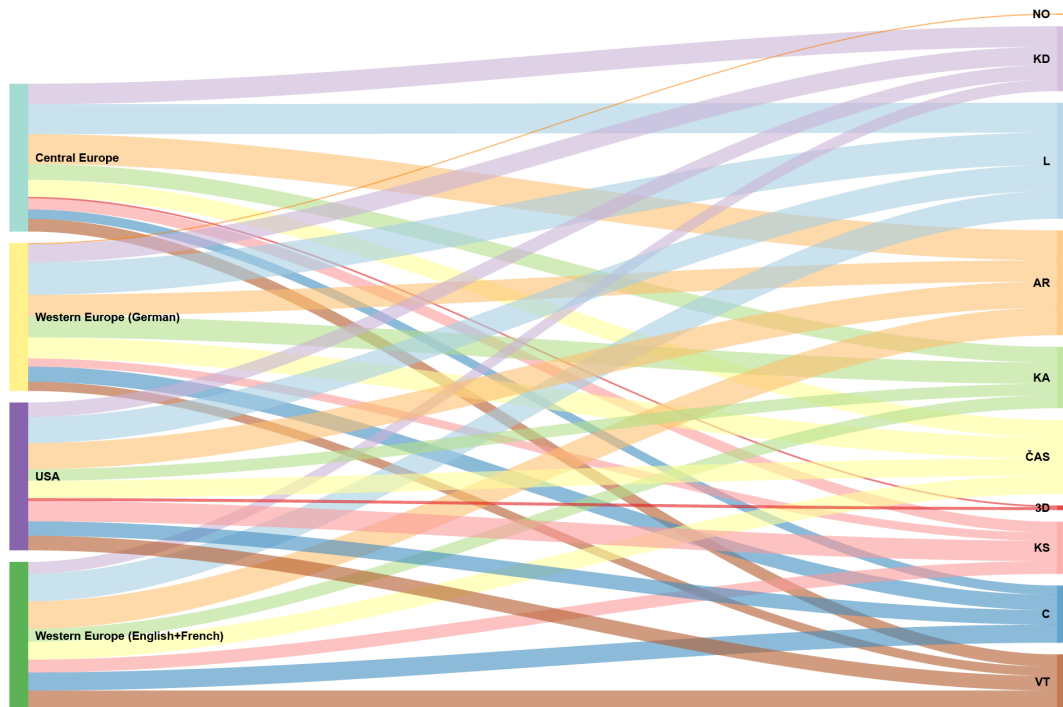


Fig. 3 – Map categories in the historical atlases by publishing country

Comparing Figure 4a and 4b, more could be said about the aforementioned correctness of the decision where to incorporate the atlases published in Austria. The character of the Austrian atlas production after 1950 ranks this country in the same group with German atlases rather than in the Central-European group of countries with whom Austria, due to its historical development, shared a great part of its history during the time of the Austro-Hungarian Empire. This may be explained by quite a long period elapsed since the moment when the Austro-Hungarian cartographic school dissolved into the successor states' productions. The size of the nodes on the right implies which of the cartographic method (or map category) is used the most.

All presented outputs together form a more complex picture of the historical atlases from a cartographic perspective. The users can better understand which states preferred using certain cartographic methods or map categories to others and how the use of cartographic methods varied over time (Figure 6). Although there is a very slight change in the use of cartographic methods over last 70 years of the cartographic production, the thematic focus of the atlases varies over time. Since 1990, more historical atlases with a special thematic focus has started to be published. Until then, mainly general focused historical atlases had been published. By the comparison of Figure 3 and Figure 7, the readers may understand whether countries that published an atlas of certain thematic focus more than others did also prefer the use of certain map categories over the other ones. In the USA only monothematic atlases were published with the prevalence of atlases focusing on military issues. On the contrary, in Europe and especially in Central European countries, there is a tradition

of atlases combining various topics. The relation between the thematic focus of the atlas and the map categories can be identified from Figure 5.

