Significance of geological cartography in priority problems of engineering geology

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A b s t r a c t . The top-priority trends of research in the field of geological engineering presented in the article have been developed in reference to the relevant policy for the years 2004–2010 accepted by the Polish Ministry of the Environment and the Geological Engineering Documentary Commission sessions' discussions. The analysis of the above mentioned materials shows that main and, at the same time urgent tasks are to gather geological engineering data in the integrated, geospatial databases and to execute cartographic studies necessary for the needs of spatial management and forecasting the environmental changes caused by investment processes. Data concerning evaluation of nationwide hazards of natural and anthropogenic processes should be included in such databases.

Concurrently, as a part of adapting Polish legal standards to those of the European Union, it is necessary to prepare regional correlational dependences for the geological engineering classification of main types of lithogenetic soil and rocks covering regional geological variability of Poland in the subgrade and bedrock evaluation.

It has also been highlighted in the article that of crucial importance is fast drawing up the rules and methods of documenting geological engineering conditions for building waste disposal sites, marine hydrotechnical structures, mines and other structures shutdown, as well as educating people involved, promoting the role of geological engineering studies in the proper course of investment processes and the necessity of undertaking appropriate legislative actions in order to obtain a systemic placement of such studies in the investment processes.

Key words: *geological-engineering, cartography, geospatial databases*

In the broad domain of geology, engineering geology plays a characteristic role. It thoroughly uses certain elements from many fields of geological knowledge in order to put forward optimal engineering solutions compliant with the modern requirements of urbanization, raw material and space development and protection of the environment.

Geological-engineering research must therefore be considered a diagnosis of geological factors which decide about optimal exploitation of engineering techniques and minimization of negative influence on investment would have on geological environment. It should also serve as evaluation of existing and future transformation of natural space in works connected with spatial planning as well as local land development. Hence, they play an important role in long-term planning and investment decision-making nationwide and local decision-making following the current needs of state economy.

Although not all, some aspects concerning the necessity of conducting geological-engineering research are normalized by appropriate legal acts. Those are mainly the regulations of the geology and mining law, and connected with it the rules of the Minister of Environment. In accordance with these acts the geological-engineering research constitutes an indispensable element which initiates the whole process of preparing an investment.

In order to deal with the vast development of urbanization, raw material exploitation techniques, construction industry, decreasing land resources and requirements regarding protection of natural resources and the environment, the strategy of geological-engineering research should be consistently directed at prognostic action and control of accuracy of applications during design works for space development, protection of the environment and deposit exploitation in all investment activities.

In such conditions it is crucial to integrate efforts of the government, self-governments and various levels of administration authorities to comprehend the important role of the geological-engineering research at all stages of investment decision-making within the scope of:

- ❏ spatial development in the country;
- ❏ protection of the environment, especially protection of the surface of the Earth (lithosphere);
- ❏ analysis of conditions of raw mineral deposit exploitation;
- ❏ completion of construction investment.

It is the correct evaluation of the geological-engineering conditions that defines costs and guarantees the success of investment actions and the minimization of interference with the environment in accordance with carefully laid plans of space development.

However, meeting those requirements is possible only when integrated geological-engineering databases and regional cartographic prognostic analyses are created. This involves significant budgetary expenditures. Nevertheless, gradual work on setting up an appropriate information database that shall focus on national engineering geology should be a basic element in the strategy of development of engineering geology.

Among research on engineering geology to be conducted in the years 2004–2010, defined by the Ministry of Environment as priority and requiring budgetary expenditures, following issues have been raised:

I. IT implementation — first of all, it is seen as clearing backlog in the geological-engineering data sorting through creation of regional and central databases, indispensable

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for the purposes of geological-engineering cartography, monitoring the pace of changes in the field of geology, geological-engineering documentation and local investment decision-making as well as satisfying the needs of spatial planning.

II. Predictions and evaluation of adverse natural and anthropogenic geological-engineering conditions, dangers of landslides and floods, therefore creation of an information system dealing with endangered areas locally, regionally and globally, which would be crucial to carry out tasks resulting from the needs of construction industry, protection of the environment and means of remediation of transformed or degraded areas.

