The 1834 Ermellek earthquake effects and the architecture of migration after war in Baroque times

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Context

Sathmar Swabians migrated from SW Germany to Sathmar in Romania, along the Danube. Migration happened in the 18th century, starting 1712. In SW Germany that time Baroque churches started to be built. Also in Sathmar they built Baroque churches.

My grandfather was a Sathmar Swabian, hence genealogy research and personal communication with friends and relatives was combined with architectural history and earthquake engineering and geography research.

Research questions

The first aim of the research was to compare church architecture and vernacular architecture of Sathmar Swabians in their origin places with the places they colonised. It was observed, that the churches, although Baroque, are different, and that the vernacular architecture is also different. While in case of churches this may be influenced by foreign architects, in case of vernacular architecture it may be influenced by the fact that original architecture is not kept, as it was destroyed by the 1834 earthquake, and afterwards construction followed the rules from Vienna for migrants which came later to Banat.

Methodology

Overall methods

- Literature research
- Field investigation (site visits, discussions with inhabitants and site administrators)
- Archive research in genealogy archives
- Mapping
- Network analysis
- Comparative architecture investigation

Methodology – macroelements (1) churches and vernacular

- Structural mechanics: element – building – zone
  - Buildings subdivided in elements
  - Simplified calculations (Pavia): height plus material for common buildings
- Rural zone as application after urban zone Magheru in postdoc - Érmellék
  - Macroelements to determine seismic intensity at churches – engineering methods applied at cultural heritage reports (history – based on art history reports from archives, not buildings survey)
  - Conclusions from statistic mapping of damages in localities regarding seismic intensity – seismologic computations

Methodology – macroelements (2) churches

- ARC GIS lessons on buffer zones
- A free resource on the macro-elements method of Sergio Lagomarsino is available here http://db.nzsee.org.nz/Seminars/2014/Lagomarsino_Christchurch_2014-2-18.pdf including 28 COLLAPSE MECHANISMS OF THE SURVEY FORM FOR DAMAGE AND VULNERABILITY ASSESSMENT OF CHURCHES published in Lagomarsino S. (2012). Bull Earthquake Eng (2012) 10:73-92. Towers particularly considered.
- (Lagomarsino and Podestà, Earthquake Spectra, May 2004 explains also a vulnerability index for all 28 mechanisms
- This needs to be updated for successive earthquakes

Methodology – macroelements (3) churches

- Literature
  - Lagomarsino S., Podestà S. (2004) Seismic vulnerability of ancient churches. Part 1: damage assessment and emergency planning. Earthquake Spectra. 20: 377-394
  - Lagomarsino S., Podestà S. (2004) Seismic vulnerability of ancient churches. Part 2: statistical analysis of surveyed data and methods for risk analysis. Earthquake Spectra. 20: 395-412

Methodology – mapping churches and vernacular

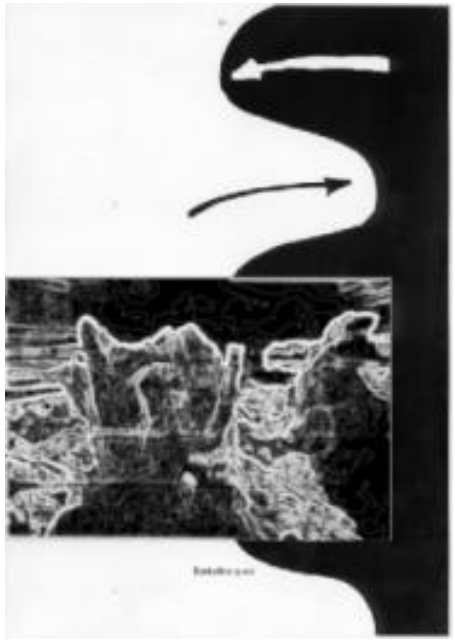
- ARC GIS lessons on buffer zones
- Relationship between scales:
  - Mapping common buildings versus landmarks
    - Lynch
    - Nolli
    - Muratori and Caniggia
    - Space syntax
  - Christopher Alexander: Pattern language
- Layer superposition: building – zone (different scales) graphically
  - Layer of common buildings (colour)
  - Layer of routes / strategical elements (plan)
- Applicable for tourist trails (see nature in the area)

Methodology – morphogenesis churches

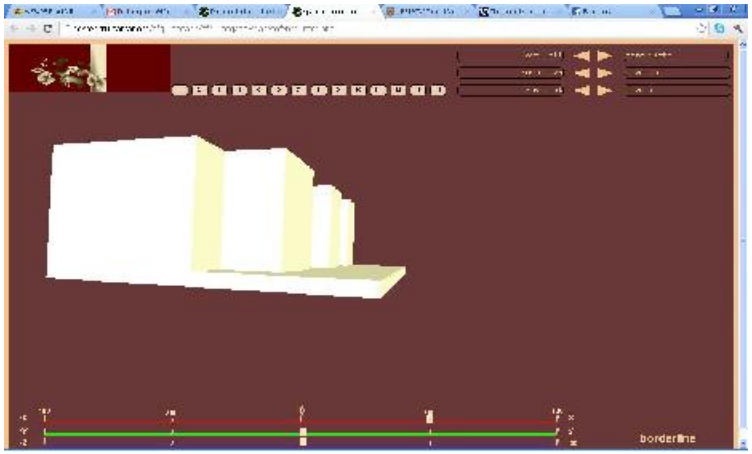
- The method of Lagomarsino models churches as summ of macro-elements.
- I worked with simplified models of churches in order to 3D model them for digital models.
- This is applicable when doing for example tours on maps, as in the mentioned mapping methods.
- But morphogenesis, in urban morphology, can be translated in structural morphology. Good methods of computational morphology for structures are developed by Ohmori (see IASS symposium 2005 in Bucharest). The Extended Structural Optimisation (ESO) method is available from here https://ecommons.cornell.edu/bitstream/handle/1813/11550/P6_Ohmori_Extended.pdf

Morphogenesis of simple shapes (1) – rediscovered space

2D



3D



Morphogenesis of simple shapes (1) – Lisbon earthquake

Simplified shape

Artistic drawing

Morphogenesis of simple shapes

- Simple shapes development https://arhitectura-1906.ro/2012/07/marcel-iancu-si-alfabetul-sau-formal-un-exercitiu-didactic-in-derulare-i/
- And the map at the basis of that http://www.e-cart.ro/asociatia/ro/noutati/Traseu_urban_M.Iancu.pdf

Methodology – game simulation

- Game simulation
  - City building games
  - Green revolution game
- Story maps with the landmarks can be done on ArcGIS
  - This is a participatory mean discussed at the EGU
- Story maps can incorporate those models maybe
- But maps can be done as games as in the Lisbon/Köln developments of the author with Adobe Director (3D or not)

Methodology – lessons between scales (church and vernacular)

- Lessons can be learned between
  - Urban morphology and resilience
    - Considering the street grid, incl. Deleuze‘s philosophy on flat and striated
  - Structural morphology and resilience
    - Considering that common buildings have grid structures but landmarks not

19th century disasters

- An archive is at the CCA
  - It includes the Norcia earthquake, where recently there has been a series of earthquakes

