

GIS AS A PART OF THE CZECH HERITAGE INTEGRATED INFORMATION SYSTEM

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Abstract:

In the past two decades, several pilot projects of a small non – governmental Czech organisation of specialists on rural heritage and vernacular architecture SOVAMM (Atlas of vernacular architecture of Bohemia, Moravia and Silesia (basic inventorial survey), Detailed inventorial survey of the National Park of Dyje Valley (Thayathal) and of the Litomyšl – Vysoké Mýto region) enabled the development of the actual GIS data model used since 2007 in the Czech Heritage Integrated Information System IISPP (<https://iispp.npu.cz> (the system can be consulted so far only in Czech)).

IISPP provides the environment in which significant cultural heritage data are collected, interpreted, presented and archived in order to facilitate understanding of the configuration, evolution, condition, and context of heritage sites and objects.

The IISPP GIS is based on the object data model with seamless datasets for the whole territory of Czech Republic. The GIS is not only used to inventory and analyze (13 thematic maps for ArcGIS Desktop and 10 internal and 3 public web mapping projects are available), but it offers the unique spatial identifiers for other databases of IISPP (e.g. MIS – system for the management of the digital and digitalized documentation, that is used also for the storage of the GIS data, that could not be included in the seamless datasets of Czech Republic, and other databases planned for integration such as InList – list of unmovable and movable cultural monuments, conservation areas and protection zones and objects and sites of cultural heritage interest). Thanks to unique spatial identifiers the visualization of the documentation stored in MIS is possible in GIS map projects and MIS can benefit from spatial analysis tools of GIS.

The interoperability with other institutions is provided by public web map services and mapping projects, that enable the use of the IISPP spatial identifiers.

1. HERITAGE GIS PRIOR IISPP

1.1 Archeological GIS

GIS is used in the Czech National Heritage Institute since the beginning of 1990s, when the State Archeological Register (SAS) was created. This GIS for archeological investigations and inventories at scale of 1:25000.

1.2 Historic structures surveys and inventories of SOVAMM

Despite this pioneering project that lasted until 2001 before the GIS was deployed to other tasks, in which

the Institute is involved. Its development would not have been possible without previous pilot projects of a small non – governmental Czech organisation of specialists on rural heritage and vernacular architecture SOVAMM (Atlas of vernacular architecture of Bohemia, Moravia and Silesia (basic inventorial survey), Detailed inventorial survey of the National Park of Dyje Valley (Thayathal) and of the Litomyšl – Vysoké Mýto region). These projects covered the needs of the basic types of surveys:

- inventorial surveys of whole districts or regions elaborated at scale 1:5000
- surveys of villages or towns, their historic centres or parts of settlement (methodology used also for the conservation areas) at scale of cadastral maps 1:2880 - 1:1000
- detailed analytic historic structures surveys of buildings elaborated at scale 1:100 - 1:50 (1:25)

2. GIS OF PROTECTED AREAS AND IMMOVABLE CULTURAL HERITAGE OF CZECH REPUBLIC (paGIS)

2.1 Data model

The basic principles of the data model developed for these surveys were subsequently used in the design of the existing data model of the geographic information system of protected areas and immovable cultural heritage of Czech Republic (paGIS), which since 2006 has become one of the essential elements of the Integrated Heritage Information System (IISPP (<https://iispp.npu.cz>)).

This data model is based on unique geometric parts of features with data needed for thematic analysis stored in the internal attribute or relational tables (figure 1). This means in other words, that the elements necessary for various thematic maps and analysis need to be constructed (apart from the necessary updates) only once, that significantly simplifies data management. All the information necessary to identify the feature and thematic analysis are stored in their thematic component.