III. Preparation of appropriate legal regulations aiming at acquiring full control over professional licenses, the formality of documenting and reinforcement of the geological-engineering system in the government and self-government administration and relations with appropriate European Union bodies.

IV. Geological-engineering cartography, which is comprehended as a source of information about land in layer aspect, integrated with a geospatial database system.

V. Classification and synthetic evaluation of parameters of rocks and soil considering the regional aspect of geological changeability of Poland, in connection with modern classification and indexing systems, recommended for the purpose of assessment of geological-engineering conditions by examples of worldwide application and standards set by the European Union.

VI. Educating participants of various stages of investment processes through giving detailed executive instructions, recommendations, methodical analyses and cooperation between institutions.

Some elements of those issues are already being implemented in compliance with decisions made by the Minister of Environment (Drągowski, 1997; Frankowski, 2000).

However, the analysis of implementation of the tasks and the discussion within the community point that the level of implementation is not satisfactory. Moreover, a **proper IT system** gathering data and transferring it to recipients must play a central role in development and implementation of geological-engineering research results for practical applications. Engineering geology is immeasurably delayed in this field. Lack of a geospatial IT system concerning engineering geology has a negative influence on the fulfillment of its other tasks, because when there is no data flow between institutions, it results in, e.g., incomplete analysis of regions endangered by geological-engineering factors, lack of a system of parametric evaluation of rocky or soil land based on geological factors, as well as inadequate control of the compliance of construction decision-making with principles of interpretation and geological-engineering knowledge.

As for training, the lack of modern geological-engineering information transfer systems has a negative impact on the possibility of effective cooperation between investment process participants of various specialties as well as on integration of efforts concerning legal regulations that aim at reaching optimal solutions for space and natural resources development and the economic aspects of investments.

IT implementation

Easily accessible information on an area is a basic element in modern engineering geology. Therefore, it is crucial for the completion of an investment process that databases are used as early as during the preliminary stages of decision-making, which gives a possibility of analyzing geological-engineering conditions at a level allowing the investor and a future contractor to make the right decisions about space development, proper placement of buildings, minimization of damages inflicted on the environment and the economic aspects of investment. As for priorities, it is important to define the range and the system of gathering geological-engineering information in regional databases and the rules of cooperation with Central Geological Database (CGDB), where a block of data on engineering geology has been created with a determination of access to information.

This is vital because during the stages of planning and documenting geological-engineering research the discrepancy between the actual knowledge and solutions that are applied grows. It is mainly a result of transferring the competence of bodies responsible for approving research plans and geological-engineering documentations to lower levels of state administration. The economic aspect of risking a breakdown or losing a possibility of implementing an innovation, a cheaper solution resulting from a detailed geological-engineering analysis is not always appreciated there. Also, according to the theory of planning by Bieniawski (1992), the optimal engineering solution should be based on a philosophical assumption of Yoshikawa (Fig. 1) and begin with a detailed description of real conditions and phenomena (R), transformed into a synthetic concept of planning parameters selected for a given purpose (K), which, in turn, through applying appropriate laws of logic (L) shall serve in creating a new, real object in a process of investment (Pinińska, 2003). This idea, however, also seems remote. Simplifications influence the whole continuation of the planning process, especially during the first stage of gathering data about the geological environment.

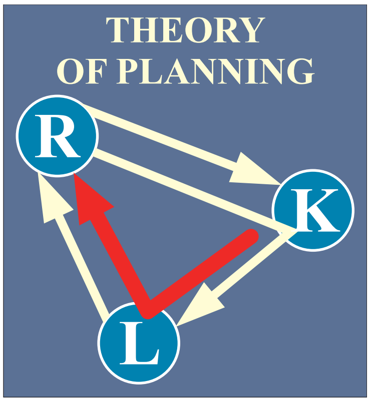

Fig. 1. Planning process according to the concept of Yoshikawa after Bieniawski, 1992 (Pinińska, 2003)

Databases located in an appropriate system of gathering geological-engineering information, with pre-selected clusters of information, are therefore an important element of planning process. Concurrently, data resources may be

Fig. 2. The Town Council of Pisa stated: As you can see, thanks to savings on geological-engineering research, a remarkable piece of work has been created

selected on purpose, and not at the basis, thereby curtailing and simplifying the path of transferring from elements of geological identification (R) to parameterization of features of a rocky and soil medium (K).