Results

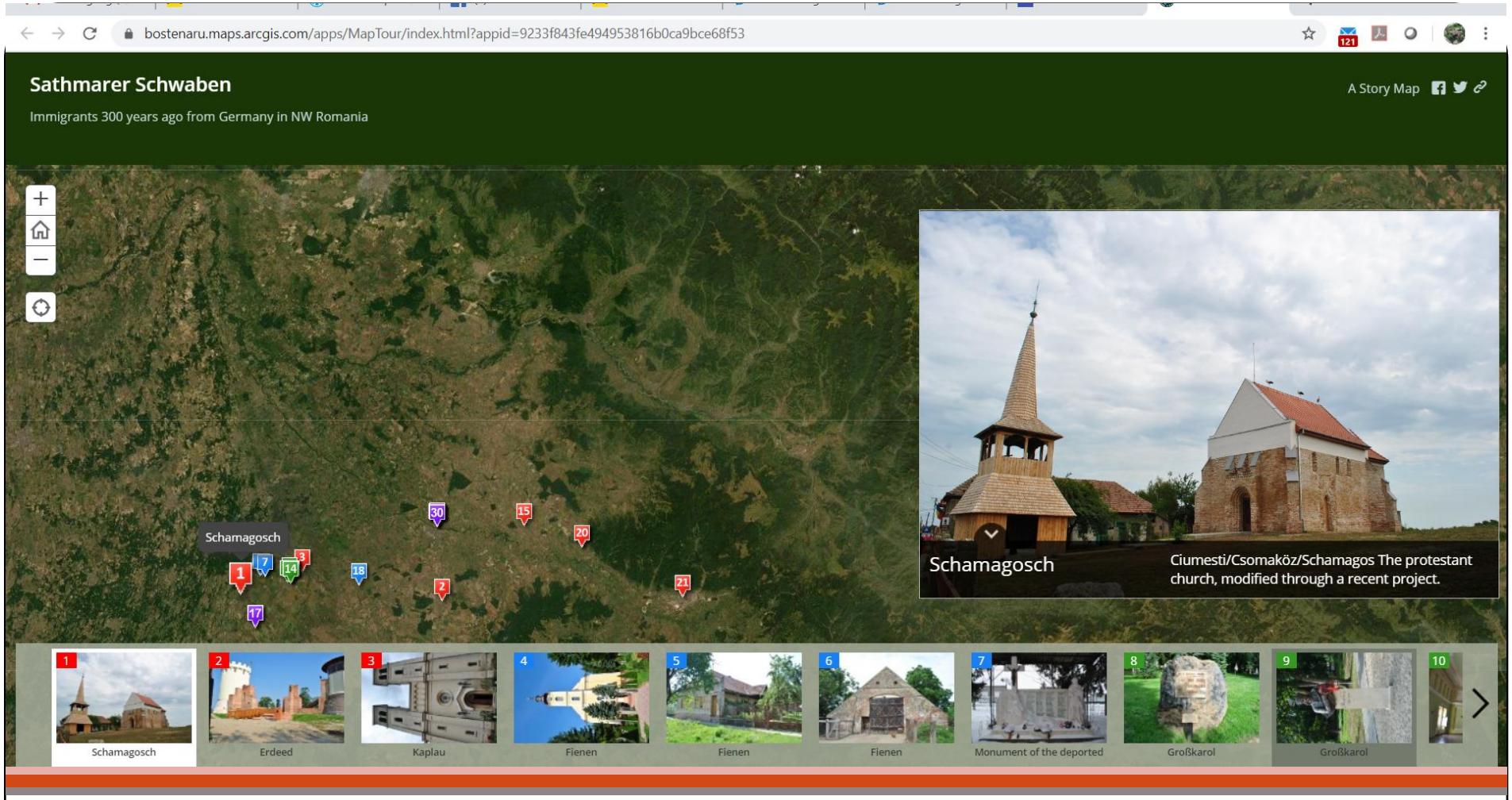
Results

- Migration
- Earthquake
  - Church buildings
  - Vernacular buildings
- Nature in the area

Migration

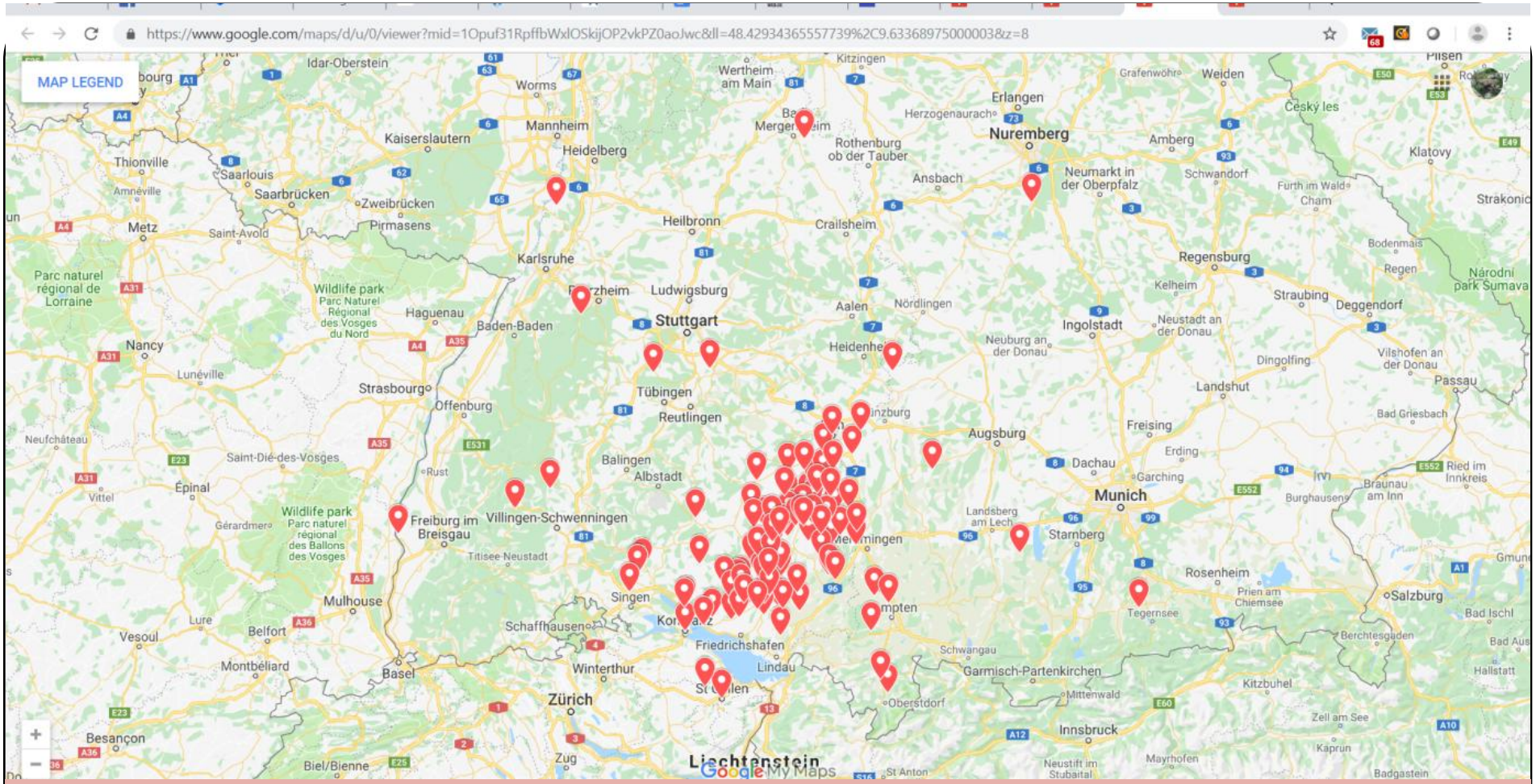
Donauschwabenufer

A plate on the Danube shore in Ulm, Germany, commemorating the places where Sathmar Swabians settled: 31 localities founded in the 18th century



