

State borders in ETRS89 coordinates Reality or fiction?

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Abstract

Common unique ETRS89 coordinates of the state boundaries are crucial for cross-border data harmonization for international projects. In the frame of European Location Framework (ELF) project Czech Office for Surveying, Mapping and Cadastre (ČÚZK) cooperates with Poland on edge-matching on the state border. During the preliminary phase of the project was some difficulty identified. If the state boundary is measured and administered in the national coordinate system, the accuracy of the transformation into the ETRS89 is influenced by discrepancies of the local trigonometric network, which results in two slightly different state boundaries. Final solution for Europe – international treaties on the state borders based on the ETRS89 coordinates – is necessary, but it will take years.

Keywords: State borders, European Location Framework, ELF

1. Introduction

In the frame of INSPIRE implementation [3], the common unique ETRS89 (European Terrestrial Reference System 1989) coordinates of the state borders are not only taken for granted but also crucial for cross-border data harmonization. The process of harmonization has been already accomplished for number of middle scale geodatabases and INSPIRE themes data and does not seem to cause any troubles. Data were usually edge matched to an adjusted common border. However the first attempt to use INSPIRE (Infrastructure for Spatial Information in Europe) network services for pan European spatial products and services has been designed in the frame of the ELF project.

2. ELF project – general information

European Location Framework (ELF) project was launched in 2013 and is co-funded by the European Commission's Competitive and Innovation Framework programme. The project will run for three years and deliver a pan European cloud platform and web services build on existing INSPIRE services and enable access to harmonized data in cross-border applications. The project is supported by a consortium of 30 partners across Europe including the Czech Office for Surveying, Mapping and Cadastre (ČÚZK).

In the frame of the project several groups of neighbouring countries (clusters) has been established to start a pilot run of ELF products as well as to test developed tools (like edge-matching tools and other). In one of them the Czech Republic (ČÚZK) cooperates with Poland (Ministry of Administration and Digitization - MAC). Putting together data and services from both sides of the state border, we have identified particular difficulties described later.

3. Source information systems for State Borders

An official source of the Administrative Units in the Czech Republic comes from the Basic Register of Territorial Identification, Addresses and Real Estates (RÚIAN). RÚIAN is an important part of national Basic Registers System in the frame of the Czech e-government solution. RÚIAN is focused to the spatial data and the content of this register practically covers the requirements for the Cadastral parcels, Buildings, Addresses and Administrative units INSPIRE themes. Administrative Units (including the state borders) within RÚIAN are derived as an envelope of parcels. Parcels as an important part of cadastral spatial data can be maintained solely by the cadastral workplaces in the frame of the Information System of Cadastre of Real Estates (ISKN). Editing of ISKN content must be always linked with an official document, in case of the state borders it is an approved international treaty. This is the reason why the editing process is a little bit rigid in comparison with ZABAGED.

Fundamental Base of Geographic Data of the Czech Republic (ZABAGED®) is a digital vector model of the territory of the Czech Republic based on the 10 000 scale and maintained by the Land Survey Office (ZÚ) [1]. Administrative Units in this data set have been originally digitized from the maps but now are maintained mainly using RÚIAN data. State border geometry in ZABAGED is based on available border documentation and data gained from our surveying department are implemented immediately after approved by Border Commissions. This is the reason why state borders in both databases (RÚIAN and ZABAGED) differ a bit.

4. Edge-matching on the state borders

Taking into account large scale map themes like Cadastral Parcels and Administrative Units, we can identify particular difficulties. From the point of view of data harmonization, cadastral parcels should fit the state boundary and the state boundary should contain the same ETRS89 coordinates from both neighbouring countries. This premise has been tested in the frame of the ELF project. Practical experience from the Czech-Polish cluster proved that none of these assumptions has been met. Discrepancies between parcels (derived from the cadastral maps) and state boundaries are usually caused by mistakes in the map and are easy to fix. In case of the Czech-Polish border it will be accomplished by the end of 2015. On the other hand, if the state boundary is measured and administered in the national coordinate system, the