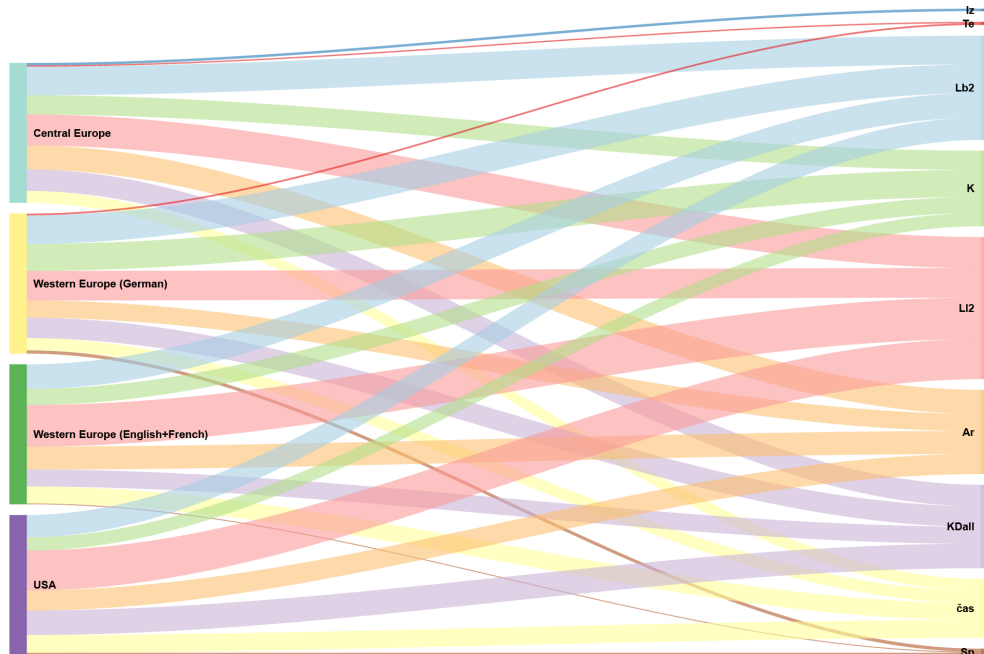


Fig. 4a – Methods of thematic cartography used in the historical atlases by publishing country

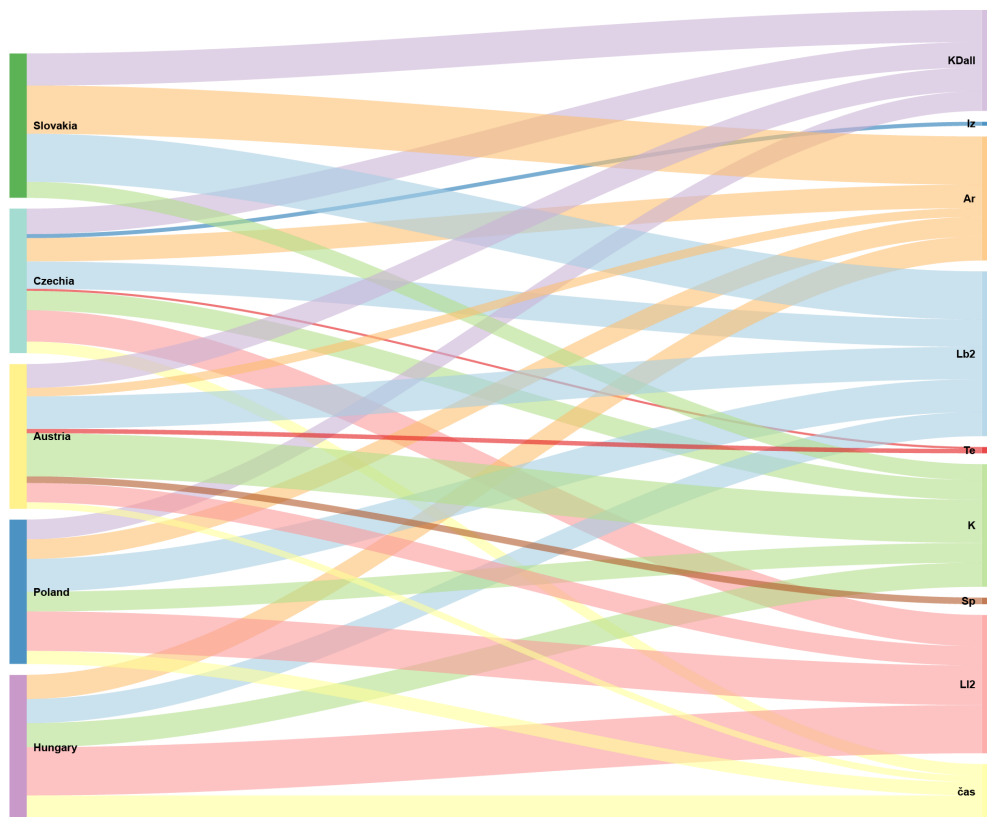


Fig. 4b – Methods of thematic cartography used in the historical atlases by publishing country (Central European states vs. Austria)

