Statistics, Geodata and Geoinformation

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The Czech Statistical Office has been involved in national processes in the creation, processing, and usage of geoinformation and has been investing into vast know-how, technology, and production of geodata on the territorial register platform. In this field the Office concentrates on keeping of detailed borders of statistical territorial units (statistical district, basic settlement unit), elementary units in coordinates (buildings, address points), their attributes, and on their continuous updating. Identifiers of territorial units are introduced into life cycle of statistical tasks – into the preparation, collection, processing, and presentation of data. Territorial units and/or addresses are present in statistical processes since the very beginning, or are interlinked ex ante (georeferencing). Their applications are carried out in projects of the population and housing census, in the social statistics, in agricultural censuses, in the construction statistics, in statistics on utilities and amenities of municipalities, etc. The existence of detailed localised data enables to develop new methods for presentation by means of regular polygons (grids). The Office participates in the project of GEOSTAT. The system support to the creation and presentation of geoinformation has been implemented in source application superstructures linked to the basic registers of public administration. Since 1998 there has been

cooperation with Ministry of the Interior of the CR and the Czech Office for Surveying, Mapping and Cadastre focused on coordination of activities, including the national geoinformation policy, exchange of data sets, and services based on spatial data.

1. Introduction

Spatial data accompanies the lifecycle of almost all statistical tasks. The traditional statistical candidates for linking with similar primary localisation (coordinates) includes social statistics (selection surveys, demographics), house, apartment and population censuses, agriculture (Agrocensus), construction (buildings, apartments), civic amenities, etc. The selected basis for linking statistics and spatial data, apart from the traditional administrative division of the country, is the elementary object of the address point and its expression in coordinates with the accuracy of a cadastral map. To present the geodata linked to statistical and spatial indicators, the web portal uses the territorial register with implemented links to the map services of the Czech Officer for Surveying, Mapping and Cadastre (ČÚZK).

2. National geoinformation infrastructure – tradition, impulses

The basis for development of geoinformation (GI) in the Czech Republic dates back to the 1970s, with the greatest boom taking place in the 1990s when there were particularly favourable conditions: expansion of CAD/GIS technology and user applications in surveying and cadastre, agriculture, forestry and environment, in the state statistics and Eurostat, the massive production of information about the territory at district offices, sharing of information, and the development of secondary and university education in geoinformation. These activities brought together a community of people that formulated a vision and found solutions in progress.

New legislative regulations were adopted on information systems, basic registers, statistics registers, on the transposition and implementation of European Directive 2/2007/ES on the

establishment of infrastructure for spatial data in the European Community (INSPIRE). Many private and public projects were implemented in the field of GI. Development is regularly coordinated with technical novelty and trends in the area of geographic information systems (hereinafter GIS) and their implementation within Eurostat and the individual statistical offices.

Functional cooperation and the coordination of state administration and local governments in the implementation of tasks is crucial. In the long term, the ČSÚ naturally cooperates (based on entrusted competences) with the Interior Ministry in the area of territorial information, and since 1998 also with the ČÚZK on the occasion of the population, house and apartment census or the development of registers. Cooperation with the ČUZK takes many forms – from legislation to projects, coordination, exchange of data and use of map services.

Today, the Czech Republic has a reliable, quality and accessible state map and cadastral services, geoproduction by the state statistical service, many geoapplications for the production and non-production spheres, information systems that help solve, improve or save lives and property, and a document for the state policy in the field of geoinformation is being prepared.

The main strengths of the national geoinformation infrastructure in the Czech Republic at present are as follows:

- Launch of the basic public administration register from 1 July 2012: Personal register, Population register, Register of territorial identification, addresses and real estate, Register of rights and obligation; solving of the follow-up public administration agenda;
- Necessary development of legislative regulations;
- Continuing implementation of INSPIRE and solving integration competences with the national geoinformation infrastructure;
- Strong and action-ready community of geo information specialists and their supporters;
- Quality, accessible state map and cadastral service;
- Quality and accessible geographic production of the state statistical service;

- Geoapplication solution in rescue systems, agriculture, environment, insurance, meteorology, zoning planning, etc.;

The weaknesses are as follows:

- Non-existence of a register of public administration apartment (only apartment records at the ČSÚ with inconsistent identification of apartments within the building);
- Lack of a state policy in the area of geoinformation infrastructure;
- There has been little success in mediate political presentation on all levels of persuasion about the potential of GI in the decision-making process.

