

The concept of the Historical Geographic Information System for the settlements of Transylvania

Mátyás Magyar^{a,*}, Zsombor Bartos-Elekes^b, José Jesús Reyes Nuñez^a

^a Institute of Cartography and Geoinformatics, ELTE Eötvös Loránd University, Budapest, Hungary, magyarim@student.elte.hu, jesusreyes@ik.elte.hu

^b Department of Geography in Hungarian, Babeş-Bolyai University, Cluj-Napoca, Romania, zsombor.bartos@ubbcluj.ro

* Corresponding author

Abstract: Historical geographic information systems are becoming more and more common in historical research, because of their ability to emphasise the role of space in understanding historical events. Researchers concerned with the history of the settlement network of Transylvania would undoubtedly benefit from such a historical geographic information system, as it could shed a completely new light on the evolution of the settlements in this diverse, multilingual and multicultural region of Romania. Changes in the name, legal status, administrative role and affiliation of the settlements of the last one thousand years could all be integrated and even visualised in space and time in a similar system, using current webcartographic solutions. This paper explores the issues motivating the need to set up the Historical Geographic Information System for the settlements of Transylvania and examines the possibilities for its implementation.

Keywords: historical GIS, Transylvania, settlement network, webcartography

1. Introduction

Located in the north-western part of Romania, in the embrace of the Carpathians, Transylvania has a very diverse past. In fact, the term Transylvania has been applied to areas of varying extents in different historical periods, due to the constant changes in the affiliation of the territory.

In the Middle Ages, Transylvania was part of the Kingdom of Hungary. The Hungarian state extended its power to Transylvania in 1003, which had developed into a relatively autonomous province within the kingdom by the 13th century (Kristó, 2003, pp. 109–115). The territory of this province can be considered roughly the same as the Transylvanian Basin, surrounded by the Eastern Carpathians, the Transylvanian Alps and the Apuseni Mountains (Barta, 1987, pp. 207). Today, the term *historical Transylvania* is used to refer to this area (see Figure 1).

After the Ottomans occupied Buda (1541) and the Kingdom of Hungary was divided into three sections, Transylvania soon (1570) became a quasi-independent state, called the Principality of Transylvania. The area of the principality, however, did not consist exclusively of historical Transylvania, but also of some neighbouring territories, which were not conquered by the Ottomans. The term *Partium* emerged to mark those parts of the Kingdom of Hungary that were governed by the Prince of Transylvania (Bartos-Elekes, 2020, pp. 63, Köpeczi, 1989, pp. 268–269).

The independent Principality of Transylvania ceased to exist in 1690, becoming a separately administered realm of the Habsburg Empire. The Habsburgs restored the territorial integrity of Hungary by 1718, recapturing *Banat* as the last of its medieval territories from the Ottomans (Bartos-Elekes, 2020, pp. 19–22).

Nevertheless, the legal status of Partium was not fully settled until the late 19th century. Due to these legal uncertainties, accompanied by constant warfare for a long time, the extent of Partium – and therefore also that of Transylvania – has constantly varied over time, yet it still survived as an entity until the formation of the Austro-Hungarian Monarchy (1867), which saw Transylvania become an integral part of Hungary (Bartos-Elekes, 2020, pp. 63).

Following the First World War, the Treaty of Trianon (1920) transferred historical Transylvania and parts west of it from Austria-Hungary to Romania: *Crişana* and *Maramureş* (which are more or less equivalent to the territory of Partium), as well as most of Banat. Two new terms have entered the vernacular: *modern-day (or present-day) Transylvania*, as a synonym of all the territories that were formerly part of Hungary, but now belong to Romania (see Figure 1) and *modern-day (or present-day) Partium*, as the territories of modern-day Transylvania outside historical Transylvania and Banat (Hajdú-Moharos, 1997, pp. 6).

During the Second World War, following the Second Vienna Award (1940), the northern and eastern part of modern-day Transylvania became part of Hungary again, but a few years later, de jure after the Paris Peace Treaties

(1947), they were returned to Romania, to which they belong ever since (Hajdú-Moharos, 1997, pp. 14).