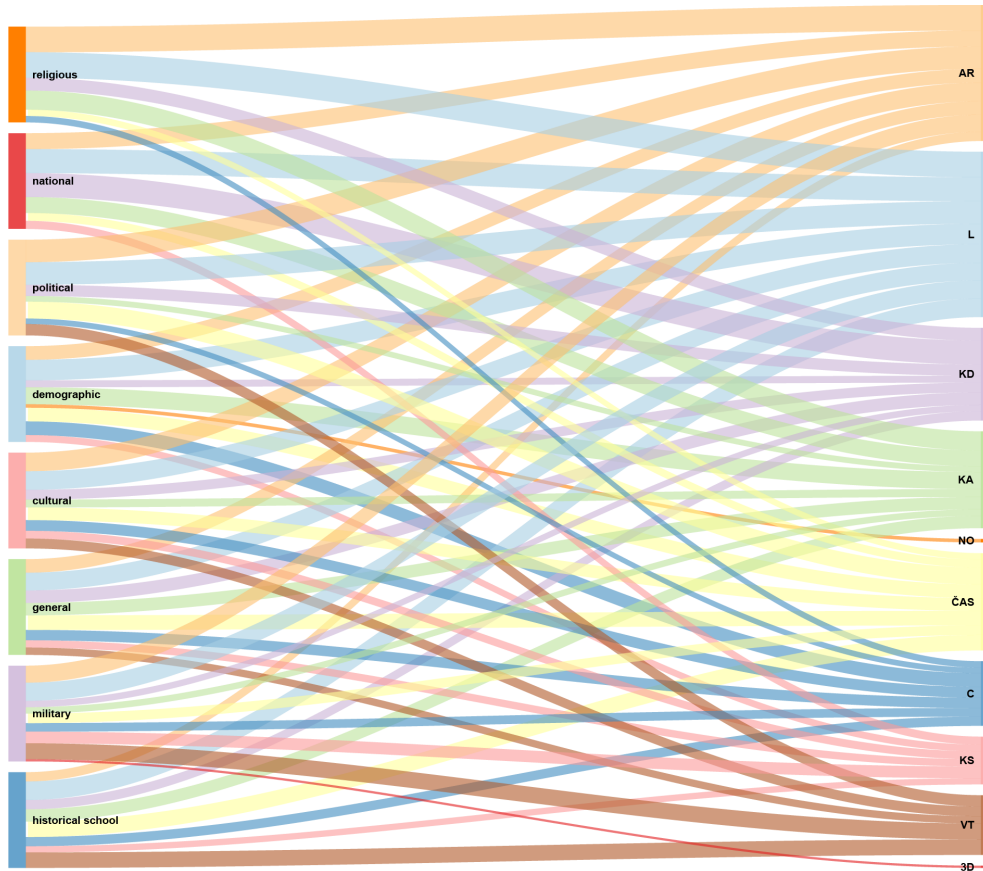


Fig. 5 – Map categories according to the thematic focus of the atlas

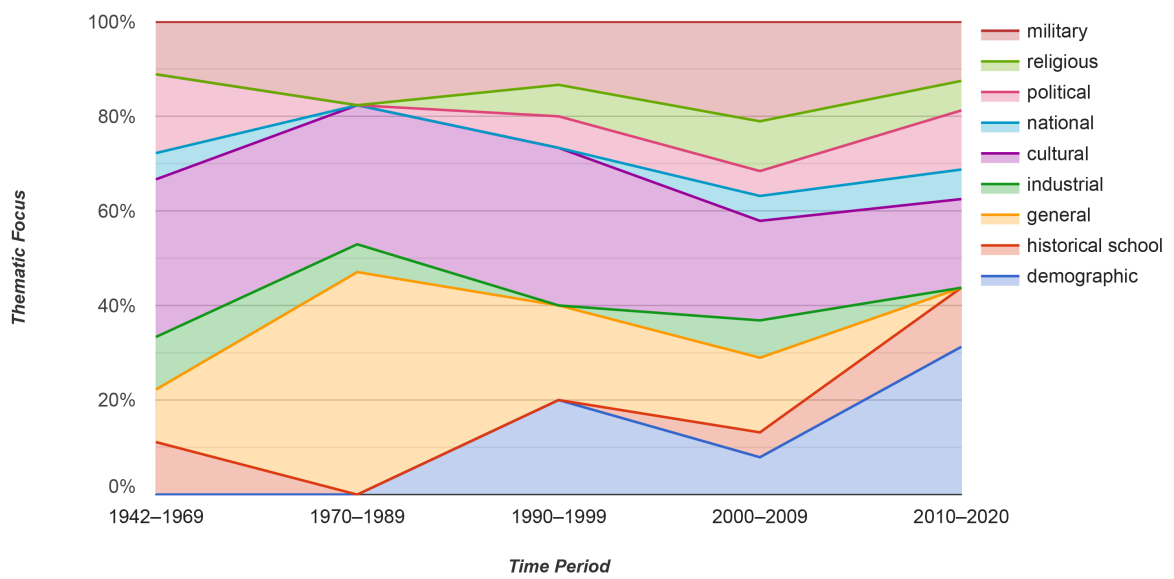