The following diagram of the development of the national geoinformation infrastructure in the Czech Republic since 1995 on the background of political, legislative, coordination and technological influences.

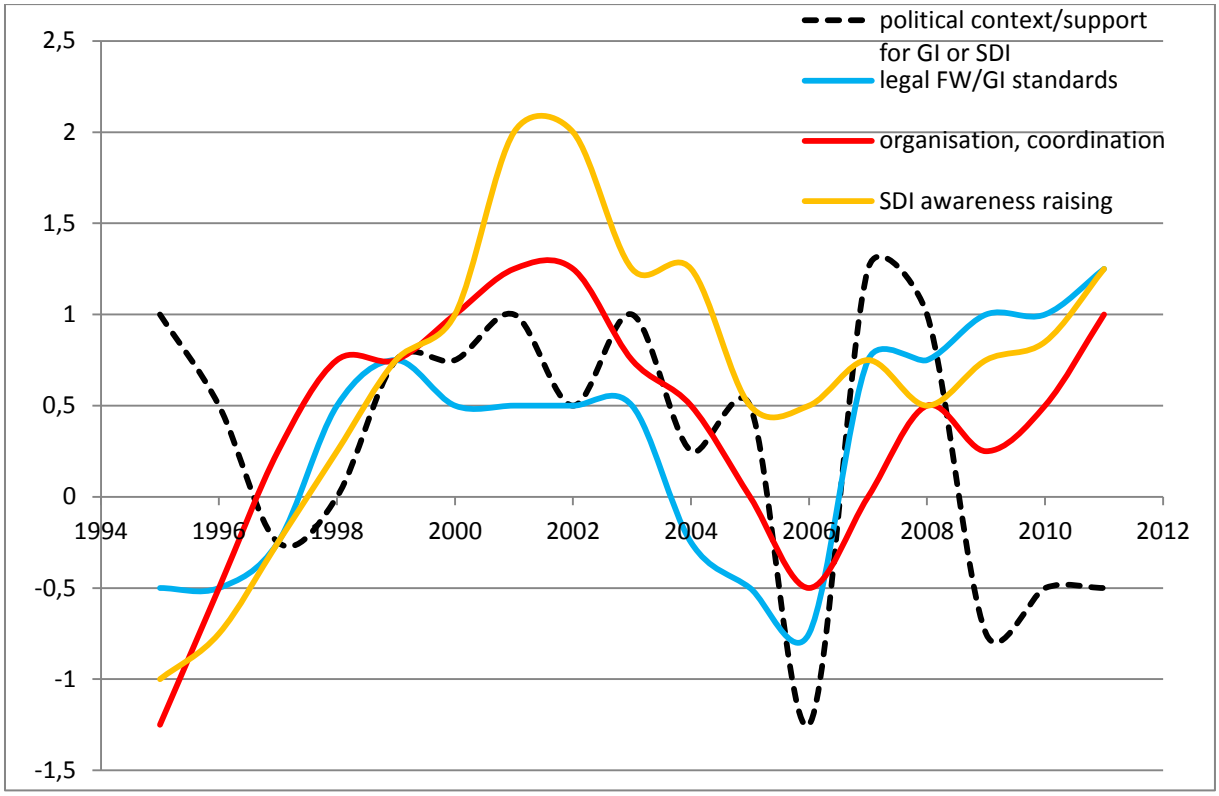

Fig. 1: Evaluation of the development of the national geoinformation infrastructure in the Czech Republic since 1995

3. Statistics and registers

The ČSÚ is part of the national processes of creation, processing and use of GI and has been investing in the extensive know-how, technologies and production of geodata on the platform of the territorial register for 15 years. In the 1990s, a crucial factor for the launch of the territorial register were among other the experience and vision of ex-chairman of the office, E. Outrata, from his previous statistical post in Canada, as well as the experience acquired in building the population register in Denmark, the development of GIS companies in society, the need for massive production of public administration GI and the existing close cooperation with the decisive departments. The internal motivation for the ČSÚ was the need to rationalise the preparation of labour force surveys in households, and later to conduct the territorial preparation of the census of people, houses and apartments with digital map support (census district maps) and other surveys in social statistics.

Spatial data is present in many statistical tasks – from the outset of preparation and collection to processing and presentation.