The data must, however, undergo geospatial integration through a system of geographical coordinates. This, for example, may be done by granting full access of the Geographical Information System (GIS) in the field of engineering geology and creating integrated databases. This shall allow cooperation in the field of data regarding subsoil and geological-engineering conditions with other databases associated with planning, over- or underground infrastructure, etc. It shall also facilitate making use of aerial and satellite pictures as well as a numeric model of an area for local construction work purposes.

The availability of information is the only way of stopping the negative tendency of economic limiting or even relinquishing of carrying out the geological-engineering evaluation, forecasts of geodynamic processes, natural and anthropogenic dangers for purposes of local investments (Fig. 2).

Geological-engineering cartography

Geological-engineering analysis of natural and anthropogenic processes is most often of local and not regional character. For this reason it is necessary for planning needs to obtain a reliable, uniform image of the conditions of the environment after applying methods of modern cartography. The advantage of those methods is a possibility of presenting local geological-engineering factors in any thematic configuration and regional context. Numeric processing, which is an indispensable tool in modern cartography, makes it possible to obtain multi-version solutions and finding most beneficial planning options.

Thus, starting at the stage of spatial planning it is necessary to highlight areas characterized by various levels of conflict with the environment and to calculate their values. This is impossible without performing a geological-engineering indexation of investment areas based on predictions of changes in the geological-engineering conditions. The success of those solutions and their proper preparation for investment processes depends on the development of information technology and the national block of geological-engineering information in the CGDB framework.

It would also be purposeful to draw up maps of geological-engineering land usability. The maps would be a cartographic reflection of geological-engineering conditions defining the dominating geological factor in the highlighted areas, or factors with a given size of their influence on the cost of an investment and on the environment. It is the items shown on the map and gathered in a database that are an optimal source of information on a potential investment area and the natural environment.

A map of geological-engineering area usability should be a basis when preparing a study of conditions and directions of spatial development, a document which is necessary while preparing a local plan of the extent of spatial development in a district or a province.

Integrating of geospatial data with carefully chosen information items and creating geological-engineering maps and atlases on this basis will make it easier for state and self- government administrations to access information on an area while making various investment decisions.

On geological-industrial maps of 1 : 50,000 (GIM) geological-engineering aspects are presented. They do not, however include areas covered by protection of natural resources. The maps in this scale therefore do not include areas of mineral resources, protected nature (national parks, scenic parks or reserves), forest land and agricultural areas of classes I–IVa, grasslands on soil of organic origin, areas of greenery, densely built-up areas in large agglomerations, embankments, and parts of valleys protected in this manner. Because of the small scale of maps only two categories of areas are taken into consideration: favourable for construction work and unfavourable, which means the areas, where construction work encounters major difficulties.

For the level of local planning the requirements are set by a Thematic System of Regional Information (TSIR), which comprises the following units: management (administration, exploitation and area reserves, land ownership), infrastructure, surface waters, the atmosphere, geological-engineering unit with two information sub-units (construction foundation and underground water supply) and a sozology unit (contaminations, protected zones, ranges of repeating natural disasters and others; Instrukcja, 1999). They are not supposed to perform the evaluation on regional or larger scale. It should be mentioned, however, that they do constitute considerable progress in geological-engineering analysis and planning studies at a mesoregional (district) level. It is worth reminding at this point the first, even pioneer guidelines for geological-engineering indexation of land that were introduced by a traditional geological-engineering map (Łozińska & Stochlak, 1970).

The progress that has occurred in recent years and the continuation of works on creating a group for regional information for the needs of geological-engineering atlases and maps for cities and agglomerations of population larger than 100,000, and conducting research on new types of thematic maps which would include regional conditions of rocks and soil should commence in connection with regional development programs and national policies, because a map is still a clear and important data carrier and a means of presenting area information.