To sum up, the territories that constitute modern-day Transylvania have been part of a number of different state powers throughout history (Hungary, Ottoman Empire, Principality of Transylvania, Habsburg Empire, Austro-Hungarian Monarchy, Romania). At certain points, these territories have even been shared by several states (Köpeczi, 1989, pp. XIII).

As a consequence, many different ethnic groups have settled in the area, either voluntarily or for various purposes, such as border protection or repopulating territories decimated by war (Köpeczi, 1989, pp. 408–409, Veress, 2020, pp. 151–153).

The most significant of these are the Romanians, the Hungarians and the Germans, who together have made up the largest part of the Transylvanian population, at least since the 12th–13th centuries until the last quarter of the 20th century. Of these, the Romanians have been the most numerous since about the beginning of the Habsburg times. Prior to that, the Hungarians formed the majority, and although their numbers have since declined considerably, they still constitute around 20% of the population. In contrast, the once substantial German community now accounts for less than 1% of the total

population (Bartos-Elekes, 2013, pp. 77, Köpeczi, 1989, pp. 411, Veress, 2020, pp. 151–153).

The ethnic groups of modern-day Transylvania often gave different names to the geographical features of the area, while at other times they adopted the geographical names of the neighbouring communities, translating them or adapting them to the phonetic peculiarities of their own language (Bartos-Elekes, 2013, pp. 18–20). Thus, many of the geographical features situated here, including most of the settlements, have always possessed – and still possess – multiple names in different languages, something rather uncommon in most parts of the world.

The current official name of the settlements is in Romanian, but German and especially Hungarian variants are also frequent, and some localities possess names in Transylvanian Saxon, Ukrainian (Ruthenian), Serbian, Slovak, Czech, Bulgarian, Croatian, Romani or even other languages as well. Sometimes several name variants of a settlement may exist within one language.

Figure 1 highlights the present official (Romanian) names of the 16 current county seats situated on the territory of the study area, as well as their pre-First World War official (Hungarian) names, which are still widely used by the Hungarian community.



Figure 1: Historical Transylvania as part of modern-day Transylvania. Author: Mátyás Magyar.

2. Historical geographical works on the settlements of Transylvania

It can be observed that modern-day Transylvania has always been – and still is – a multi-ethnic, multilingual and multicultural territory. The historical, ethnic and linguistic diversity of the settlements from Transylvania has been the subject of numerous scientific works. For instance, several gazetteers covering part or all of modern-day Transylvania have been published throughout history, which attempted to summarise the name variants of the settlements in use at the time of their creation.

The earliest detailed work of these is the name index of János Lipszky's map of Hungary, the so-called *Repertorium* (1808), which includes all the known contemporary name variants of the settlements, even though the map usually features only one variant, the one primarily used locally. The index also contains the contemporary legal status of the settlements. Herner (1987) has compiled an individual work from the records of this index relating to features situated in present-day Romania (Bartos-Elekes, 2013, pp. 92–93).

Similar noteworthy publications are the works of Lenk (1839), Boldizsár and Bordeaux (1875), Moldovan and Togan (1909, 1919) or Martinovici and Istrati (1921). The common feature of these is that they capture different language name variants, with the result that they were or can be used as a kind of dictionary. Some of them also indicate the contemporary administrative affiliation of the localities. The former includes geographical names other than settlement names as well (Bartos-Elekes, 2013, pp. 93, 111–112, 127, 142).

From the end of the 19th century, official gazetteers synthesised the settlement names currently in use, issued initially by the Hungarian, then after the First World War by the Romanian authorities. The name variants included in these became official names. The first official gazetteers contained names in multiple languages for a settlement (meaning that these had several official names at the same time), but later only one name per settlement was indicated, depending on the language that was official at the moment (Bartos-Elekes, 2013, pp. 113–114). The current official name of the settlements from Transylvania can be found in the Information System of the Register of Territorial-Administrative Units of Romania (SIRUTA).

Besides these, as historical geography gradually gained ground in the region, historical geographical works appeared, covering smaller or larger parts of modern-day Transylvania. Relying primarily on archival sources, these usually summarised the written records of the settlements as well, giving an insight into the way the names and other data of the settlements have changed over time (Jobbitt and Györi, 2020, pp. 77–79).

