The management and data distribution system of the *Hydrogeological Map of Poland 1 : 50,000*

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A b s t r a c t. The Hydrogeological Map of Poland (HMP) in 1:50,000 scale is an Intergraph technology based project. The HMP database and its interfaces updating process was initiated in the year 2002. To make the project work a software environment was built to enable the execution of all tasks in the HMP's sheet setup: import of vector and raster data, data verification (graphics and attributes), translation of GIS data into cartographic format, map printout and data storage. With the completion of the data collection process, the data management phase is to be initiated: data updating, addition of new information layers and distribution activity. These tasks will be run on the catchment and administration units basis. The paper is aimed to present these software solutions.

Key words: hydrogeology, data base, geographical information system, hydrogeological map, cartography

Compiling the *Hydrogeological Map of Poland in 1 : 50,000 scale* (*HMP*) is a project initiated back in 1996. It is one of the first projects of this magnitude, that assumed creation of the cartographic (printed) version of the map on the basis of topologically correct GIS data (*Instrukcja...*, 1999). In the 1990s it was an innovative solution, given that most maps were then created by "drawing the map on monitor screen". The *HMP* Project is realised in the Intergraph technology, with specially created environment for all necessary tasks, i.e., entering vector and bitmap data, data verification (graphic and attributes), resymbolizing GIS data to cartographic format, map printing, data storage, etc. In 2002 compilation of the last set of maps began, so that the hydrogeological map will soon cover the whole area of Poland. Simultaneously, the updating of collected data will begin. The presently used HMP technology is focused, as initially assumed, on data input and verification and on printing of a cartographically correct map sheet on paper. When the data collection is completed, the focus will shift towards data management and updating (including addition of new information layers), as well as the distribution of information. Therefore, it is necessary to start modernizing the HMP database and its interfaces. This would enable adapting the current tool environment to new purposes. Modernizing the HMP environment is a complex and long-term project, so it has been thoroughly planned. Its concept (*Ogólna koncepcja modernizacji*, 2002) is outlined below.

Aims and assumptions of the hmp modernization

The major goal of modernizing the *HMP* is to create the basis for a national Hydrogeological Information System, scheduled to become the principal spatial database for the Polish Hydrogeological Survey. The modernization assumes shifting the concept from a map, towards a GIS object database. Main aims of modernizing *The Hydrogeological Map of Poland (HMP) in 1 : 50,000* scale are as follows:

1. Verification and updating of the collected *HMP* data;

2. Creation of a spatially continuous hydrogeological database;

3. Creating a modern GIS-based environment for data management;

4. Developing mechanisms of data distribution;

5. Creating procedures and tools for updating the hydrogeological database;

6. Improving the attractiveness of the map and database for users.

Of many basic assumptions used in planning the *HMP* modernization, most important are:

1. *HMP* modernization should be a continuation of work began in 1996.

2. Modernizing the system will take into account the experience gathered during development and exploitation of the current *HMP* system and similar GIS systems operated in Poland and abroad.

3. The architecture of the modernized system will enable stepwise implementation, with new information layers added successively, as the import of updated data will allow, while the system will be fully operational, offering all functions for the partial data subset at any given moment.

4. The new data management environment (GeoMedia) will be compatible with the current environment (MGE) at the tool level.

5. Creating new environment for the MHP data management and processing will improve the efficiency of hydrogeological data management by the staff of the Polish Geological Institute.

Scope of modernization

Geographic coordinates. Because the hydrogeological database is to be spatially continuous countrywide, it has been decided, that the coordinates of objects in the new base will be given in the national flat rectangular grid known as the „1992" coordinates system. The „1992" system has been chosen mainly for two reasons:

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❏ It allows storage and display of objects from the whole territory of Poland within a single projection zone;

❏ The Proclamation of the Council of Ministers of 8th August, 2000, on the national spatial reference system, specifies in § 3 point 4 that the national spatial reference system is based on "flat rectangular grid designated with the symbol „1992" used in official maps in scales 1 : 10,000 and smaller".