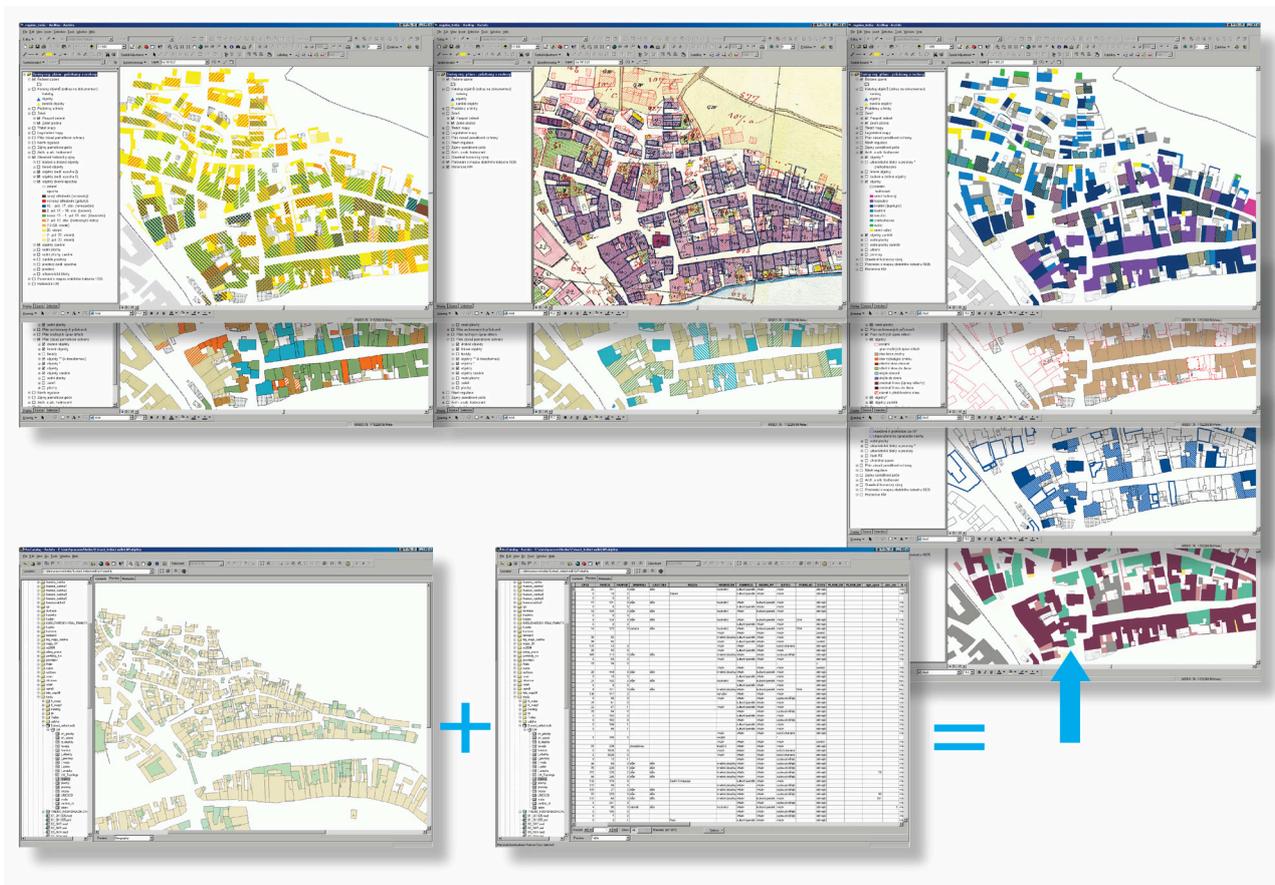


Figure 1: Catalogue view of the feature class of buildings with thematic maps generated from its attributes; example of the survey of Třebíč

For the purpose of the historic structures surveys and inventories they can be divided into:

- identifiers - identification of features, which allows basic searching and creating relationships with external databases (land registry, register of Czech cultural heritage)
- basic descriptive part – construction stages and actors, architectural and urban evaluation, existing conditions,...
- temporal part: construction history, comparison with historical maps and plans, changes, transfers and extinction of objects
- relational part: description of nonspatial relationships, in which feature enters with other spatial objects, identification of logical units (ensembles - of buildings and open spaces, which have a complementary relationship)
- regulation part: maintenance requirements, recommendations for any proposed work based existing conditions and preservation objectives
- quality part: accuracy of geometric and thematic components