In general, these focused on the Middle Ages, as did one of the first and still one of the most relevant historical geographical works on the region. This multi-volume publication by Csánki (1890–1941) aimed at presenting the settlements existing in the counties of the Kingdom of Hungary, including the ones in Transylvania, in the late

medieval times (at the end of the 15th century). Unfortunately, this material providing information on the contemporary name, legal status and administrative affiliation of the settlements has remained unfinished, and therefore only covers certain parts of Hungary and Transylvania (Jobbitt and Györi, 2020, pp. 79).

Nearly the same can be said of Györffy's (1963–1998) monumental work, published almost a century later. This is also composed of several volumes, also concentrates on the settlements existing in the counties of the Kingdom of Hungary, providing a lot of historical information on them, and is also incomplete; only the target period is different: the early Middle Ages (11th to 13th centuries).

A breath of fresh air amongst historical geographical publications on the Carpathian Basin is the interactive digital map application displaying the content of Engel's (2020) database about the settlements and land ownership patterns in the late 15th century Hungary.

Regionally relevant scientific materials also enrich the collection of historical geographical works on the settlements of Transylvania. The dataset accompanying Jakó's (1940) book on the situation of Bihar (Bihor) County before the Ottoman era, for instance, lists the settlements existing in the study area in the period in question, indicating their ethnic composition, among others. In addition, regional monographs have been written for several territorial units of Transylvania, which also contain historical data on the settlements, such as the work by Petri (1901–1904) on Szilágy (Sălaj) County, to name but one.

In an attempt to synthesise the content of such works, supplemented by the data available in previously unprocessed historical documents, historical gazetteers have been created. These are specific tools for historical geographical research, as they list the data of both existing and disappeared settlements (name, legal status, administrative affiliation etc.) from different time periods in chronological order, ranging from the earliest sources to the present (Bartos-Elekes, 2013, pp. 182–183).

During the 20th century, several historical gazetteers focusing specifically on Transylvania were published, justified by the need to facilitate the identification of an increasing number of settlement names, emerging as a result of the constant changes in international borders and political systems. The first such work was written by Suciu (1967), who arranged the written forms of the settlement names of modern-day Transylvania in order of the time of their occurrence. A comparable publication on historical Transylvania proper was brought to light by Wagner (1977) soon afterwards (Bartos-Elekes, 2013, pp. 170, 173).

In addition to the settlement names, the works of Varga E. (1998–2002) and Szabó M. (2003) around the turn of the millennium organise the changes in the legal status and administrative affiliation of the settlements in chronological order as well. Both of these compile the data of around 6000 settlements from all over modern-day Transylvania, but while the former only takes into account changes in the 19th and 20th centuries, the latter considers

as many known historical documents as possible, some of which even date back up to a thousand years. This makes Szabó M.'s historical gazetteer the most detailed available exploration of the historical evolution of the settlements from Transylvania.

3. The concept of the Historical GIS for the settlements of Transylvania

As we have seen, we have a wide range of sources to turn to, if we intend to investigate different aspects of the settlements of Transylvania and their history. However, most of these materials concentrate either on a specific time period or a particular territorial unit, if not both, which means that at best they can only shed light on either the state of the settlement network in a fixed period or its changes over time within a given geographical area.

A comprehensive picture of the evolution of the whole settlement network of modern-day Transylvania, from the early Middle Ages to the present day is provided only by the work of Szabó M. (2003), but even this does not cover, for instance, all the currently independent settlements.

Further complicating the interpretation of the materials is the fact that, apart from Engel's (2020) digital map¹, they are only available in text form. Although some of them have also been published digitally, this has mostly meant scanning the printed copies, with few digital versions being actually backed up by a database that would facilitate, say, browsing within the works (Szabó M's gazetteer² is an exception from this point of view as well). The text format also requires the use of auxiliary materials (such as maps) to identify the location of the settlements.

Thus, in order to obtain a truly holistic picture of the historical evolution of the settlement network in modern-day Transylvania, multiple scientific and auxiliary materials need to be used simultaneously.

A solution to this problem might lie in a user-friendly, yet reliable digital tool, synthesising the historical data available on the settlements and at the same time enabling their spatiotemporal representation.