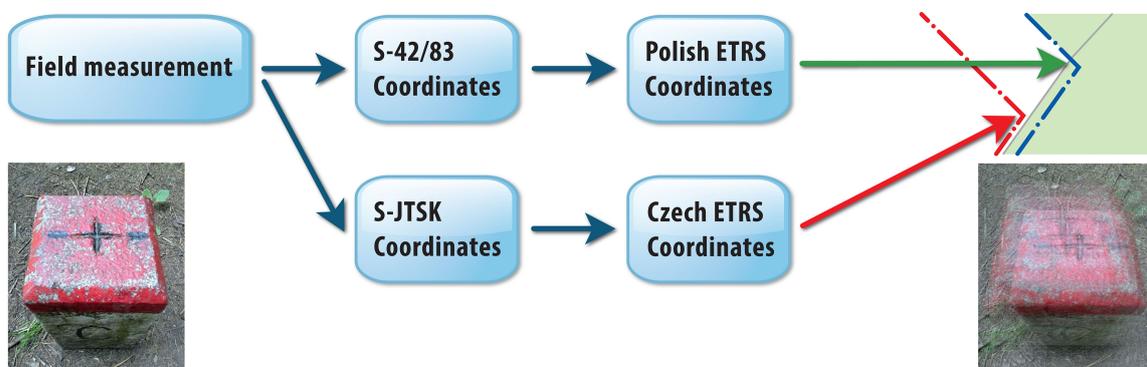
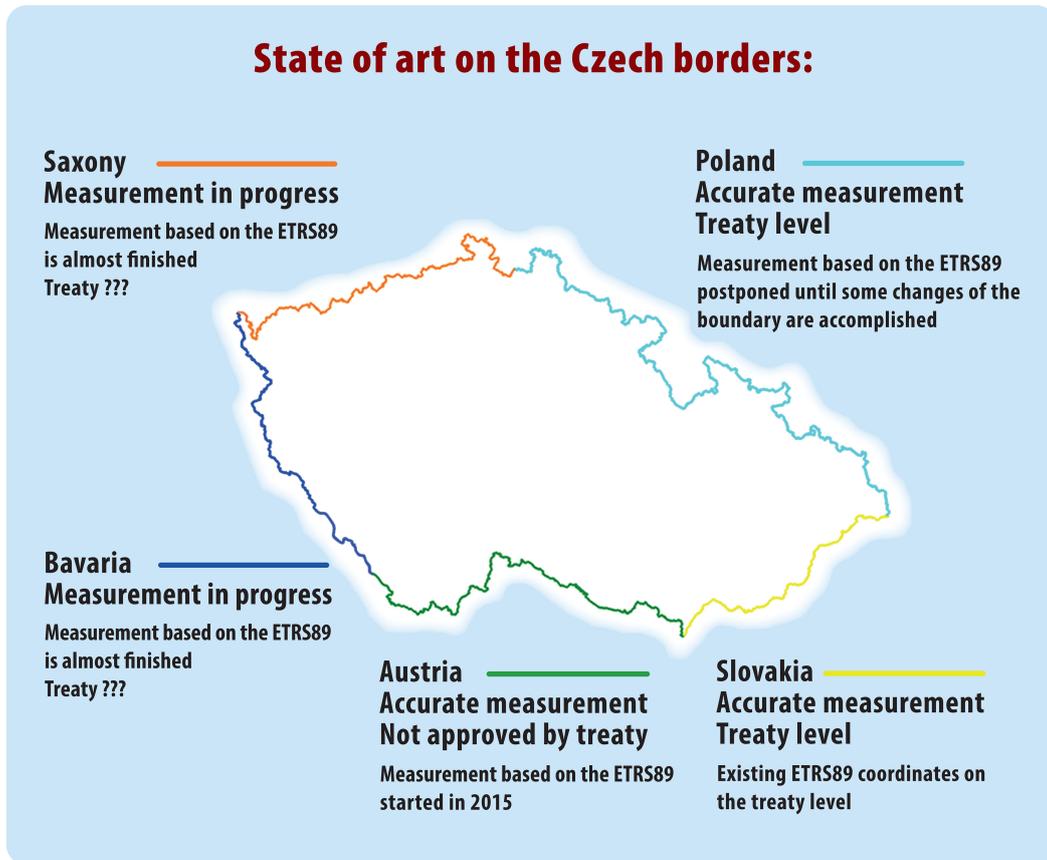


Figure 1: Scheme of determination of the ETRS89 coordinates in Czech Republic and Poland



Lengths of the Czech state borders			
Germany	810.7 km	Austria	460.3 km
Poland	795.8 km	Slovakia	251.8 km

Figure 2: State of art of the Czech border mapping

accuracy of the transformation into the ETRS89 is influenced by discrepancies of the local trigonometric network, which results in two slightly different state boundaries. In case of the Czech and Polish border, the mean deviation was approximately 10 cm, however it is a common issue for all neighbouring states – see also Fig. 1.

This little deviation certainly cannot have negative influence on using the data for environmental purposes, on the other hand until the state boundary is fixed in the accurate and unique ETRS89 coordinates, other INSPIRE themes data cannot be harmonized in the final fixed position.

The process of mapping of the Czech Republic state border in 2015 is shown at Fig. 2.

5. Conclusion

The aim of this article is to point out, that the common unique ETRS89 coordinates of the state boundaries are crucial for cross-border data harmonization for international projects. Final solution for Europe – international treaties on the state borders based on the ETRS89

coordinates – is necessary, but it will take years (due to additional measurement and processing). All neighbouring states of the Czech Republic are currently aware of this necessity. The international Czech-Slovak treaty on the ETRS89 coordinates on the border has been recently approved. Measurements are almost finished on the Czech-German border (Bavaria, Saxony).

In the meantime an adjusted common boundary for edge-matching of other INSPIRE themes (Hydrography, Transport Network, ...) has to be used. After establishing official ETRS89 coordinates on remaining borders, additional processing of the data will have to be done to match them to this fixed position.

Furthermore, a special coordinate transformation [2] to the ETRS89 (based on a dynamic grid) in the Czech Republic is being prepared to fit on-line provided themes (Cadastral Parcels, Buildings) precisely to the state boundary.

References

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