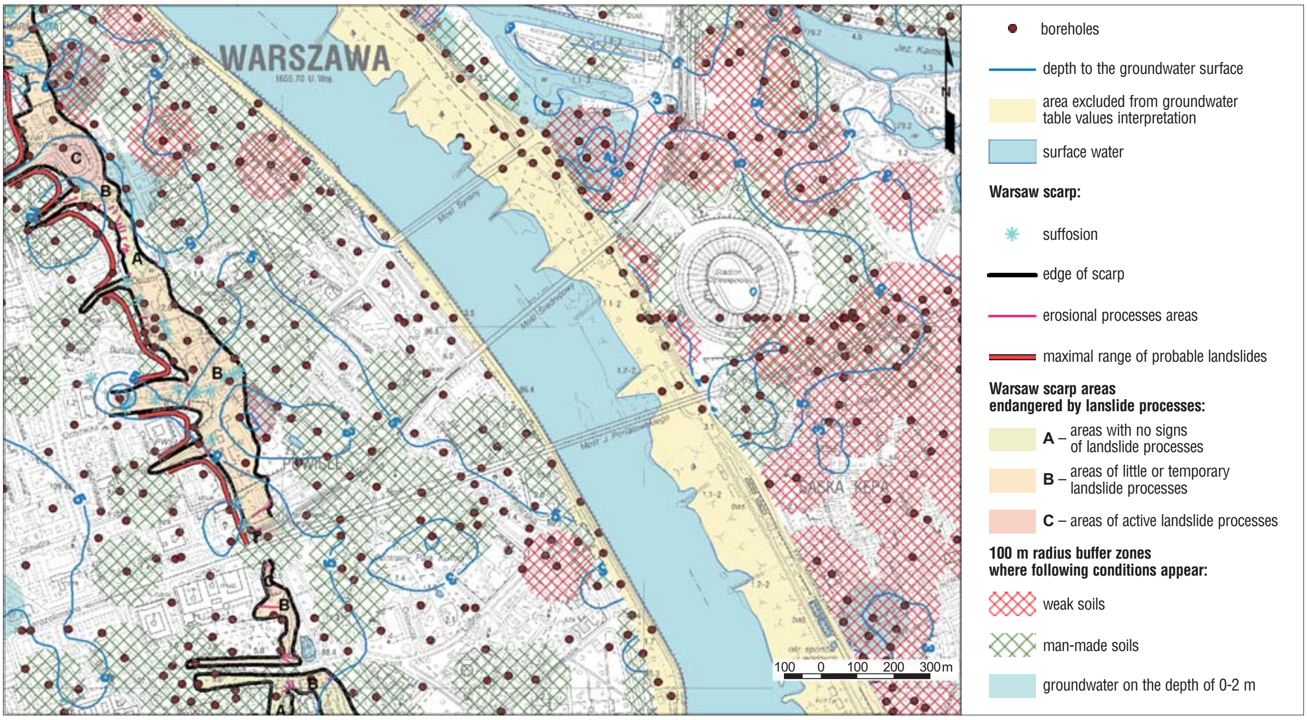

Fig. 3. Map of building conditions at 2 m depth

Geological-engineering atlases of Warsaw and Katowice agglomeration in 1 : 10,000 scale were a basis for improving the methodology of making atlases in the GIS system and geological-engineering databases. Fragment of the map of building conditions from geological-engineering atlas of Warsaw presented on Fig. 3. It is a significant trend in the development of the world engineering geology (Dai et al., 2001; Van Rooy & Stiff, 2001).

In Poland, however, the discipline of geological-engineering cartography is not developing fast enough. This is not only for economic reasons, but also because of the lack of awareness of its possible beneficiaries and the tolerance of existing regulations which do not oblige anyone to make preparations of this sort, but can be felt post factum, when disastrous social and economic effects of landslide and flooding hazards are irreversible.

Evaluation and predictions of changes of geological-engineering conditions. Legal regulations

The global tendency of preventing catastrophic phenomena helps to understand why in Polish conditions attention should be directed to landslides and floods and their tragic effects. Landslides that took place in the Carpathian Mountains in the years 1997–2000 and floods occurring on urbanized river terraces initiated legislative action and started numerous ways of registering hazards.

Appropriate entries have been introduced in legal acts. Concurrently, the creation of a bank of geological-engineering information on natural environmental dangers related to active exogeodynamic and anthropogenic processes has been started. By orders of the Ministry of Environment work on registering landslides occurring all over the country is in progress.