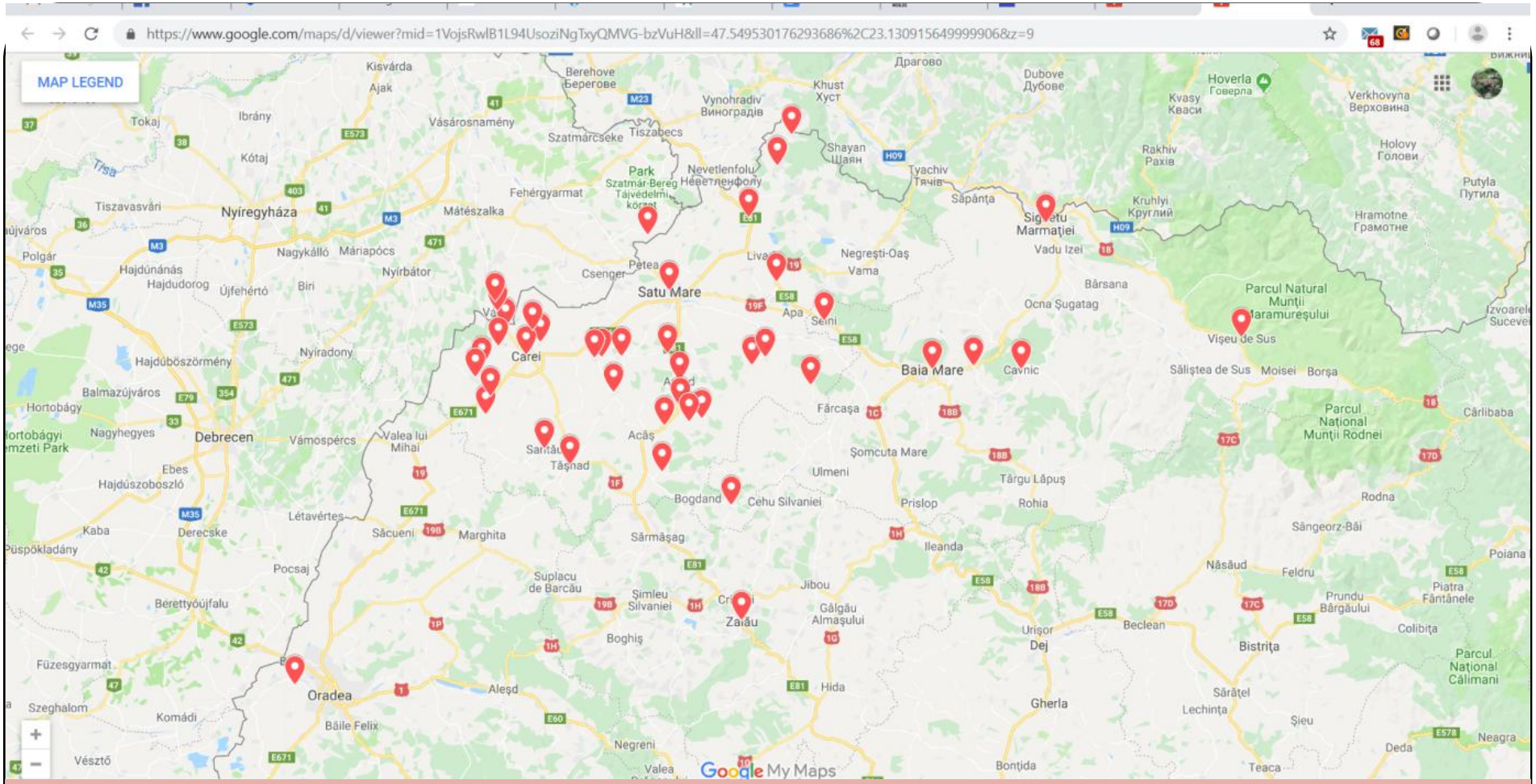
Story map of Sathmar Swabians

https://arcg.is/1m1PGu



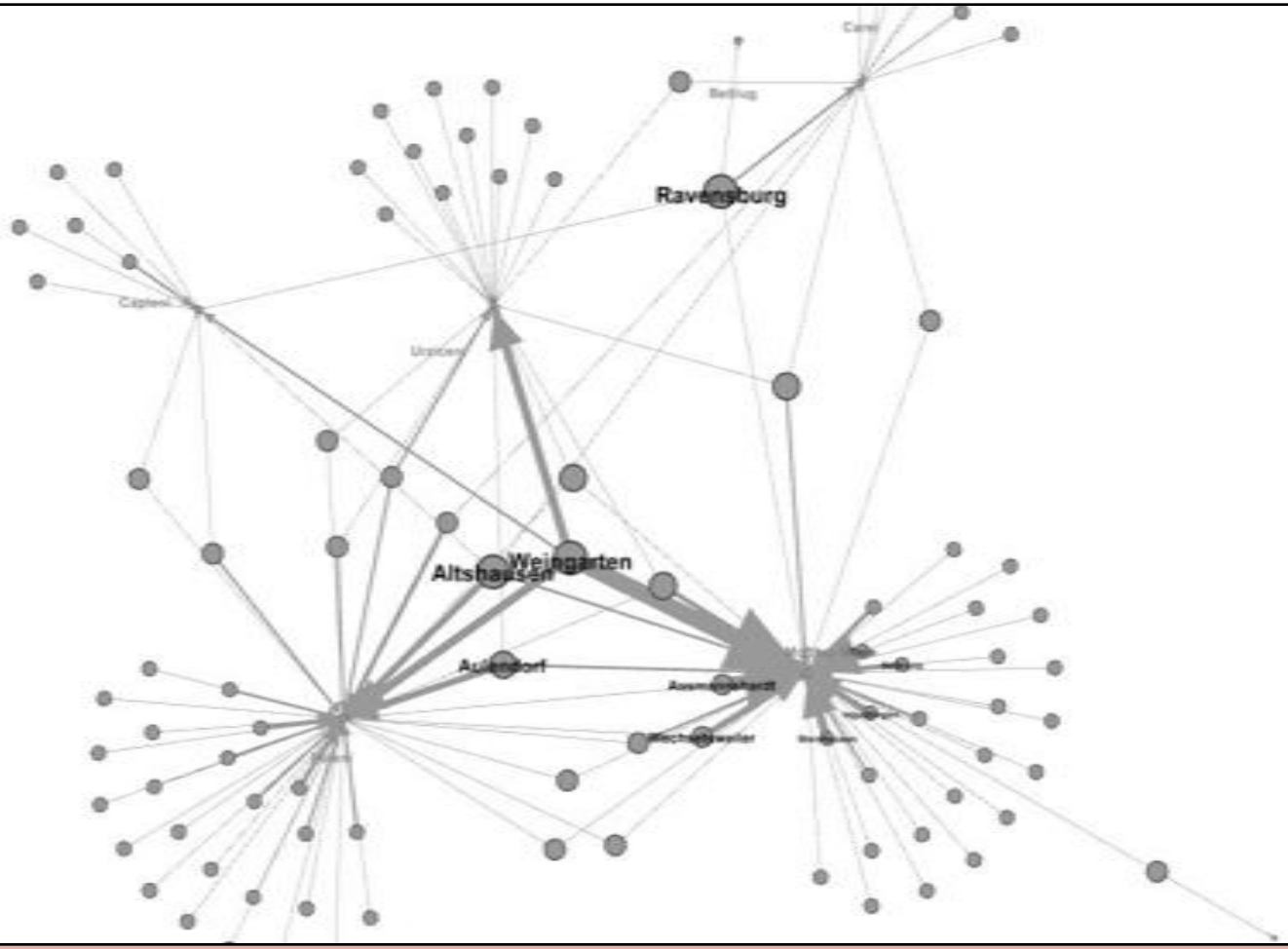
Oberschwaben