The hydrogeological data stored in the „1992" system may be also distributed in other coordinates systems specified by the HMP team.

New data classification. The *Hydrogeological Map of Poland 1:50,000* began as a cartographic project with elements of GIS. The data categories were organized mainly to facilitate collecting data for mapping purposes. Modernizing the *HMP* managing system is intended to shift the focus from the map and cartography towards the database and GIS. Thus, there arises the need to modify the classification of hydrogeological data, currently constituting the map contents. The new systematics should first facilitate the data analysis, as the original one was oriented on facilitating data collection. The main assumption for creating the new data classification is the need to aggregate *HM*P objects and expanding the range of their attributes.

Developing procedures of data transfer to the new structure. The *HMP* data from projects prepared in the MGE will be transferred into the new database structure. The data will be processed with GeoMedia, GeoMedia Professional and GeoMedia WebMap software. Information on geometry of the objects and their attributes will be stored in Oracle database using object-oriented data model. The data will be spatially indexed using mechanisms of Oracle Spatial. The process of data transfer will be automated. Functionality of applications for data conversion will enable transfer of multiple datasets at once, with simultaneous control of the correctness of the transferred information.

Verification of sheet contacts, merging neighbouring objects. The data to be transferred into the new environment (GeoMedia and Oracle) will be first verified according to procedures used in the *HMP* project. The verification of data includes: topology check, checking correctness of object acquisition, checking database coherence, checking agreement between attributes and glossary. After transfer into the new structure, the contact zones between neighbouring sheets will need checking and correcting any potential errors. The procedure of checking and geometry correction of the border objects will be automated. After matching the adjacent sheets, objects with the same characteristics will be automatically merged.

Building the *HMP* data management environment. Data management will require proper IT tools and efficient technical infrastructure: servers, workstations, communication networks and peripheral devices. The management system of *HMP* will be modular. Most system functions (data input, verification and integration, analysis, distribution) will be available as standard functionality of the implemented software tools. To ensure proper operation of the specialized system, in particular cases, special dedicated application will be created. Writing such applications will be always preceded by preparing a functional project and prototype. The functionality of the GIS system implemented for the *HMP* will ultimately enable fulfilling all necessary tasks related to:

❏ Data collection and updating;
❏ Data verification;
❏ Data management and distribution;
❏ Metadata module operation.

Maintenance of the metainformation bank. Already at the stage of entering first data into the system, it is necessary to begin creation of a metainformation bank, which will hold "labels" of all information stored in the hydrogeological database. The labels will include basic information characterizing the data: data type, format, resolution, update status, location, etc. The metainformation base will be an integral part of the GIS base, appended during addition of new data or updating the existing information.

Data distribution. The way of distributing information from the hydrogeological database will be the topic of a future projects related to the HMP modernization. The data will be distributed in various ways, including the following:

❏ distribution of the *Hydrogeological Map of Poland* (*HMP*) *1 : 50,000* in traditional format (plotter printout of map sheets);

❏ distribution of the *Hydrogeological Map of Poland* (*HMP*) *1:50,000* in electronic version (map sheet offered as a GIS project in a selected GIS format);

❏ distribution of any data range (selected information layers), for any area (in electronic or traditional format);

❏ distribution of selected data via intranet/Internet;

❏ distribution of new types of maps in each format (e.g., Map of hazards to the major aquifers, containing only selected information layers.

The data distribution in the intranet will use a specially designed webpage within the internal network of the Polish Geological Institute, and then in the open access site. The functions available through intranet sites will allow browsing the *HMP* databases without dedicated special software (only with internet browser, such as Microsoft Internet Explorer). The following operations will be available:

❏ Information display without specialized processing;
❏ Simultaneous display of vector and bitmap information;
❏ Search and on-screen visualization of objects according to their attributes;
❏ Search and map visualization of objects using spatial operators;
❏ Interactive topical maps (zooming, moving, fitting, etc.);
❏ Browsing reports and datasets;
❏ Printing maps, datasets, reports;
❏ Other.

References

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