Geological-engineering hazards are important pieces of information about land. If a piece of information about hazards is not part of the database available to the investor or a decision-making authority it is often ignored. Although direct effects of a hazard are those of local character, the geological factors generating it reach much further than the local documentation area requires. Therefore, it is essential for planning needs to use digital images of regional character, obtained using new, effective and relatively cheap methods of modern cartography. Those methods depend on popularization of progress in IT data presentation. With the present techniques they allow the analysis of local geological-engineering factors in any configuration and any regional context selected by topic.

An extremely important element of geological-engineering assessment of the hazard scale of catastrophic natural and anthropogenic processes is, during the process of indexation of terrain for spatial planning purposes, to map them on the terrain safety margin, in other words, the area generating the given hazard.

The problem persists despite various regulations and instructions. It is only possible to find the definition of the size of an area which should be examined. Usually, however, putting the object in contrast with the whole hazard zone with reference to sources of regional hazards is not practiced and numerous construction disasters result from just this relinquishment of carrying out geological-engineering evaluation of surrounding terrain (Dobak & Pinińska, 2003).

There are many characteristic hazards and disasters as well as their traditional and not modern comprehension in comparison with the geological interpretation of the idea of moving from generality to details.

In case of structures situated on slopes, the whole slope should be subject to general assessment, starting at the bottom, going all the way up to its upper edge or ridge with special consideration for the possibility of an occurrence of an soil movement, erosion or an uncontrolled runoff during heavy rainfall (Fig. 4).

However, legal regulations concerning the supervision and the necessity of registering landslides as well as other geodynamic processes are still unsatisfactory, while those that do exist are not fully integrated with other regulations of construction law and laws concerning space development and protection of the environment.

The range of changes proposed thus far in legal acts and laws other than the geological and mining law includes indications of considering terrains endangered by "sliding of earth" (planning and space development act of 27/03/2003, OJ No 80 item 717; art. 15, par. 2, pt. 7 and pt. 9, art. 17, pt. 74 and art. 39, par. 3, pt. 6).

By the resolution of the Sejm (the lower chamber of the Polish Parliament of 8/01/2004 appropriate amendments have been introduced to:

- Environment Protection Act of 27/02/2001 (OJ No. 62, item 627);
- Agricultural and Forest Land Protection Act of 3/02/1995 (OJ No16, item 78);

which include indispensable actions preventing and limiting hazards to people and economy by surface earth movement. However, in the drafts of amendments to the above mentioned acts a colloquial term "sliding of earth" appeared, which is not used in engineering geology. The guidelines for fulfillment of tasks set in those acts drawn up as a regulation of the minister dealing with environmental issues, their preparation should be looked into more intensely.

There are now two main bodies monitoring the hazards of landslide, the Polish Geological Institute and the Stanisław Staszic University of Mining and Metallurgy in Cracow (Proc. Conf., 2004). This topic is also covered by works connected with international programs: International Union of Geological Sciences Working Group on Landslides (Popescu, 2001), the Polish Geological Institute Center of Excellence: Research on Abiotic Environment (REA).

However, geological-engineering research concerning other geological-engineering hazards such as hazards of karstic processes, degradation of areas (often local) of historical mining exploitation and abrasion of the shoreline of the Baltic Sea. It is worth remembering, though, that the fulfillment of tasks defined in *The strategy of protection of the Polish shoreline until 2020* shall require creation of accompanying hydrotechnical structures. It is therefore indispensable to simultaneously draw up the rules of geological-engineering documentation for marine hydrotechnical structures and in appropriate legal acts introduce entries dealing with the necessity of carrying out geological-engineering researches in the seashore area.

In accordance with the guidelines set by the European Union and *The principles of energy policy for Poland until 2020* the usage of renewable energy sources will increase in the coming years. A number of wind farms are planned to be built in the seashore area (territorial waters) and in other regions of the country. Building large wind power plants is a new problem in the field of their locating and determining their influence on the environment. It is purposeful to work out the guidelines for geological-engineering documentation for wind power plants on land and at sea.

In national flood control programs a strong stress is applied on increasing the retention of reception basins.