Fig. 6 – Change of the thematic focus of the historical atlases over time

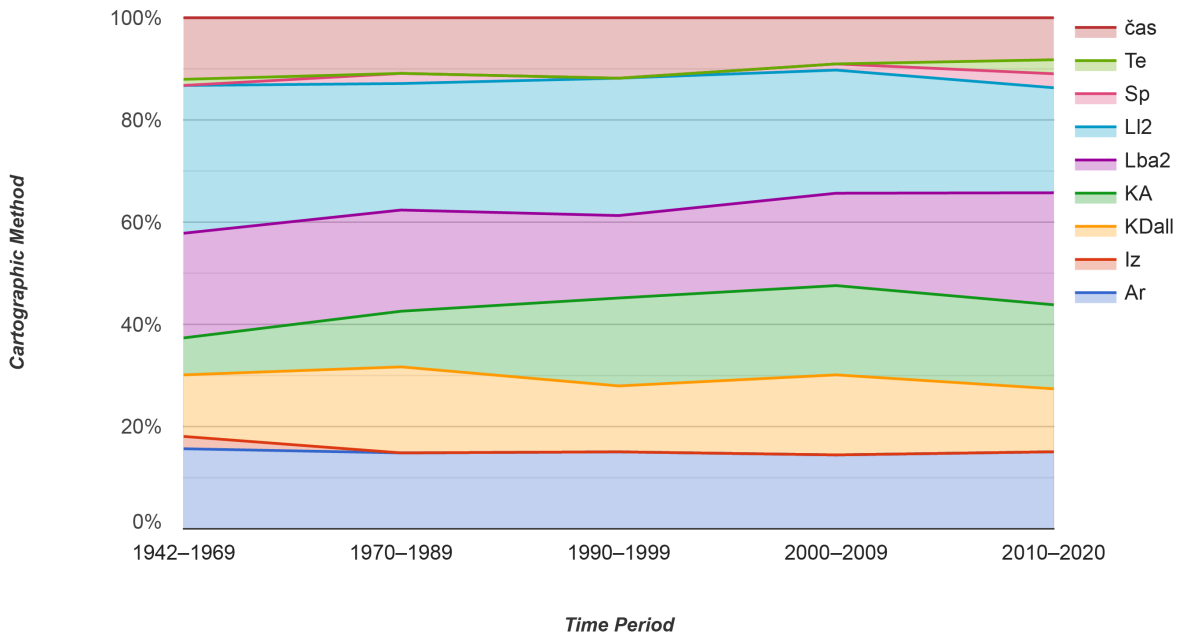


Fig. 7 – Change in the use of the cartographic methods in the historical atlases over time