The localities of origin of Sathmar Swabians in SW Germany.



Satu-Mare

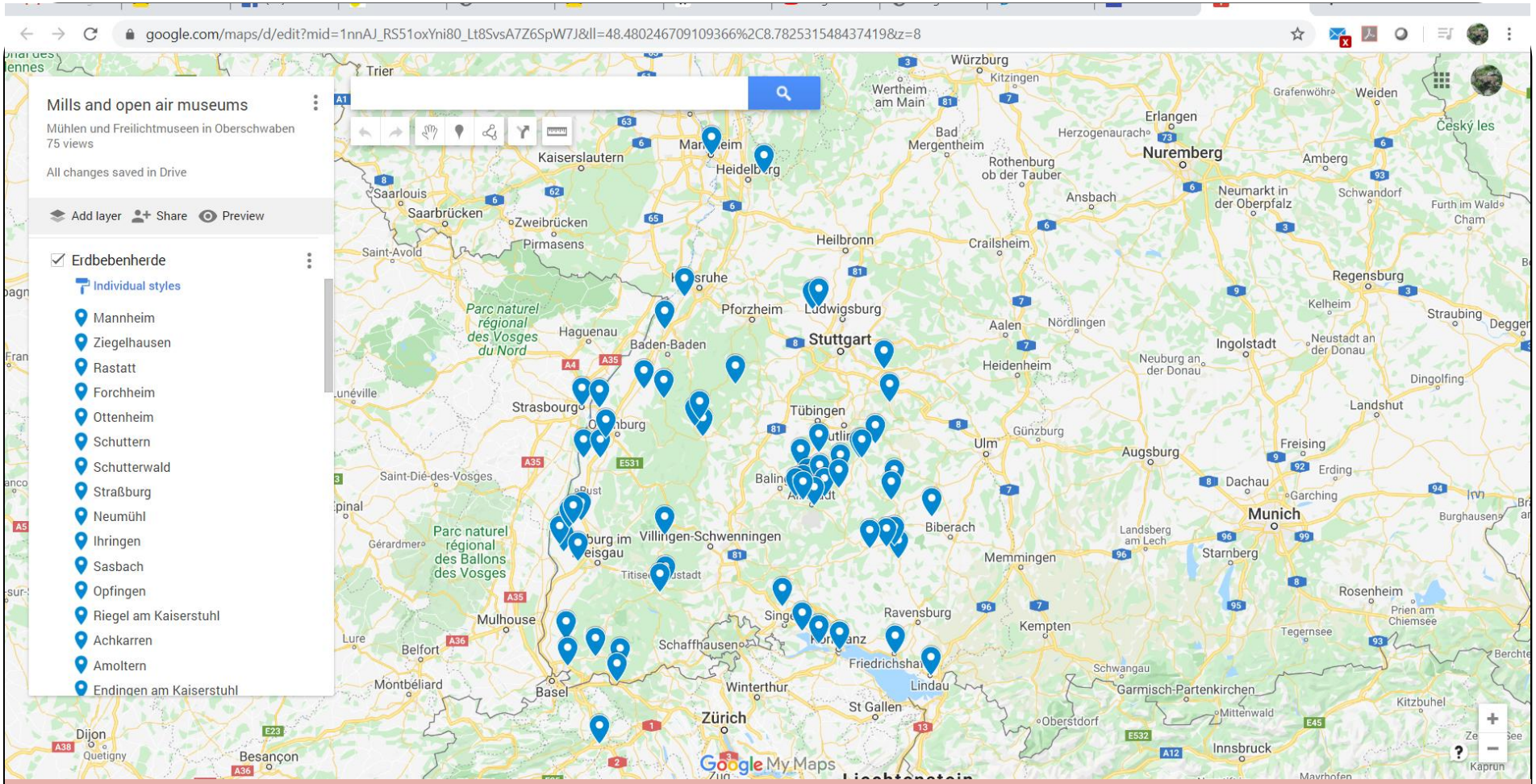
The places where the Swabians settled in Sathmar, NW Romania