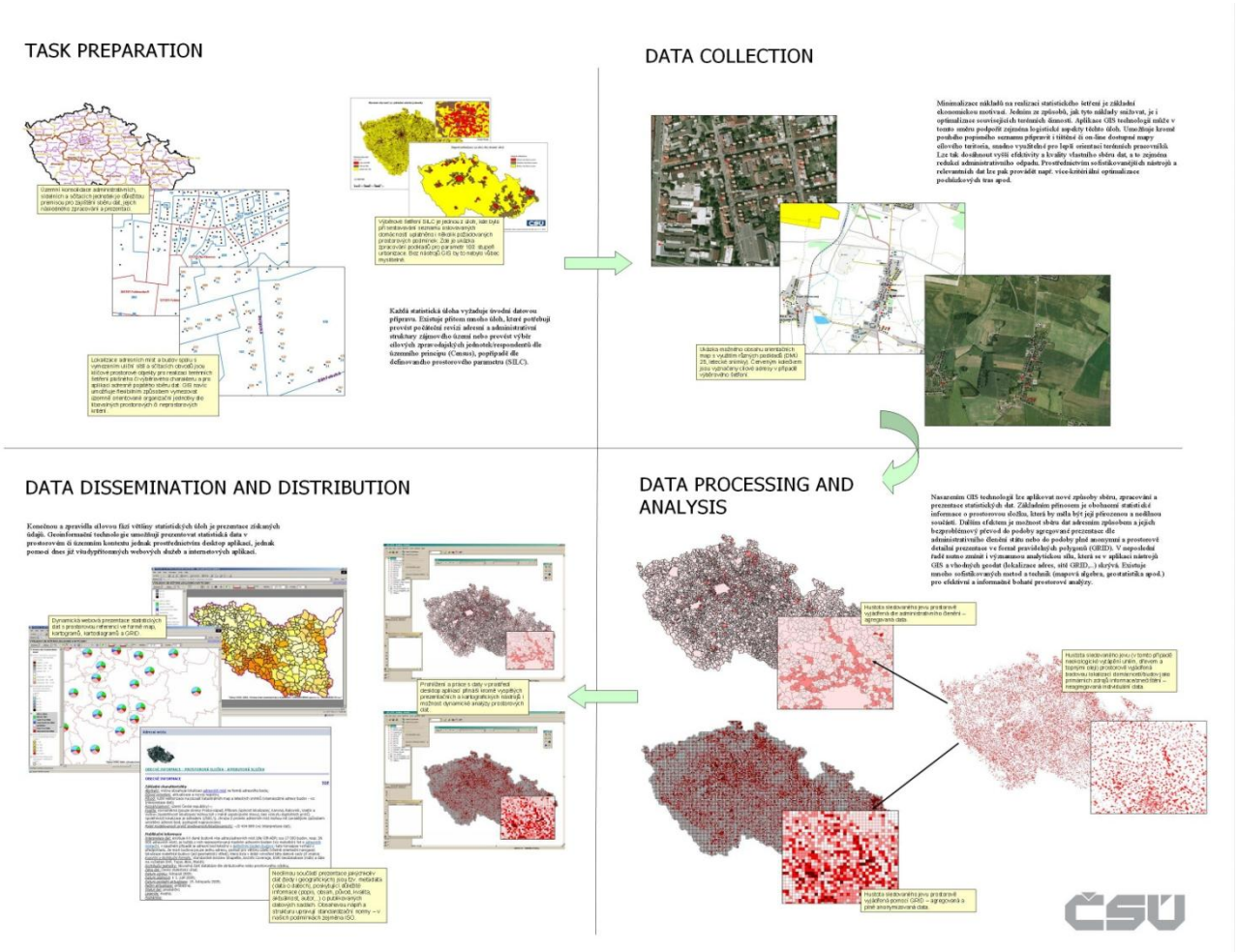

Fig. 2: Support of the lifecycle of a statistical task by GIS tools

Within the framework of the concept of work, statistics were pinpointed for the creation of geoinformation (see the following overview).

Agenda	Spatial framework	Analytic methods	Form of presentation
Demographic data	Borders of administrative, residential and statistical units Address points GRID	Map algebra, + geostatistics (distance analyses, interpolation methods /kriging/, quadrant method, kernel, etc.)	Cartograms and cartodiagrams with geographic (administrative, territorial, etc. units) or geometric borders (GRID), analytic maps (contour lines, methods of coloured layers and surfaces)
Census data	Borders of administrative, residential and statistical units Address points, definition points of buildings GRID	Map algebra, + geostatistics (distance analyses, interpolation methods /kriging/, quadrant method, kernel, etc.)	Cartograms and cartodiagrams with geographic (administrative, territorial, etc. units) or geometric borders (GRID), analytic maps (contour lines, methods of coloured layers and surfaces)
Voting statistics	Borders of administrative and purposefully specified units		Cartograms, cartodiagrams
Economic statistics	Borders of administrative units Address body	Map algebra (distance analyses)	Cartograms and cartodiagrams with geographic (administrative, territorial, etc. units) or geometric borders (GRID), analytic maps (contour lines, methods of coloured layers and surfaces)