Unlike older GIS projects, when GIS was disintegrated into parts corresponding to each cadastral territory, current projects use the opportunity to create a seamless datasets of the whole country, which was enabled by the dynamic development of software tools for creating GIS in recent years and the transition from file to stored data to geodatabases. Seamless data sets of the entire territory of Czech Republic in such cases as paGIS are an essential prerequisite to ensure uniform representation of GIS data and are important for facilitating their management and updating.

Heritage and historic surveys and inventories GIS data naturally have their specific and it was an important decision, which data have to be created as a seamless and which may or must be separated. Seamless immovable heritage GIS data (regardless of whether they are protected or not) with defined topological rules for feature class subtypes are stored in the basic dataset A1 of the central geodatabase. Feature class A1 can be divided into logical ancillary data sets (figure 2):

- Evid_ - register of check-outs and cut-outs of the dataset A1 (spatial parts of the datasets for processing by regional editor(s) with basic metadata necessary in case of editing of the seamless datasets)
- Graf_ - graphical symbols (compositional axis, posts,...), dimensioning,....
- Obj_ - objects (man made object and object of the cultural landscapes)
- ObjUrb_ - elements of urban structure
- Ochr_ - spatital identification / extents of the cultural heritage units of the registr of Czech cultural heritage (list of cultural monuments, conservation areas, protection zones, buffer zones of listed units and objects and sites of cultural heritage interest)
- Rev_ - revision of the spatital identification / extents and borders of the cultural heritage units of the registr of Czech cultural heritage
- Prac_ - working and unverified data

For completeness, we should add that the datasets stored in the central geodatabase contain also other data developed in the cultural heritage field and external data necessary for creation and analysis of the heritage data:

- heritage data at scale of topographic maps at scale 1:10 000 - 1:25 000 (archaeological data)
- purpose digital cadastral and topographic maps necessary for the creation of specialized data
- historical maps and ortophotomaps
- identification data sets – spatial identifiers used within the IISPP (databases of all IISPP applications and modules obligatory use these identifiers for the spatial identification purposes)
- reference data sets (a system of administrative and territorial registration elements of the Register of Enumeration Districts of the Czech Statistical Office) serving for the generation of the spatial relations with

the identification data sets.



Figure 2: View of the A1 dataset and its basic feature classes (man made objects, cultural landscape objects, elements of urban structure, spatial extents of the cultural heritage units); example of Uherské Hradiště

2.2 Thematic map projects

The paGIS data are be visualised for the consultation and analysis use by thematic maps for ArcGIS Desktop (ArcMap and ArcReader) and internal and public web mapping projects, that are available at the map portal of IISPP <http://gis.up.npu.cz>. These map projects include:

- Basic overview map for conservation specialist
- Cultural heritage protection and objects of interest
- Historical urban and village settlement and its identification in CZ-Retro database
- Historical maps (second military survey and so called stable cadastre)
- Comparative analysis of stable cadastre maps
- Historic structures analysis
- Architectural and urban evaluation
- Evaluation in terms of spatial planning
- Urban heritage evaluation of historic towns and villages. (Thematic map based on the methodology of “Principles of urban heritage protection”)
- Survey of historical urban and village settlement - Protection and evaluation plans
- Survey of historical urban and village settlement - Plan of protection and evaluation of roofs.

3. IISPP SPATIAL IDENTIFIERS

The GIS is not only used to inventory and analyze, but it offers the unique spatial identifiers for other databases of IISPP (e.g. MIS (http://iispp.npu.cz/mis_public) - system for the management of the digital and digitalized documentation, that is used also for the storage of the GIS data, that could not be included in the seamless datasets of Czech Republic, and the other databases planned for integration such as InList – list of unmovable and moveable cultural monuments, conservation areas and protection zones and objects and sites of cultural heritage interest). Thanks to unique spatial identifiers the visualization of the documentation stored in MIS is possible in GIS map projects and MIS can benefit from spatial analysis tools of GIS.