Gephi

Network analysis of the localities most Swabians came from

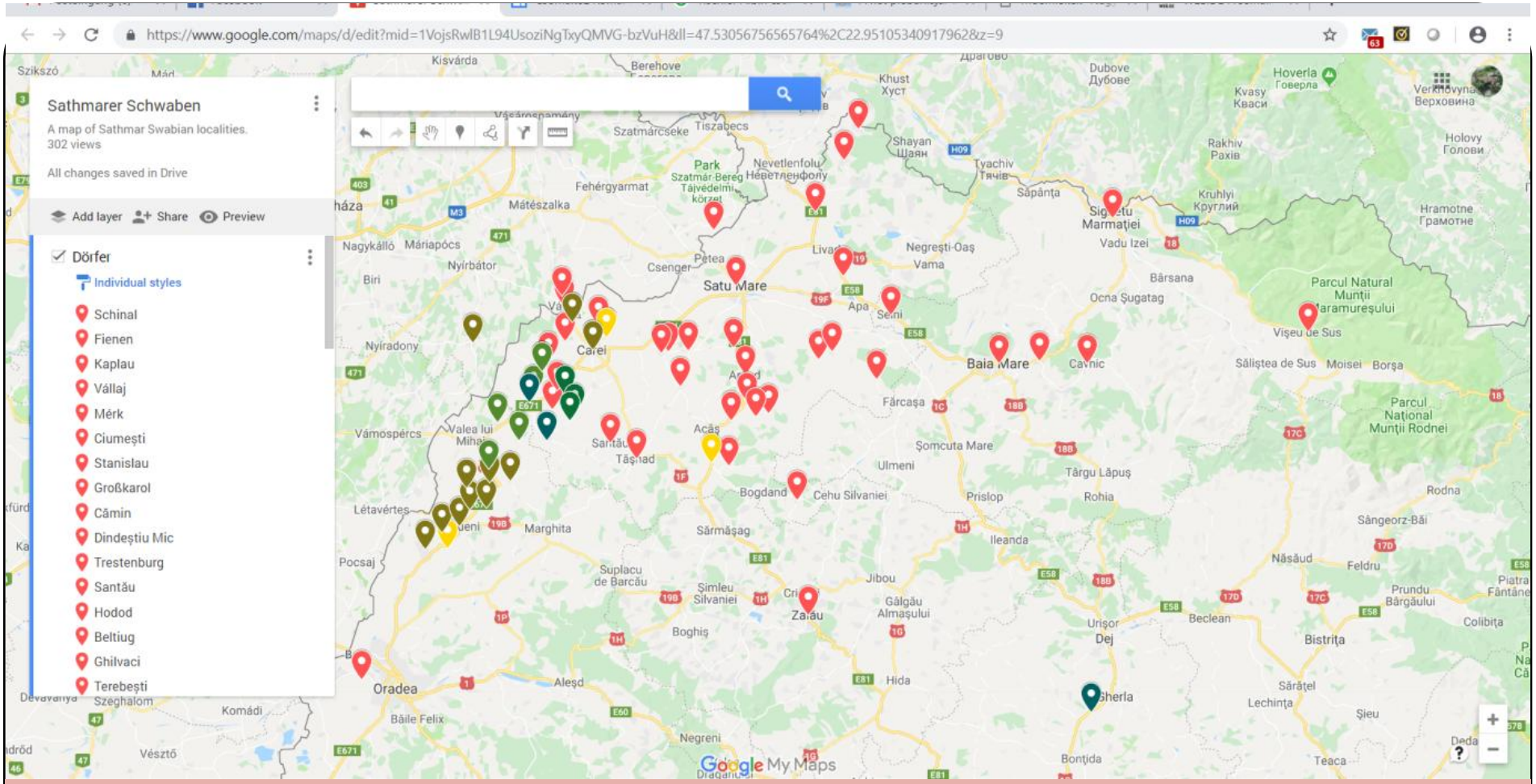
1834 Érmellék earthquake



Earthquakes epicentres in SW Germany

Earthquake epicentres in the origin area of Sathmar Swabians. It can be observed that many earthquakes are in the Rhine valley and thus a different region, but also around the Boden lake.

Full map here:
https://drive.google.com/open?id=1nnAJ_RS51oxYni80_Lt8SvsA7Z6SpW7J&usp=sharing



1834 Érmellék earthquake

Dark blue: epicentre, and towards yellow the intensity decreases. Data after Zsíros (1981), based on damage to vernacular houses. In red not affected Sathmar Swabian settlements.

Full map here: https://drive.google.com/open?id=1VojsRwlB1L94UsoziNgTxyQMVG-bzVuH&usp=sharing

Impact on church buildings

Church	Building data	1834 earthquake effect
Reformed church in Ciumești	Built in the Middle Age	1841 replacement of the crown (webpage of the commune)
Roman-catholic church in Ciumești	(1854-1856) architect Albin Tischler	The first small church built 1815 suffered damages and it was decided to rebuild it. (webpage of the commune)
Church in Căpleni	(1842-1848) architect Ybl Miklos	Built in frame of post-earthquake reconstruction.
Church in Moftinu Mare	1793-1797 architect Josef Bittheuser	It did not suffer notable damages (Bara, 2016)
Kalazanci Szent József roman-catholic church in Carei	(1769-1779) architect Franz Sebastian Rosenstingl	The tower collapsed, Miklos Ybl rebuilt it as lower tower. (description in the church)
Reformed church in Carei	enlargement 1746 – 1752 architect Josef Bittheuser	The tower leaned, the head of the tower and the bells felt down. 1836 on June 26k a fire happened and damaged the roof. The tower was repaired 1877 and covered with new metal. (Bara, 2016)
Church in Șandra	1781 Architect Josef Bittheuuser	In frame of the post-earthquake repair works a flat roof was built except of the spaces along the altar and the organ. (Bara, 2016)
Church in Petrești	1784-1786 architect Josef Bittheuser	The tower was damaged, and felt over the main nave. In frame of the post-earthquake repair works the vaults were replaced by a flat slab except around the altar. 1861 the tower was also rebuilt. (Bara, 2016)
Church in Foieni	(1783-1785) architect Josef Bittheuser	Damaged. The tower leaned, the peak of the tower was damaged as well, and it was repaired in 1838. (Bara, 2016)
Greek-catholic church in Carei	(1737−1739)	Strongly damaged, but it was repaired. 1888 it was repaired again. (zothmar.ro)