Fulfillment of these programs requires an appropriate resource base referring to the subject matter, in the shape of research-documentation works as well as instructions for preparing geological-engineering documentation for reservoirs of small and large capacity, considering the specific

Fig. 4. Aerial picture of a fragment of a landslide in Lachowice — 2000; aerial picture by M. Ostrowski (Ostrowski et al., 2003)

aspects of small hydroelectric energy (energy obtained from renewable sources). Documentation work should be correlated with a scheme on small retention, which has been started in 1997 and covers all the provinces in the country. Numerous floods of larger and smaller scale, which occurred on watercourses and tributaries in the 2001–2002 period, point to the continuous relevance of the "small retention" scheme.

An important topic that needs analyzing is an assessment of the influence of existing reservoirs on various aspects of the environment. Hydrotechnical facilities often cause significant changes to natural conditions in their surroundings, among others a rise of underground water surface, flooding, initiation of landslides, etc. Preparation of a synthesis of geological-engineering problems that occurred during the building and exploitation of reservoirs shall be a basis of assessing the conditions of those facilities and defining the directions of their further exploitation. The experience gathered shall also allow drawing up predictions of the influence the designed reservoirs have on the environment.

At the same time, recent years have shown there is a growing problem of waste disposal, especially municipal. There has been a significant increase of low capacity public landfill sites. For economic and environmental reasons, however, construction of larger landfill sites, which could be used by a dozen or so communities, would be more purposeful (Drągowski, 2002).

Those and other problems regarding waste disposal thus require:

- ❑ preparation of rules of geological-engineering documentation for individual types of landfills in compliance with Waste Disposal Act of 24/04/2001 (OJ No. 62, item 628), in adjustment to the regulation of the Minister of Environment concerning precise requirements regarding location, construction, exploitation and shutdown, with which individual types of landfills should correspond (OJ No. 61, item. 549, 2003);
- ❑ creation of geological-engineering maps showing usefulness of land for the needs of locating public, industrial, dangerous and radioactive waste disposal sites. It is crucial to conduct nationwide geological-engineering analyses in order to select a number of most favourable over- and underground locations for dangerous waste disposal sites, in compliance with Polish legal acts and European Union legislations;
- ❑ setting the criteria of selection of solid ground needed for the construction of isolating barriers, which are a basic protection measure of every landfill site;
- ❑ assessment of usability of underground mining waste, stored in slag heaps for land reclamation works or as building materials;
- ❑ hierarchisation of pits from the perspective of their capability of storing waste according to its type.

Other new tasks of engineering geology are associated with changes in the exploitation of raw material deposits. They concern both the exploitation of the deposits on various scale and complex, large-scale changes in the geological environment connected with shutting down of mines. At this point, research should be directed at the following:

- ❑ preparation of rules of monitoring and modern documentation of unfavourable geological-engineering phenomena that did or could occur in mining areas where both new and shut-down mines are located, and methods of conducting research;
- ❑ preparation of methodology and criteria of evaluation of existing or predicted geological-engineering transformations, regionalization and classification of degraded areas and rules for their cultivation.

The presented review of tasks connected with hazards concludes that in order to draw up a consistent national strategy that aims at minimization of conflicts occurring in the natural environment, it is necessary to create a general, nationwide, digital-modular assessment of regional geological-engineering hazards, which could include natural and anthropogenic aspects. After the completion of this task, unified nationwide assessment of geological-engineering hazards should be prepared. At the same time it should be presented on digital maps and highlight hazard areas, their hierarchy and regionalization based on a uniform assessment scale. This allows for highlighting areas that are particularly endangered by conflicts of several generations. This shall create an opportunity for a presentation of nationwide hazard conditions in the surface zone of the lithosphere, for an agreement on a national geological surface policy as well as hierarchisation of detailed tasks that are carried out.

Synthetic assessment of rock and soil parameters in comparison with the regional geological shape of Poland

Progress in the areas of engineering and building technology, investment activities on a large scale and placing structures at even greater depths require new, updated synthetic and index data prepared in close relation with geological classifications and research technologies.

Including international ISO or CEN norms in planning gives the Member States of the European Union significant rights to apply their own regional experiences, innovations and modern technical solutions and classification. In order to ensure Polish specialists and documentations retain their sovereignty and competitiveness on the expert market it is both crucial and urgent to prepare **regional correlational parametric dependences** assessing the geological-engineering properties of rocks and soil. In order to carry out a laboratory or a field research it is necessary to introduce new methods, which have not yet been used in Poland.