The interoperability with other institutions is provided by public web map services (http://gis.up.npu.cz/tms/ows/wms_uzident/ows.php) and mapping projects, that enable the use of the IISPP spatial identifiers:

- Spatial identification for public access (http://gis.up.npu.cz/tms/npu_uz/index.php?)
- Spatial identification for internal use of the National Heritage Institute

Both of these mapping projects enable besides the access to the spatial identifiers of the Czech Heritage Integrated Information System (IISPP) also the consultation of the documents (photographs, map, plans, reports...) linked to theses identifiers and stored in Metainformation System of IISPP.

The uniform standard of spatial identification of IISPP recognizes actually two levels:

- Definition points of paGIS objects with the unique identifier IDOB_PG (definition points generated primarily from the datasets of buildings with so called “descriptive number” of the Register of Enumeration Districts (RSO) of the Czech Statistical Office (CSO) and gradually complemented by other objects of interest such as churches, chapels, crosses, sculptures, elements of cultural landscape etc.). Data for a still missing items or repair of existing definition points are collected also through other IISPP applications (MIS), where users can enter coordinates X, Y (in the coordinate system S-JTSK) of the definition point the creation of which is required. These coordinates are visualised in the spatial identification map projects until a proper definition point is created.
- Definition points and polygons of historic localities (eg town, village, hamlet, their parts and quarters) with the unique identifier KOD_CZ. These data sets were created and are managed in collaboration with the SOVAMM association and its database CZ_RETRO developed by Karel Kuča (http://sovamm.wz.cz/o_kodech.htm).

These identifiers are through the spatial relationships joined together with attributes of GIS data of the Czech Statistical Office, so that the applications of IISPP obtain all actual spatial identifications (address, land area, cadastre, municipality, district, region etc.).

In last few years the identifiers were use in several inventory projects of NPÚ for generating of interactive maps with the documentation stored in MIS:

- Architectural heritage of the 19th and 20th centuries
- Historic urban heritage survey and documentation (figure 3)
- Historic vernacular heritage survey and documentation
- Our Lady, Trinity and Other Saints' Columns and Pillars

The users of IISPP can participate in the development of these specialised maps by simply storing their documents in MIS and completing their metadata according to the inventory requirements.