Moftinu Mare - exterior

From 1797

- Architect Josef Bitthäuser

Moftinu Mare - interior

No notable damages

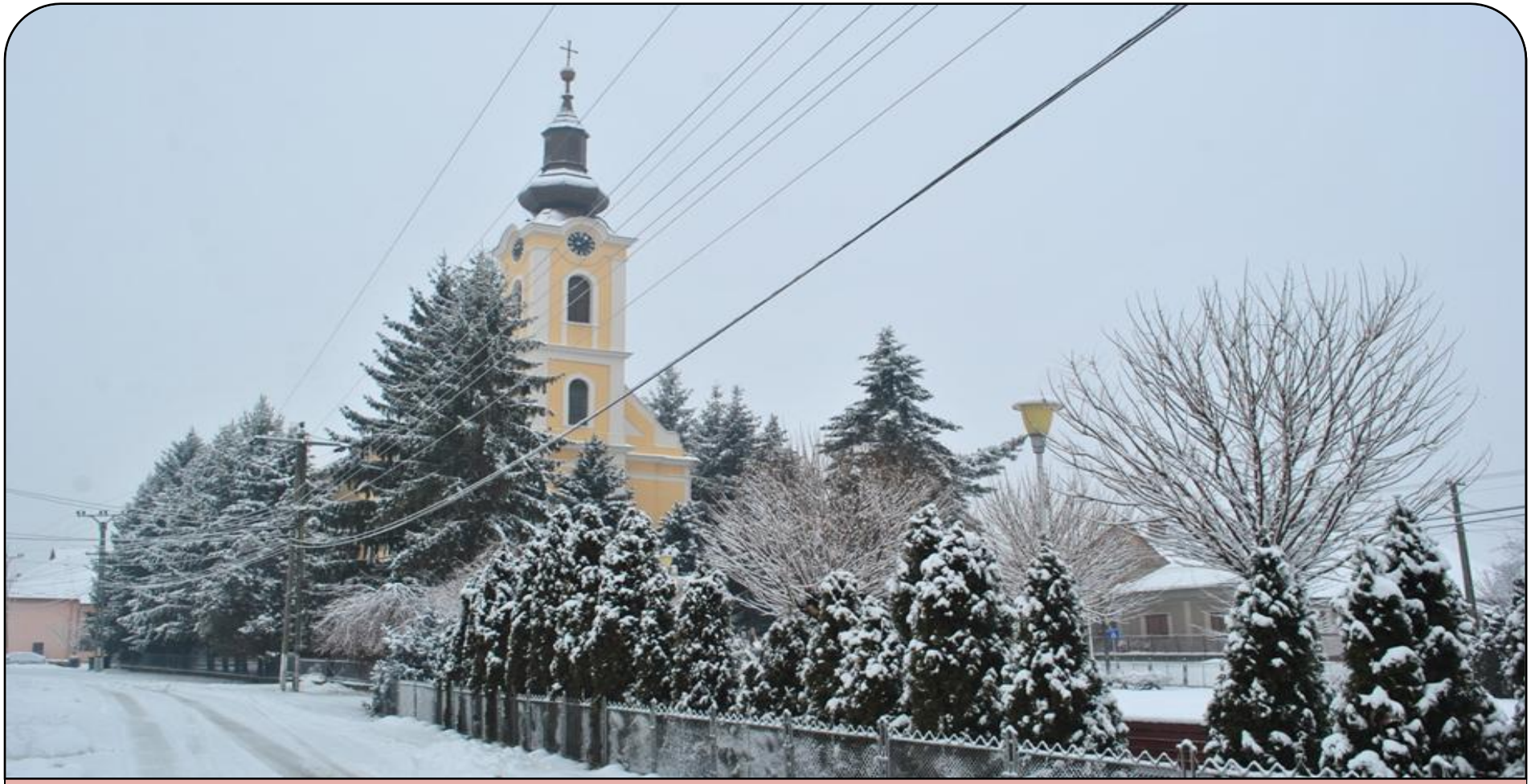
Petrești - exterior

From 1786

- Architect Josef Bitthäuser
- Tower was rebuilt 1861

Petrești - interior

The vaults were replaced with flat slab, as one can see, except of the altar (in the background) and around the organ.



Foieni

From 1785

- Architect Josef Bitthäuser
- Tower repaired 1838.

Foieni - interior

Here one can see how the original vaults of the architect might have looked like, as in other churches (Petreşti, Şandra) except Moftinu Mare were not kept.

Reformed church Carei

Enlarged 1746 – 1752

- Architect Josef Bitthäuser
- Tower repaired 1877 after leaning and peak falling down as well as 1836 fire of the roof.

Reformed church Carei

Roman-catholic church Carei

From 1769-1779

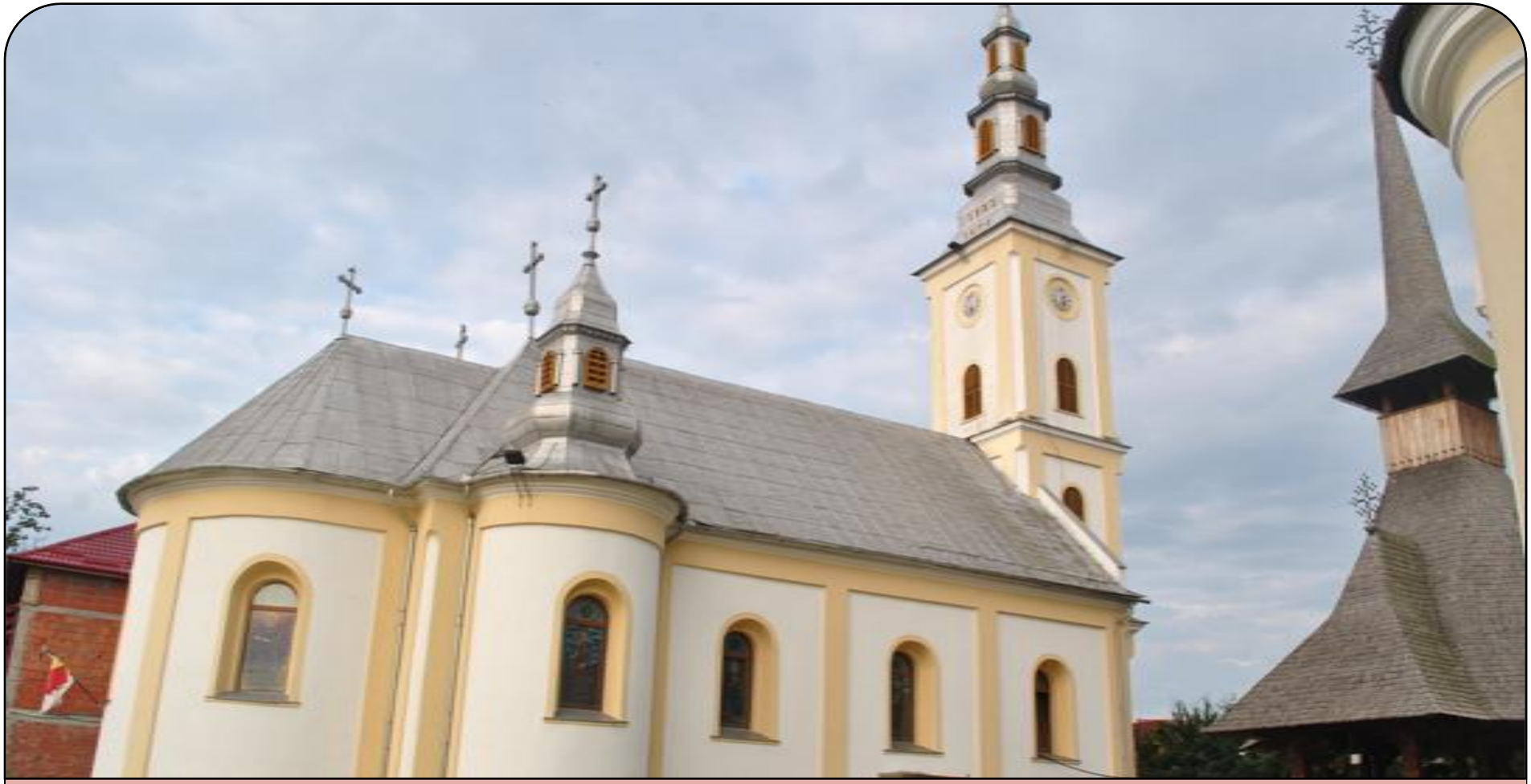
- Architect Franz Sebastian Rosenstingl
- The tower collapsed, Miklos Ybl rebuilt it as lower tower