3.1 Historical GIS as a tool of visualizing historical geospatial information

Lately, the use of geographic information systems (GIS) has become widespread in historical research. GIS databases combine geographic coordinates with descriptive information, allowing for instant spatial representation of data (DeBats and Gregory, 2011, pp. 455). Organising historical data into GIS databases can therefore lead to the spatial visualisation of the past.

Integrating tools and methods of GIS into historical research has even evolved into a distinct, interdisciplinary field of study, called historical GIS (HGIS). The purpose of HGIS is to emphasise the role of spatial context and

relationships in understanding historical events (Gregory and Ell, 2007, pp. 1, Zhang and Logan, 2017).

These, however, do not only have a spatial, but also a temporal dimension. Adding analytical temporal context to historical geographic information systems is not self-evident, but recently HGIS has provided the means to examine changes in data in a specific area through time (Martí-Henneberg, 2011, pp. 2).

Although the temporal component of information is not explicitly incorporated into GIS software, effective ways can be developed to handle time using the currently available GIS functionality as well. For example, separate layers can be used to store data relating to different time periods, but there are several options to integrate temporality into GIS databases as well (Gregory and Ell, 2007, pp. 119–137).

Because of the time and expense it often takes to create historical spatio-temporal databases necessary for its operation, and to acquire the technical skills required to use GIS software, HGIS can sometimes be challenging (DeBats and Gregory, 2011, pp. 456, Knowles, 2016, pp. 745). Nevertheless, using the toolkit and techniques provided by HGIS, researchers have the opportunity to simplify or even completely overhaul the way historical data is organised, analysed and visualised, opening up extraordinary possibilities (Gregory and Ell, 2011, pp. 1).

3.2 Historical GIS for the settlements of Transylvania

Based on the above, a historical geographic information system of the settlements from Transylvania would offer an opportunity to overcome the problems outlined earlier. The construction of an HGIS database could provide a framework for systematising temporally dynamic historical data on the localities, known from various scientific materials. This could incorporate information that could help answer the following questions:

- How long have the settlements existed according to their written records? When did the disappeared settlements become extinct?
- By what names were the settlements known throughout history? Which name variants were typical to different historical periods? When did changes occur in the use of the names?
- What legal status did the settlements bear in different time periods? When did changes in their legal status take place?
- To which administrative units have the settlements belonged over time? What kind of shifts has their administrative affiliation undergone and when?
- Have the settlements ever held any administrative role? When did they acquire or lose it?

¹ The digital map of Engel (2020) can be downloaded from: <https://tti.abtk.hu/cikkek/egyeb-hirek/megujult-engel-pal-adatbazisa-a-kozepkori-magyarorszag-digitalis-atlasza>.

² The digital version of the work of Szabó M. (2003) is available at: <https://www.arcanum.com/hu/online-kiadvanyok/ErdelyHelysegnevTar-erdely-bansag-es-partium-torteneti-es-kozigazgatasi-helysegnevtara-1/>.

As an HGIS database, the dataset would also contain the geographic coordinates of the settlements, along with other general information on them. This would enable the spatial representation of all the information, which would become, as a result of geoprocessing, historical geospatial data.

The visualisation could be further refined, for example, by developing an interactive webcartographic product linking the spatial and temporal components of the information. In this way, a platform could come to life that would facilitate the accessibility and interpretation of the data stored in the HGIS for the settlements of Transylvania for both professionals and the general public, providing an innovative tool for research regarding the settlement network of modern-day Transylvania and its history.

4. Implementation

The first step towards the Historical Geographic Information System for the settlements of Transylvania would logically be the construction of the HGIS database. This would, first of all, require the organisation of the information available in the scientific literature on the settlements in a historical database lacking spatiality, using a database management system or, alternatively, a spreadsheet editor.

While there are undeniably a number of benefits of automating this process, such as reducing the time required, manual work may yield the best results when it comes to the creation of this historical database, as it seems to be the best way to preserve the correctness of the data.

Each record of this database should correspond to a specific settlement, about which each field would contain

different types of data (e.g. current official name, other current name variants, year of the first written record, source material providing the data). Temporally dynamic information (relating to the settlement names or their administrative affiliation, for instance) could be stored as lists of data pairs, consisting of the year and type of changes. A unique identifier should be assigned to each settlement as well.