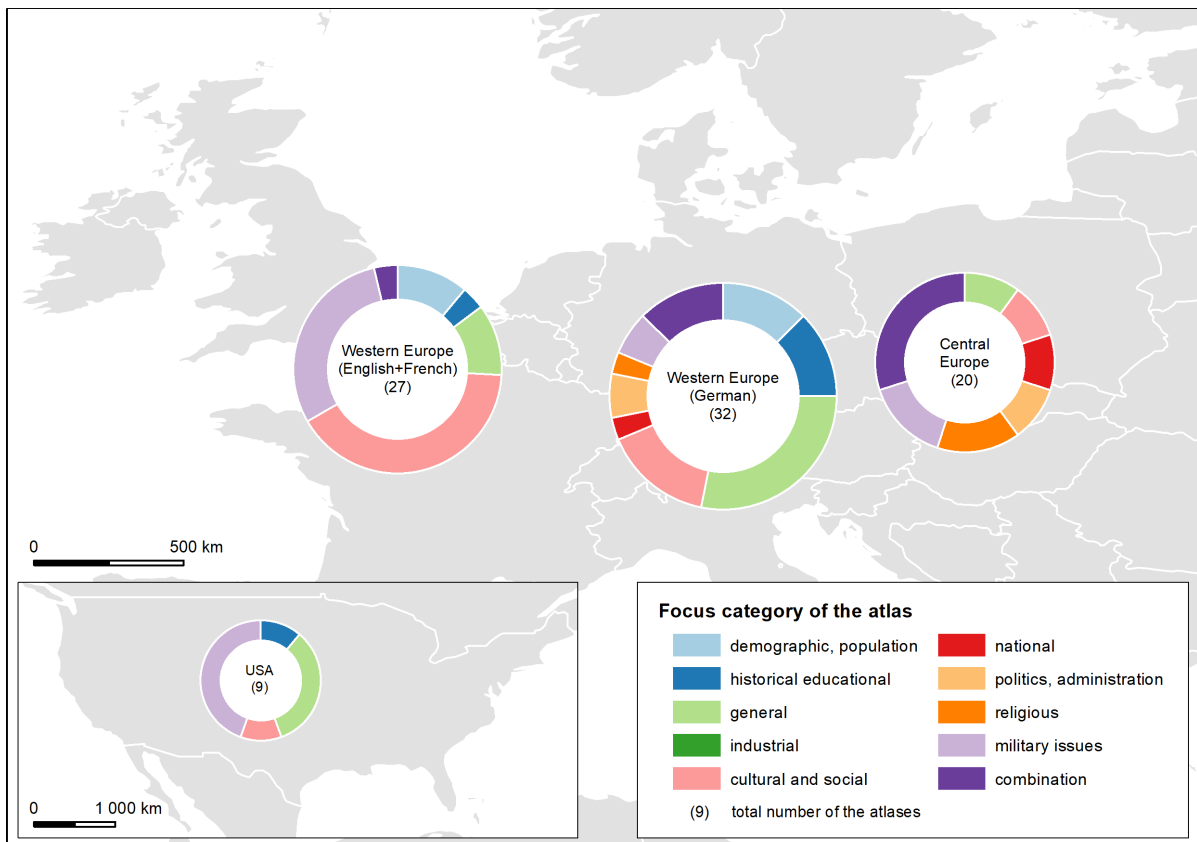


Fig. 8 – Thematic focus of the atlas works in different parts of the Europe and in the USA

CONCLUSION

One of the aims of the paper was to reveal new phenomena which are not clearly visible from the data or the database itself.

The presented charts appear more intuitive, easily understandable for the readers than an austere table view. They may show the relations between selected features in one chart not forcing the users to look for related information across many dashboards, thus they may place lower demands on the cognitive effort of the users.

It may enable the users to easily come to realize the differences or similarities in the content of historical atlases across Europe and compare them to atlases from the USA whose production was influenced by different historical factors and whose cartographic tradition has been developing entirely differently.

Nevertheless, the authors are aware of the fact that the sample of 88 atlases analysed in detail in the second phase of the research is very limited and cannot represent the world-wide production of historical atlases as a whole. But with regards to the aim of this study to only present potential data excerpts from the database and not to analyse and describe the world-wide production of historical atlases, the authors do not consider this as a significant obstacle.

The authors believe that the presented outputs as a whole will form a complex picture of the historiographic atlas production of the latter part of the 20th century; at least of the Anglo-Saxon approach.

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