Roman-catholic church Carei

- Greek-catholic church Carei - interior

Greek-catholic church Carei - interior

From 1739



Orthodox church Carei - exterior

About the same age as the Greek catholic church

Orthodox church Carei - interior

Churches in Andrid

- For this see the comments, it will follow in the next update

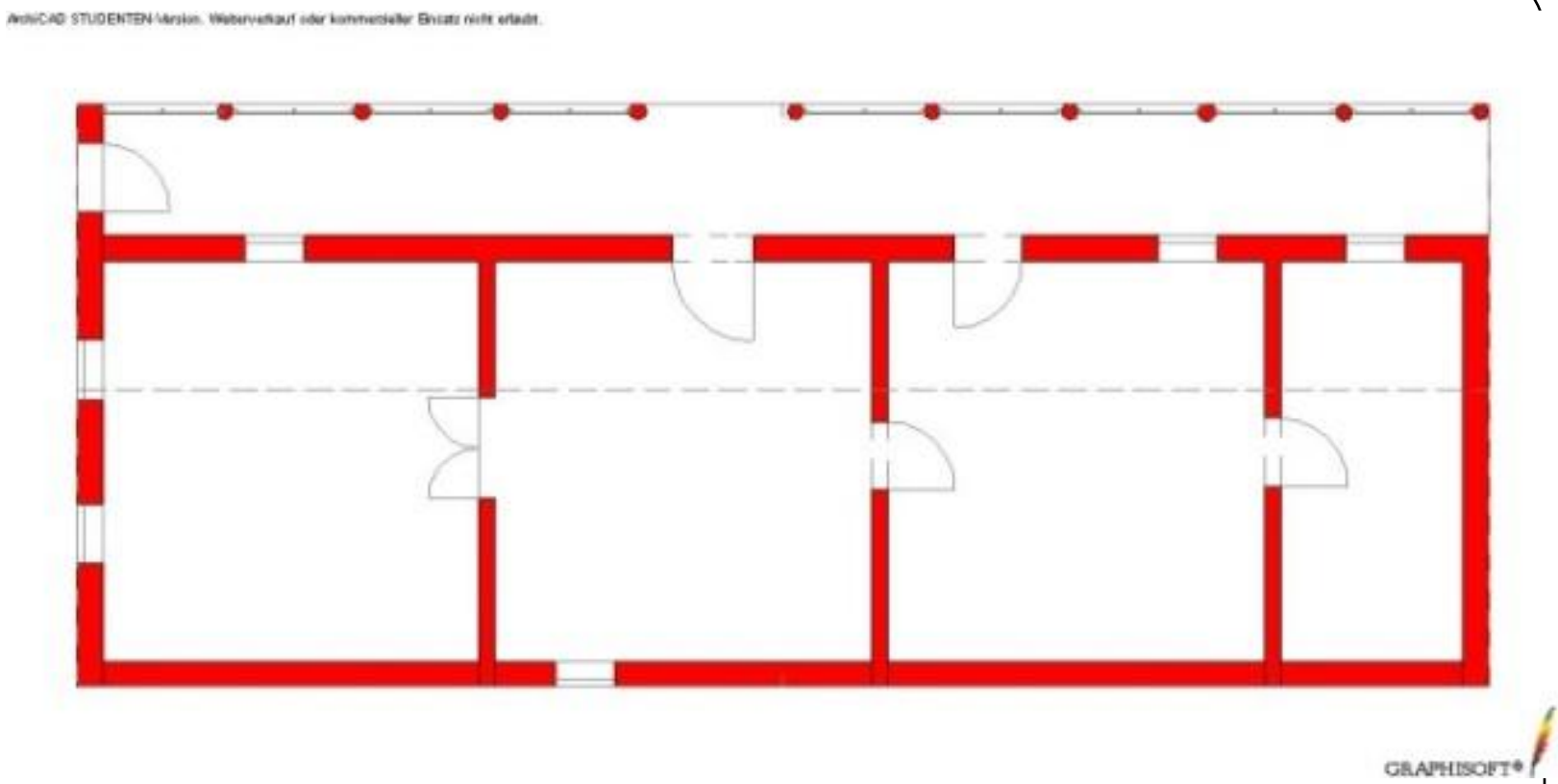
Conclusions – church building

- In most cases when damaged occured in churches, this affected the towers.
- For this reason a macro-elements investigation as in the method of Sergio Lagomarsino is recommended.
- The place of origin also displays some earthquake epicentres, and thus architectural solutions might be similar.

Impact on vernacular buildings


Schwaben Wei
Riesling
VIN ALB SEC

3D model of a Swabian house



Floor plan of a Swabian house

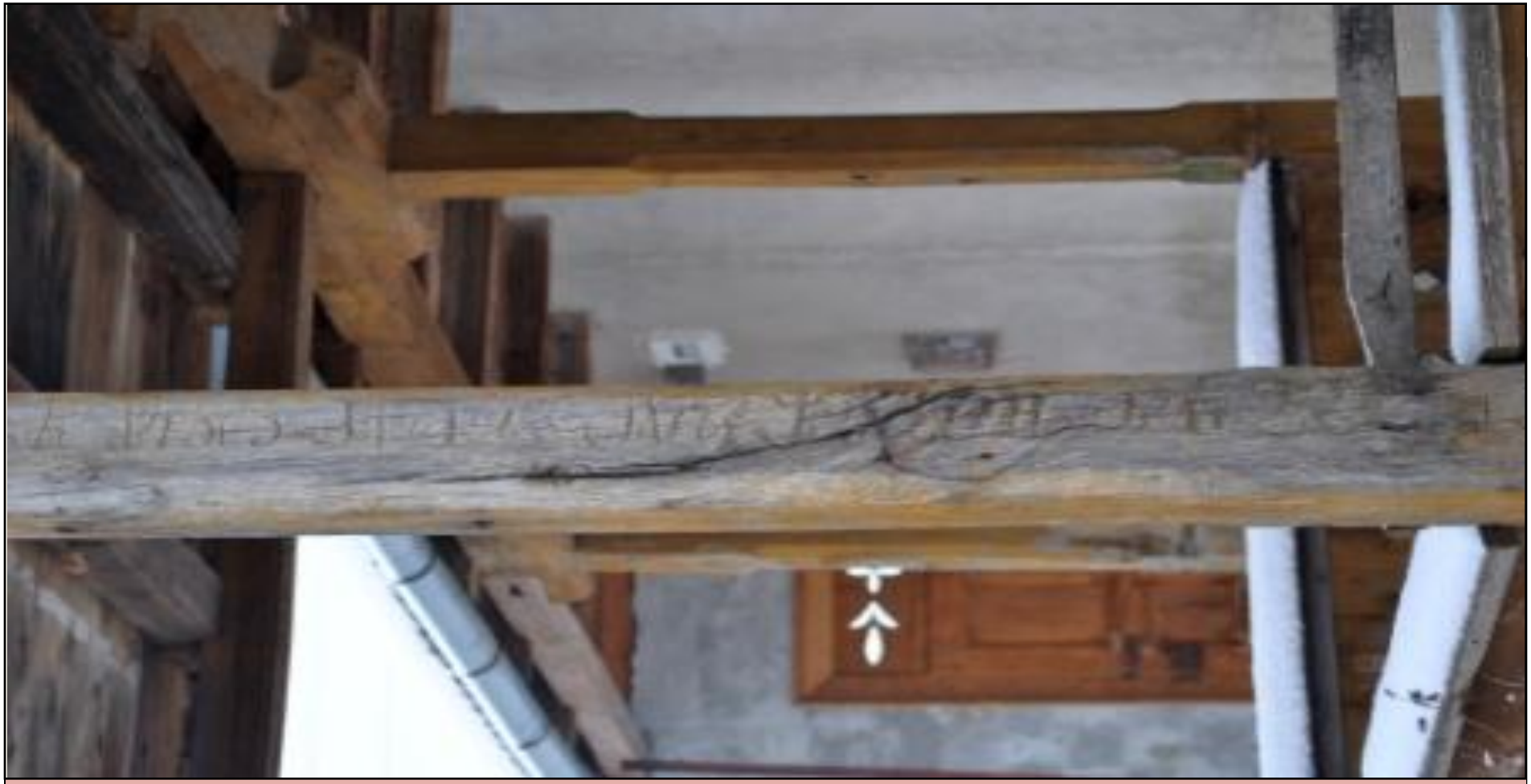
A langhouse

Swabian house of the ancestors before renovation (2014)

Swabian house of the ancestors during renovation (2019)

Master beam with authors of the house

Probably built 1848-1850 between marriage date and birth of first son date according to church records