With the help of these, the descriptive information collected in this historical database could be combined with geographic coordinates in GIS software, establishing the HGIS database. In this, point geometry vector features could represent the location of the settlements, identified through online map services or georeferenced old cartographic works, depending on whether the given settlement still exists or has already disappeared.

In a similar way, an HGIS database of the administrative units existing on the territory of modern-day Transylvania throughout history should be constructed, to help visually emphasise the administrative affiliation of the localities in the HGIS for the settlements of Transylvania. In this case, line features should mark the boundaries of the administrative entities, vectorised using georeferenced old maps or existing GIS databases.

Since these boundaries have been regularly changing over time, unlike the location of the settlements, the latter HGIS database should be built according to a different logic. The records should correspond to the different extents of the administrative units, the fields indicating the time period when these extents were constant.

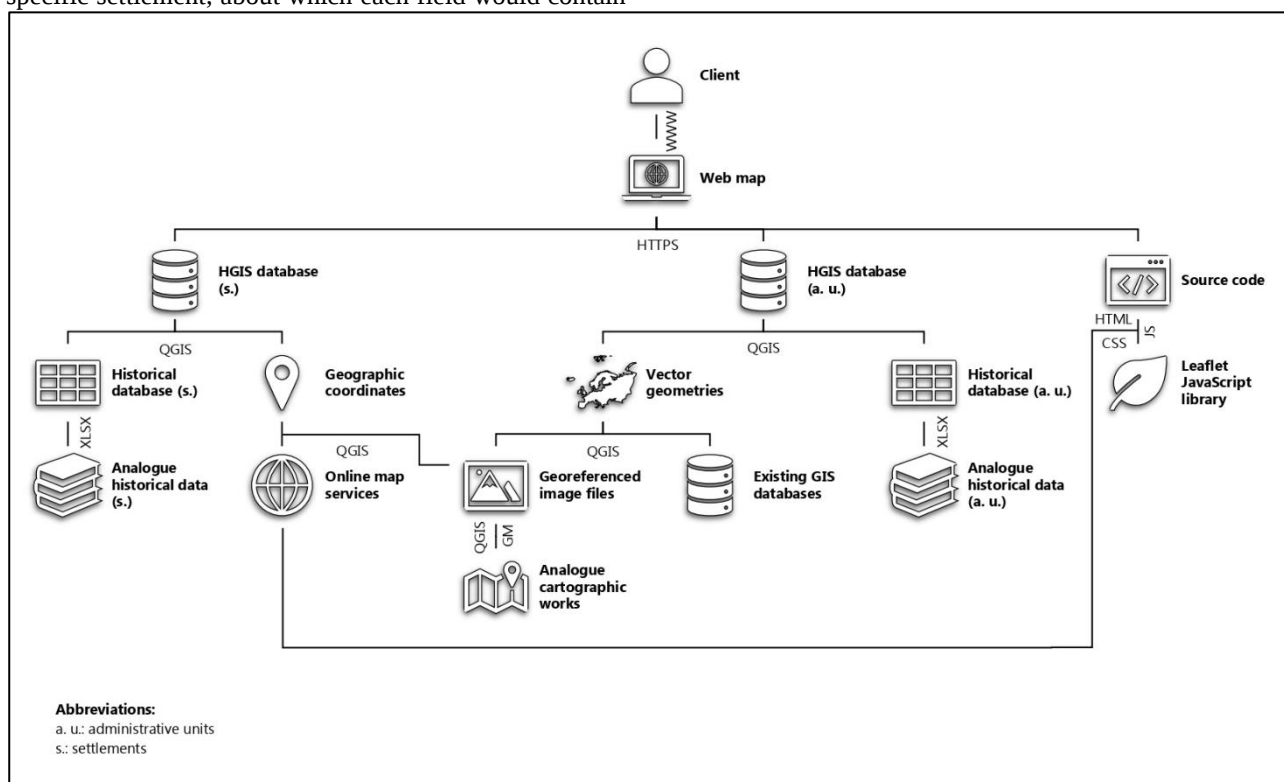


Figure 2: Functional scheme of the HGIS for the settlements of Transylvania. Author: Mátyás Magyari.