One of the basic and initial elements of this is preparation of catalogues containing information on generalised physical-mechanical characteristics of basic types of lithogenetic rocks and soil in Poland, on the basis of contemporary knowledge and modern research techniques which are competitive on the European market.

Creation of the geological-engineering criteria for assessment of the degree of complexity of geological structure in relation to geotechnical categories as well as procedures and the scope of research in adjustment to geotechnical categorization is an important element of such classifications (Pinińska, 2001). The ability of using scientific knowledge in the field of engineering and also the harmonization of especially Polish rock norms with the European ones are fundamental. Poland is far behind in this area.

The essence of parameterization should be an introduction of rules for classification of soil and rock massifs, based on diagrams synthetically presenting their complex geological characteristics in a regional aspect and correlation of their properties for various regions. It is the only way that enables synthetic introduction of varied, modern knowledge of rocks and rock massifs in the field of engineering, and standardization of IT terminology used, IT systems, databases and geological engineering cartography.

Before commencing with proper classification activities it is essential to make the terms "rock" and "soil" uniform and define up to which point they should act as separate in relation with national regulations.

Parameterization and the assessment of geological-engineering properties of soil and rocks and scales of adjusting to the Polish geological irregularities require:

❏ developing modern methods of analyzing physical-mechanical properties of natural rocks and soil, anthropogenic soil and interpret them using the knowledge in the field of soil and rock mechanics;

❏ adjusting the methodology of documenting geological-engineering conditions to new investment needs, such as wind farms, small reservoirs and protection of the environment, particularly troublesome facilities, liquidation of mines and other;

❏ improving the methodology of documenting geological-engineering conditions for the purpose of exploitation of deposits at large depths, and structures used for underground storage;

❏ improving the geological-engineering monitoring and in situ research in the context of investment and verification of empirical solutions based on laboratory findings.

Education

Education in geological engineering is a significant element that ensures the possibility of compatible, interdisciplinary cooperation between investment process participants of various specialties.

The education should go two ways. First, it should provide an educated team of professionals, second, it should put forward the appropriate proceedings in gathering documentation for persons using the geological-engineering data.

Within the area of direct education it requires:

❏ training geological-engineering personnel at higher education level and providing supplementary training for geological services and administration;

❏ creating tight and appropriate rules for examination of competence of executors and verifiers of plans and documentations waiting for approval;

In the educational domain serving the recipients of geological-engineering knowledge those are:

❏ appropriate methodology instructions and rules of dealing with samples (e.g. Instrukcja..., 1999);

❏ promoting formal enforcement of geological-engineering analyses and databases as indispensable elements of knowledge about the environment, the rate with which it transforms and the geological-engineering hazards;

❏ integrating efforts regarding regulations of legal acts binding activities concerning space and natural resources development as a whole.

Conclusion

Enabling the fulfillment of the presented tasks shall allow the performance of nationwide regulation of actions taken in the field of engineering geology. Within many issues connected with implementation of information technology fast undertaking of tasks in geological-engineering cartography is necessary. Creating geological-engineering maps and atlases is important for local planning as well as chosen regions and for areas threatened with various natural and anthropogenic processes.

There is a lack of regulations concerning gathering expertise and geotechnical documentation carried out in compliance with the Minister of Interior and Administration of 24/09/1998 (OJ No. 126, item 839) and rules on dealing with archives of liquidated national enterprises, private companies and other units possessing archival materials concerning engineering geology and geotechnics. Geological-engineering documentations are gathered by bodies of national geological administration in compliance with the regulation of the Minister of Environment of 19/12/2001 (OJ No. 153, item 1780).

Future tasks of engineering geology were discussed during a seminar on "Geological-engineering and environmental problems of space development" (Warsaw, June 2005), organized within a framework of actions of the Polish Committee of Engineering Geology and Environment under the auspices of the Ministry of Environment. They were also expressed during the general assembly of the Polish Group IAEG. In conclusion of the period 2003–2005 the participants fully agreed that both research and professional communities of engineering geologists have to deal with new tasks that are crucial for the future of the whole field of study. It requires working out appropriate standards and legal acts concerning widely understood tasks covering development, land reclamation, geoengineering both in educating engineering geologists and in shaping their professional position.

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