

## Geoenvironmental Map of Poland, 1 : 50,000 scale

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The Polish Geological Institute gathers information on geological environment since decades. A best example of their usage is provided by detailed geological maps in 1 : 50,000 scale. Since several years a GIS cartographic study in 1 : 50,000 scale is compiled as the *Geoenvironmental Map of Poland*.

Let us begin with presenting the origin and assumptions for creating such a map. Planning and land management according to the policy of sustainable development requires that government and self-government administration at all levels (national, regional and local) has access to reliable and up-to date information on the environment. In Poland, administration units are obliged to periodical (every four years) producing plans for environment protection, waste management, monitoring various elements of the environment, ecological overviews, issuing administrative decisions, e.g., mining permits, investment permissions, etc., and all these actions should be based on robust geoenvironmental data. Besides, the information on the environment should be available to the society during procedures of environmental impact assessments, especially in case of administrative decisions pertaining to investments causing concern of local communities.

Another crucial requirement for an information system is that it should be easily comprehended. The information should be useful both for professionals and for other people of different background, who need the information for administrative actions, investment decisions or education. Therefore, part of the information should be available in processed (valorised) form; e.g., in case of soil and ground pollution, most users do not need the actual content of particular chemical elements or compounds, but just want to know, whether the amounts exceed allowable levels.

To be of practical usability, the data in an information system should be up-to-date; data on some elements of the environment are best updated annually, even though the

system is not intended to present current data on-line, as in the case of monitoring stations.

Given the above assumptions and the Institute's experience, it has been decided that the best solution is to produce a map, based on modern GIS technology. It has been titled: *Geoenvironmental Map of Poland* in 1 : 50,000 scale (*GMP*). The map is made digitally, and in fact is a geoenvironmental database (*Instrukcja...*, 2002, 2005). It is routinely printed in two sheets:

Sheet A — information on nature resources of the environment.

Sheet B — hazards to the land surface.

The information included in Sheet A belong to four major categories:

- Mineral resources, their mining and processing,
- Surface and ground waters,
- Parameters of building substrate,
- Protection of nature and historical monuments.

They include such detailed topics as: perspective and prognosed occurrence of mineral resources, management and classification of mineral resources, actual and potential hazards to natural environment due to their presence, exploitation and processing. Another group consists of selected hydrogeological elements related to protection of surface and ground waters, monitoring of surface waters, mineral and thermal waters. Within the thematic group „Parameters of building substrate”, the conditions are categorized into convenient and inconvenient (i.e., making construction difficult), as well as the hazards of flooding, landslides and mining damages are indicated. The fourth group presents protected natural objects and areas (including soils, forests, national and landscape parks, areas of protected landscape, areas of European Ecological Network Natura, 2000, etc.).

Detailed information on mineral deposits (legal status, parameters of the mineral resource, method of exploitation, environmental conditions of exploitation), is entered into a deposit database available from the graphic level of the *GMP*.

Sheet B includes two major thematic levels: „Geochemistry of environment” and „Waste storage”. The first presents processed PGI data on geochemistry of soil and freshwater sediments (Sikorska-Maykowska & Strzelecki, 2001). The map shows: location of sampling points, pollution of soils with heavy metals, radioactive elements and organic compounds, heavy metal pollution of freshwater sediments, intensity of radon emissions. Soils at sampling points are classified into four categories according to their usage in land management:

□ A — standard for protected area according to the Water Law and nature protection laws

□ B — standard for agricultural lands, forests, woodlands and shrubs, idle land, built-up and urban areas

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□ C — standard for industrial, mining and communication areas

□ areas with exceeded limits for group C

The other layer (Sikorska-Maykowska et al., 2003) shows areas suitable for locating waste storage facilities due to local geoenvironmental conditions. The most important criterion is the presence of low-permeability natural insulation layer, with proper filtration coefficient and thickness. Also shown are areas where the law forbids locating any waste dumps.

The areas and sites indicated in the map as predisposed for storage of particular types of wastes should be regarded as a basis for future variant location projects and for planning relevant geological and hydrogeological research. According to the Enactment of the Ministry of Environment on detailed requirements for locating, constructing, exploitation and decommissioning of particular types of waste dumps in areas of planned waste storage and its surroundings, it is obligatory to perform geological and hydrogeological studies resulting in producing, engineering-geological and hydrogeological documentation, attached to the application for providing decision on building and land management conditions for waste storage sites.

The suggested areas should be also taken into account when choosing location of other investments than waste storage sites, because the indicated areas fulfill general requirements of Polish law concerning environmentally nuisance objects; the areas have high or very high resistance to land surface pollution.

The main goal of the *Geoenvironmental Map of Poland* is to provide a tool for government and self-government administration at regional (voivodeship = province) and local (gmina = community) levels, to be used when making decisions on environmental management. Therefore, the whole subject matter is treated with reference to current environmental protection law, Water Law, Geological and Mining Law, Act on Spatial Planning and Land Management, Waste Disposal Law, and many enactments pertaining to those legal acts.

Parallel to enhancing the information content of the *GMP* the technical process of map-making and its user-friendliness are constantly being improved.

As mentioned above, the *Geoenvironmental Map of Poland*, is made digitally and constitutes a geographic information system. The *GMP* is managed in the Modular GIS Environment provided by the Intergraph software company. This environment allows input, edition and archiving of spatial data, and cartographic editing of the

digitized material. The spatial data represent real-world object registered in the system, together with associated descriptive information. The objects are registered as vector-based entities and saved in graphic files in dgn format. The files are stored in workstations. The descriptive information associated with objects is stored in an Oracle 9.2 database server. There is also an option of storing the descriptive information in MS Access format and keeping them together with the graphic files (without the need to use a database server).

The *GMP* resources are divided into twelve topical categories:

- mineral resources
- mining
- processing of mineral resources
- surface waters
- groundwaters
- terrain cover and land use
- protected objects
- protected areas
- seashore
- administration
- waste storage
- geochemistry.

Managing the *GMP* data involves mainly data input (digitizing and coding), verification of the data and cartographic editing. The data are entered in a sheet system. Source materials are worked upon within sheets in 1: 50,000 scale, in the 1942 projection.

The data are then processed for enabling access via a WWW site. Currently, data on five provinces are available: Lower Silesia, Opole, Silesia, Małopolska and Łódź voivodeships. The data processing involves merging data from individual sheets into continuous databases extending over the area of a whole province. The website provide access both to the continuous databases and to the base divided into sheets.

## References

- Instrukcja** opracowania i aktualizacji Mapy geologiczno-gospodarczej Polski w skali 1: 50 000, 2002 — Państw. Inst. Geol. Warszawa: 1–96.
- Instrukcja** opracowania Mapy geosrodowiskowej Polski w skali 1:50000, 2005 — Państw. Inst. Geol. Warszawa: 1–117.
- SIKORSKA-MAYKOWSKA M. & STRZELECKI R. 2001 — Geochemia środowiska — propozycja nowej tematyki na Mapie geologiczno-gospodarczej Polski. *Prz. Geol.*, 49: 698–701.
- SIKORSKA-MAYKOWSKA M., STRZELECKI R., GRABOWSKI D. & KOZŁOWSKA O. 2003 — Składowanie odpadów — propozycja nowej tematyki na Mapie geosrodowiskowej Polski. *Prz. Geol.*, 51: 308–310.