The content of these HGIS databases could be transposed into a webcartographic environment using Leaflet, a JavaScript library for interactive web mapping. To accomplish this, the databases should be converted to GeoJSON format, easily manageable in this library. In this way, a webcartographic material, able to visualise the evolution of the settlement network of modern-day Transylvania could be obtained.

This web map would allow users to interact with the historical geographic information system. With its help, the settlements documented to exist on the territory of the study area in a particular year of history, as well as their contemporary name, administrative affiliation or even legal status could be easily identified.

Accordingly, the web map should include a user interface, where visitors could modify the year the settlement network of which is shown on the screen. The source code should store the year set on the user interface in a variable to select the data to be displayed, by comparing its value with the content of the GeoJSON files.

Besides JavaScript, the programming language ensuring these functionalities, HTML and CSS should be used for the development of the web map to deliver the appropriate visual effect. This could be enhanced by integrating several different online map services as base maps in the material. Creating a legend to facilitate the interpretation of the symbols used would also be beneficial.

Although Leaflet itself does not offer the possibility of labelling the features of a web map automatically, which would be an indispensable part of a quality cartographic work, using the *leaflet-labeler* extension developed by Gede (2023), this can also be overcome.

Figure 2 provides a comprehensive overview of the possible functional scheme of the Historical Geographic Information System for the settlements of Transylvania, pointing out the data flow within the system.

4.1 Achievements to date

The Historical Geographic Information System for the settlements of Transylvania is not merely an idea. Steps have already been made towards its realisation. An HGIS database containing general historical data (such as the year of the first written record) on almost 7500 settlements documented to exist in modern-day Transylvania throughout history has already been constructed (Magyari, 2023). This number means that besides the approximately 5300 localities forming the current settlement network of modern-day Transylvania, more than 2000 disappeared settlements have also been included in this database.

The core database has been developed even further, being expanded with fields containing lists of data pairs consisting of the year and the type of changes occurring in the name, legal status, administrative role and affiliation of almost 2500 settlements. This amount of data also allowed the creation of a sample web map (see Figure 3), illustrating the planned functionalities of the interface connecting the users to the HGIS for the settlements of Transylvania (Magyari, 2024)³.

The methodology for the development of the historical geographic information system is therefore provided not only in theory, but also in practice. This means, that the primary condition for the implementation of a transparent visual material offering a holistic picture on the evolution of the settlement network of modern-day Transylvania is the processing of the necessary amount of data.