Continuation of the master beam

Continuation of the master beam

Model of another Swabian house I‘ve seen

Extensions to a Querhouse

Model of a complex Swabian house

Photo of the house in the second model

Swabian room in the Danube Swabian museum in Ulm, Germany

Swabian house in the museum in Petrifeld

Swabian museum in Petrifeld, a house from 1871

Typical addition to a Swabian house

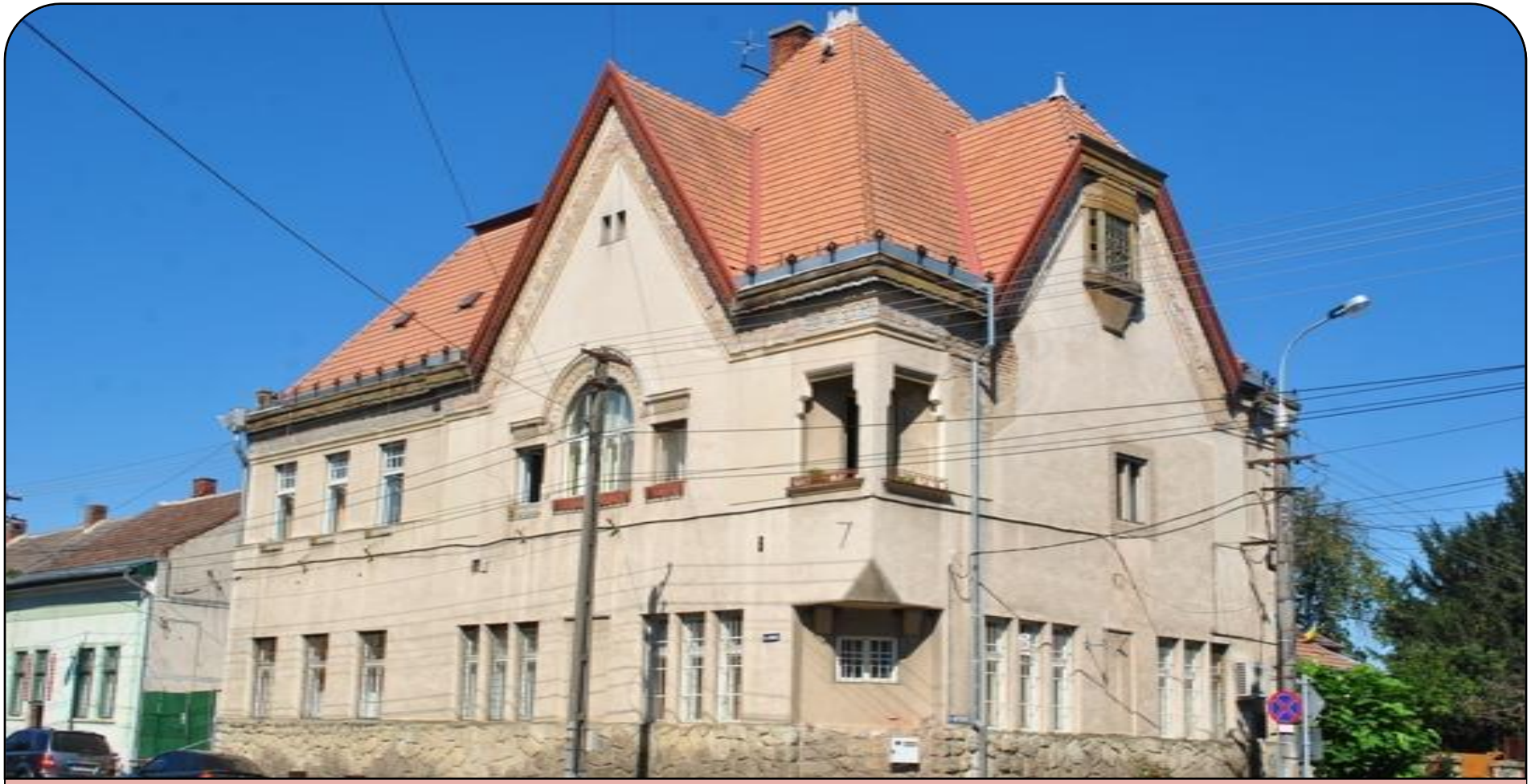
Interior

Conclusions – vernacular housing

- The postearthquake vernacular housing differs of the half-timbered and actually earthquake resistant housing (local seismic culture as himiş in Turkey and dhaji dewari in Nepal and gingerbread houses in Haiti or imposed as pombalino in Portugal and casa baraccata in S Italy) from the origin places.
- The postearthquake vernacular housing shows however features dictated by different agricultural use if we look at the village museum.
- Today remaining houses are postearthquake, hence, because the occurence of the earthquake, conclusions cannot be drawn regarding the migration of heritage with the settlers.

Nature in the area

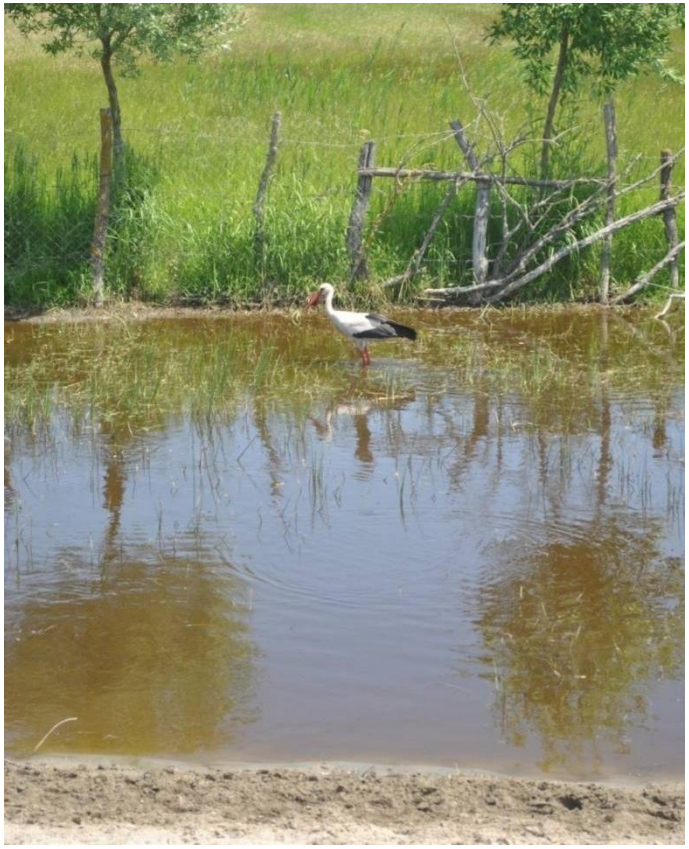
- It is a cross border landscape
  - Heritage can be experienced through trails from different European projects
  - Research as well as cultural and other projects can be done internationally
- There are festivals connected to nature
- Vernacular housing has evolved and responds to the natural environment



Administrative building of Ecsedi láp in Carei

An Art Nouveau building

Andrid (Érendréd) stork village



Valea lui Mihai (Érmihályfalva) and open acacia days

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More about the project here:

https://sites.google.com/view/domusszulofoldiosztondij/

All photos by the author.

Thank you!
Questions?