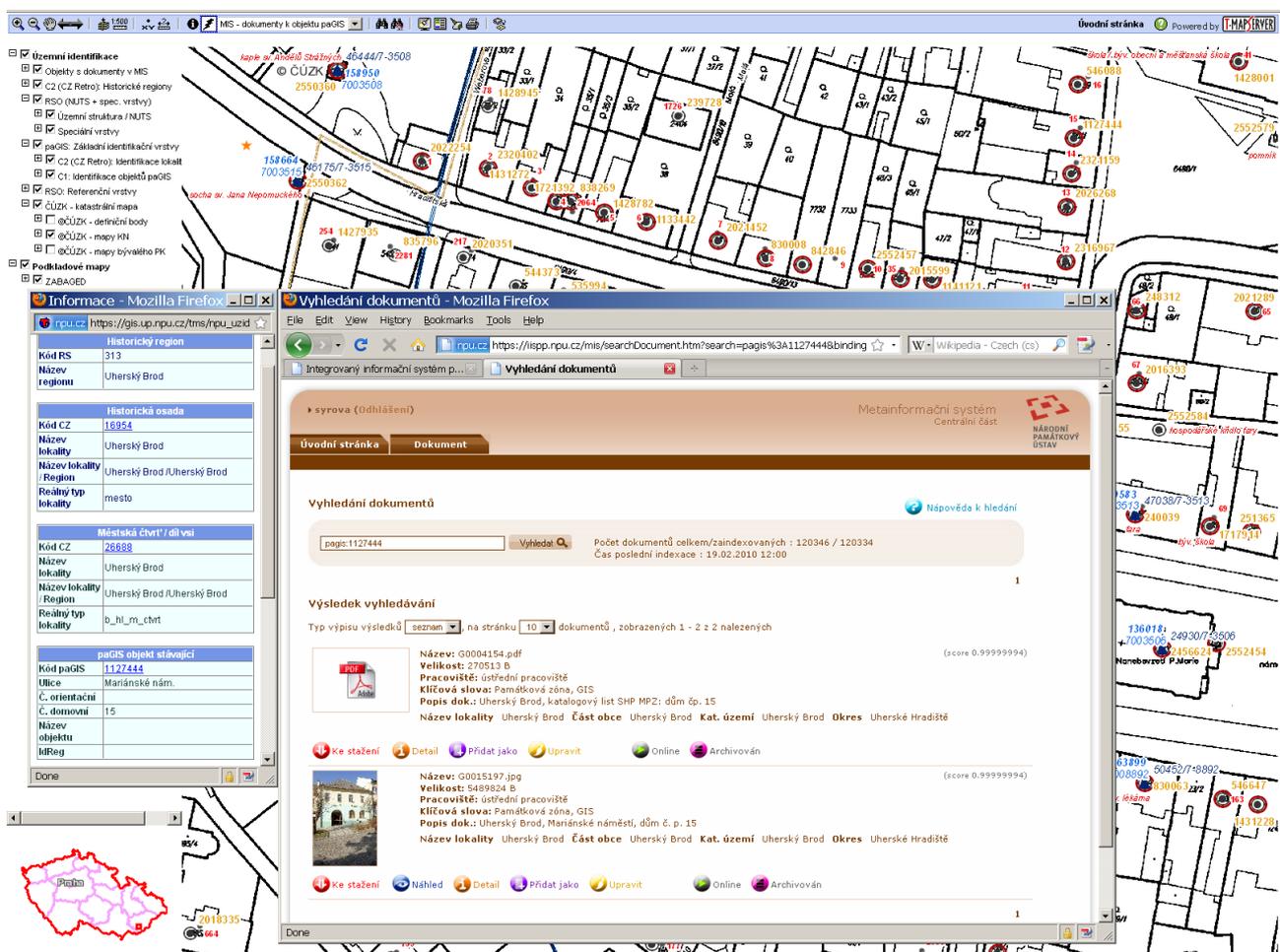


Figure 3: Historic heritage survey map project with hyperlinks to the documentation stored in the Metainformation system of IISPP; example of Uherský Brod

4. IISPP AND ITS FUTURE

A project of creating Integrated Heritage Information system (IISPP) was launched in 2006. It is built with the support of the Ministry of Culture under the research project of the National Heritage Institute No. MK07503233301. It is aimed to institutional users and also private users, who are involved or interested in the cultural and historical heritage, on national scale.

Its principal aims are to:

- store all types of existing and newly acquired data in one central data repository to ensure the security and

redundancy,

- create custom applications to enable effective use and continuous updating of stored data in a single development environment, with the possibility to define different levels of access to data for internal and external users including the public, ideally via Internet

- create methodologies and standards for the management, development and use of this complex system.

The system has a web interface which can be accessed by registered users after inserting a user login and password. Access to the public parts of IISP is not limited.

Data entry and consultation take place by connecting to a web browser without installing any software. Special software (ArcGIS) and workflows are used only for the creation of the heritage GIS data.

The modules (subsystems) actually fully integrated in IISPP are:

- heritage geographic information (sub)system (paGIS)
- metainformation system (MIS)

The integration of the important module of the central register of Czech cultural heritage and archeological information (sub)system (ISAD) is prepared. Actually the disassociation of the central register of Czech cultural heritage and its descriptive databases is probably the biggest problem of IISPP. In addition we expect the connection of IISPP to the so called national authorities.

In paGIS we plan the creation of detailed survey and documentation seamless datasets and multilingual versions (also in the context of the elaborated GIS documentation of the World Heritage in Czech republic).

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