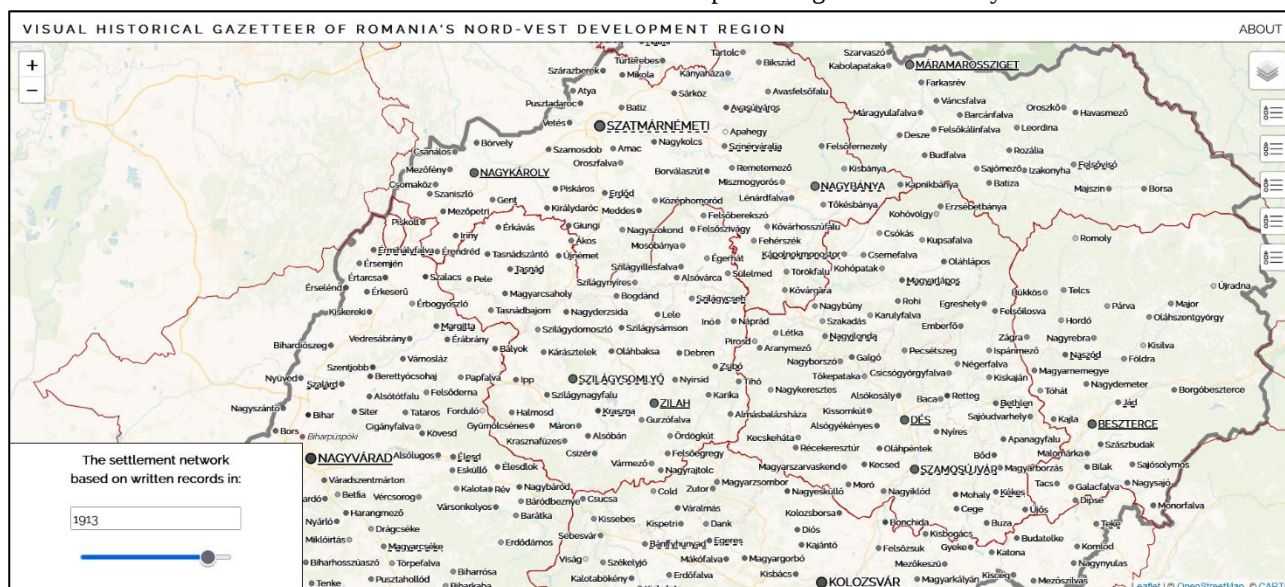


Figure 3: Detail of the sample web map, showing the settlement network of Romania's Nord-Vest development region before the First World War

³ The sample web map can be accessed through the following link: <https://magyarim.web.elte.hu/nordvest/nordvest.html>.

5. Conclusion

The scientific works on the historical diversity of the settlements from Transylvania are almost exclusively text-based. This makes them difficult to use, despite the fact that many of them are precise and logically structured. Moreover, several such materials focus only on a particular territorial unit, with only a few covering the entire territory of modern-day Transylvania.

A digital material synthesising the information available in these works could facilitate access to and interpretation of the historical data of the settlements. The most efficient way of elaborating this material appears to be the construction of a historical geographic information system. To exploit the great potential of using HGIS, this system could be accompanied by an interactive web map, visualising the evolution of the settlement network of Transylvania.

The primary objective of the implementation of the Historical Geographic Information System for the settlements of Transylvania would be the creation of a platform supplying both the general public and the researchers with reliable information on the history of the settlements from Transylvania in a user-friendly way.

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7. References

- Barta G., 1987. A történeti Erdély és határai. In: Herner J. (ed.). *Erdély és a Részek térképe és helységnévtára*, Franklin Nyomda, Szeged, Hungary, pp. 207–215.
- Bartos-Elekes Zs., 2013. Nyelvhasználat a térképeken (Erdély, 19. és 20. század). Presa Universitară Clujeană, Cluj-Napoca, Romania.
- Bartos-Elekes Zs., 2020. *Mappae Comitatum Transylvaniae*. Fundația pentru Școală – Editura ARTprinter, Cluj-Napoca – Sfântu Gheorghe, Romania.
- Boldizsár F. and Bordeaux, J., 1875. A Királyhágón inneni országrész (Erdély) legújabb törvényszéki felosztása. Stein János, Kolozsvár [Cluj-Napoca], Romania.
- Csánki D., 1890–1941. Magyarország történelmi földrajza a Hunyadiak korában I–V. Magyar Tudományos Akadémia, Budapest, Hungary.
- DeBats, D.A. and Gregory, I.N., 2011. Introduction to Historical GIS and the Study of Urban History. In: *Social Science History*, Vol. 35, No. 4, Winter 2011, Special Issue: Historical GIS and the Study of Urban History. Cambridge University Press, New York, NY, United States of America, pp. 455–463.
- Engel P., 2020. Magyarország a középkor végén. Digitális térkép és adatbázis a középkori Magyarország településeiről. Bölcsészettudományi Kutatóközpont, Budapest, Hungary.
- Gede M., 2023. Automatic Labels in Leaflet. In: *Advances in Cartography and GIScience of the International Cartographic Association*, Vol. 4, 31st International Cartographic Conference (ICC 2023), August 13–18, 2023, Cape Town, South Africa.
- Gregory, I.N. and Ell, P.S., 2007. *Historical GIS. Technologies, Methodologies and Scholarship*. Cambridge University Press, Cambridge, United Kingdom.
- Györffy Gy., 1963–1998. Az Árpád-kori Magyarország történeti földrajza I–IV. Akadémiai Kiadó, Budapest, Hungary.
- Hajdú-Moharos J., 1997. Partium, a kapcsolt részek: A Királyhágómellék földrajzi leírása. Királyhágómelléki Református Egyházkerület, [Oradea], Romania.
- Herner J., 1987. Erdély és a Részek térképe és helységnévtára. Franklin Nyomda, Szeged, Hungary.
- Jakó Zs., 1940. Bihar megye a török pusztítás előtt. Sylvester Nyomda RT., Budapest, Hungary.
- Jobbitt, S. and Györi R., 2020. East Central Europe. In: Domosh, M., Heffernan, M. and Withers, C.W.J. (eds.). *The SAGE Handbook of Historical Geography*. Sage Publications Ltd., London, United Kingdom, pp. 75–99.
- Knowles, A.K., 2016. Historical Geographic Information Systems and Social Science History. In: *Social Science History*, Vol. 40, No. 4, Winter 2016, Special Issue Introduction. Cambridge University Press, New York, NY, United States of America, pp. 741–750.
- Köpeczi B. (ed.), 1989. *Kurze Geschichte Siebenbürgens*. Akadémiai Kiadó, Budapest, Hungary.
- Kristó Gy., 2003. Tájszemlélet és térszervezés a középkori Magyarországon. Szegedi Középkortörténeti Könyvtár, Szeged, Hungary.
- Lenk von Treuenfeld, I., 1839. *Siebenbürgens geographisch, topographisch, statistisch, hydrographisch und orographisches Lexikon I–IV*. Wien [Vienna], Austria.
- Lipszky J., 1808. *Repertorium locorum obsectorumque in XII. tabulis mappae Regnorum Hungariae, Slavoniae, Croatiae, et Confiniorum Militarium Magni item Principatus Transylvaniae occurrentium*. Buda, Hungary.
- Magyari M., 2023. Systematizing written records for the creation of a spatiotemporal database concerning the all-time settlement network of Transylvania. In: *Conference Proceedings, 17th ICA Conference Digital Approaches to Cartographic Heritage*, May 24–26, 2023, Thessaloniki, Greece, pp. 208–219.
- Magyari M., 2024. Visual historical gazetteer of Romania's Nord-Vest development region. In: *Conference Proceedings, 18th ICA Conference Digital Approaches to Cartographic Heritage*, October 23–25, 2024, Bologna, Italy, pp. 63–73.
- Martinovici, C. and Istrati, N., 1921. *Dicționarul Transilvaniei, Banatului și celorlalte ținuturi alipite*. Cluj, Romania.
- Martí-Henneberg, J., 2011. Geographical Information Systems and the Study of History. In: *The Journal of*