Table 1: Statistics and their linking with geodata

Support for the target GI production is provided by the System of statistical registers and the Statistical metainformation system with territorial index administration. The register system includes a territorial register, which was founded in August 1997 based on data from the

population, house and apartment census of 1991. It is updated from several sources – output from the real estate cadastre, data about approved buildings and apartments from building authorities, population register addresses. The content base is the set of territorial and territorial-registration elements of the Czech Republic, as well as buildings, addresses and streets for the entire country. The elementary territorial objects for the needs of the ČSÚ are considered to be:

- statistical districts, which play the role of the processing unit during censuses, collection units for statistical surveys and the role of the smallest composition unit of the territorial division of the state; it is the basic processing unit for the population, house and apartment census;

- basic residential unit, which is a part of the municipal territory with clear territorial technical and urban conditions or territory with a residential or recreational character. It serves to monitor the socioeconomic and technical phenomena linked to settlement and is the basic presentation unit for the population, house and apartment census.

The territorial register is a descriptive and geographic basis, with recorded statistical and spatial data /see Act No. 89/1995 Coll., Section 20a), as amended/ whilst preserving the individual protection of data.

Address-oriented processing of statistics and registers:

Fig. 4: Various forms of presentation of address-oriented data (point density → administrative units → GRID).

3.1 *Organisation and technology*

The Czech Statistical Office has been using the ESRI technology for some time, especially the desktop applications which are primarily designated for processing data, thematic purposes and the creation of map outputs designated for office publications. It is also equipped with technology for the storage of spatial data in the ArcSDE relation database.

Geoinformation technology finds the greatest application in three areas: public databases, statistical register and population census. The Czech Statistical Office has more than one thousand permanent employees, whereas there are about 220 to 450 regular users of ESRI technology and geographic data, of which 20 to 270 in the position of data administration (culminating at the time of the census).

3.2 Sample of the presentation of ČSÚ geoproducts

The ČSÚ does not have its own map geoportal and covers its basic needs to support data collection, processing and presentation of information in the following manner:

1. Thanks to the massive development of national infrastructure and cooperation with the ČÚZK, it uses the WMS services of the Surveying Office (ZÚ);
2. Since 2009, the private **iRSO** web application has been available, which uses the freely available OpenLayers technology to present spatial data and connect the WMS services of the ZÚ (http://registry.czso.cz/irso/home.jsp).

The sought object (territorial unit, building, statistical attribute) is shown on an optional state map reference with the presentation of thematic map layers: borders of territorial units, building points, names of streets, territorial authority of offices, and other purposeful topics.

The application covers several user tasks: cooperation of municipalities in preparing censuses, provides support for the statistical procedures of building authorities, searching for building address, searching for territorial elements, reports on the territorial division of districts or municipalities, building reports, expert of territorial indexes, etc.

4. **Conclusion**

The challenges of recent years for GIS development are:

1. Territorial preparation, support of processing and presentation of the project Census of people, houses and apartments in **2009-2012**;
2. GEOSTAT project and presentation of the results of the Census of people, houses and apartments 2011 (in grids) – **2011-2013**;
3. Preparation and implementation of the Integrated Operation Programme Revision of the Set of Statistical Registers **2010-2013**;
4. Legislative, method, data and other work leading the creation of basic public administration registers of a binding and unified character using description and graphic data from the decisive departments – **from 1 July 2012.** The ČSÚ is the administrator of the basic register ROS – Personal Register; The ČSÚ is one of four editors of the basic register RÚIAN – Territorial, Address and Property Register, namely for the element of the basic residential unit.
5. INSPIRE;

The strengths of the ČSÚ in the area of GI include:

- Methodology, collection, processing and production of sets of territorial elements, buildings and addresses with a wide range of statistical and spatial variables;
- In the data field, we have a strong position among the statistical offices of the EU in the production of spatial microdata and systematic creation of methods for linking geodata and statistics;
- Communication with the creative community of the professional sphere to the public sphere.

statistics – geoinformation infrastructure – statistical task lifecycle – projects – census of people, houses and apartments– registers – basic residential unit – address point – grid – geoproducts