Interdisciplinary History, Vol. 42, No. 1, Summer 2011. The MIT Press, Cambridge, MA, United States of America, pp. 1–13.

Moldovan, S. and Togan, N., 1909. Dicționarul numirilor de localități cu poporațiune română din Ungaria. Editura Asociațiunii, Sibiu, Romania.

Moldovan, S. and Togan, N., 1919. Dicționarul numirilor de localități cu poporațiune română din Transilvania, Banat, Crișana și Maramurăș. Ediția a II-a. Editura Asociațiunii, Sibiu, Romania.

Petri M., 1901–1904. Szilágy vármegye monographiája I–VI. Szilágy vármegye közönsége, Zilah [Zalău], Romania.

Suciu, C., 1967. Dicționar istoric al localităților din Transilvania I-II. Editura Academiei Republicii Socialiste România, București [Bucharest], Romania.

Szabó M. A., 2003. Erdély, Bánság és Partium történeti és közigazgatási helységnévtára. Editura Pro-Print, Miercurea-Ciuc, Romania.

Varga E. Á., 1998–2002. Erdély etnikai és felekezeti statisztikája 1850–1992 I-VI. Pro-Print Kiadó, Budapest, Hungary – Miercurea-Ciuc, Romania.

Veress E. (ed.), 2020. Erdély jogtörténete, 2. bővített és javított kiadás. HVG-Orac Könyvkiadó, Budapest, Hungary – Editura Forum Iuris, Cluj-Napoca, Romania.

Wagner, E., 1977. Historisch-Statistisches Ortsnamenbuch für Siebenbürgen. Böhlau Verlag, Köln [Cologne], Germany – Wien [Vienna], Austria.

Zhang, W. and Logan J.R., 2017. Historical GIS. In: *Oxford Bibliographies*. Oxford University Press, Oxford, United Kingdom.