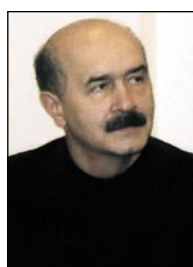


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IMPLEMENTATION OF THE EUROPEAN UNION GROUNDWATER DIRECTIVES IN POLAND

IN THIS ISSUE:

The engagement of the Polish Geological Institute in the European Union water directives implementation in Poland is presented. The assessment of the main groundwater reservoirs utilisation value has been described, as well as the problems of rational groundwater exploitation in Poland. Finally, the ways of the admission of the information on the first groundwater horizon into the GIS database of the Hydrogeological Map of Poland 1: 50.000 have also been discussed.



The Water Framework Directive 2000/60/EC is the European Union basic legal regulation concerning water management in the EU Member States. The European Parliament and European Council accepted it on October 23, 2000. The directive is stating in its introduction that „water is not a commercial product like any other but, rather, a heritage which must be protected, defended and treated as such”.

Such approach to water as to a common wealth that should be carefully carried forward to the generations to come is a corner stone of the European Union water management policy. It is placing in the first place the water resources protection, as well as the necessity of the undertaking actions for the water betterment, groundwater inclusive.

The EU Water Framework Directive has been developed as a result of long studies and preparations carried out by various European Union political structures. It has taken into consideration proposals and opinions of the EU Member States ministries, of the European Commission, of the European Economic and Social Committee as well as of the European Committee of the Regions.

The water protection and the water resources management policies of Poland have adapted in 2001 the European Union water policy, incorporating it into the Water Law Act of July 18, 2001. Since May 2004, i.e. since Poland accession to the European Union, the Water Framework Directive became the basic legal act dominating the water management regulations in Poland.

An integrated approach to the water management, formulated within the common water policy in the Water Framework Directive, requires also a simultaneous implementation of several other European Union directives, between others those concerning land use planning, water quality standards, sludge and wastes, chemical substances, and so on. The European Union directives are also obliging Member States

to co-operate with the neighbouring states in solving the transboundary aquifers problems, for instance, in water monitoring within the transboundary rivers catchments.



*A convent water well, Czerna near Krzeszowice, near Cracov
(photo P. Herbich)*

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The implementation of the Water Framework Directive regulations is planned for a longer time, and has been subdivided into several stages, covering various actions. The most important ones are as follows:

- end of 2006 – identification of the most relevant water management problems in Poland, and preparation of the complex surface water, groundwater, and protected areas monitoring programmes;
- end of 2008 – preparation, after the public consultations, of the water management programmes for particular river catchments, with the relevant action plans;
- end of 2009 – preparation of the water management programmes final versions, and the relevant action plans;
- end of 2010 – implementation of the water services costs repayment rules;
- end of 2012 – implementation of the actions foreseen by the water management programmes;
- end of 2015 (end of 2021 in justified cases) – obtaining the good water status.

As a very important part of the European Union recommendations, the implementation is to be regarded as the sustainable water use promotion, having in mind a long-term available water resources protection. As the final effect of all these actions, implementing the 75/440/(EEC) of June 16, 1975, and 80/778/EEC of July 15, 1980, will be the safety of the good quality water supply to the population, both from the surface water and groundwater intakes.

The up-to-date actions for the European Union directives implementation in Poland have covered the preparation of the preliminary catchments areas characteristics, of the abiotic surface water typology, of the water management programmes, of their economic analyses, as well as organisation of the public

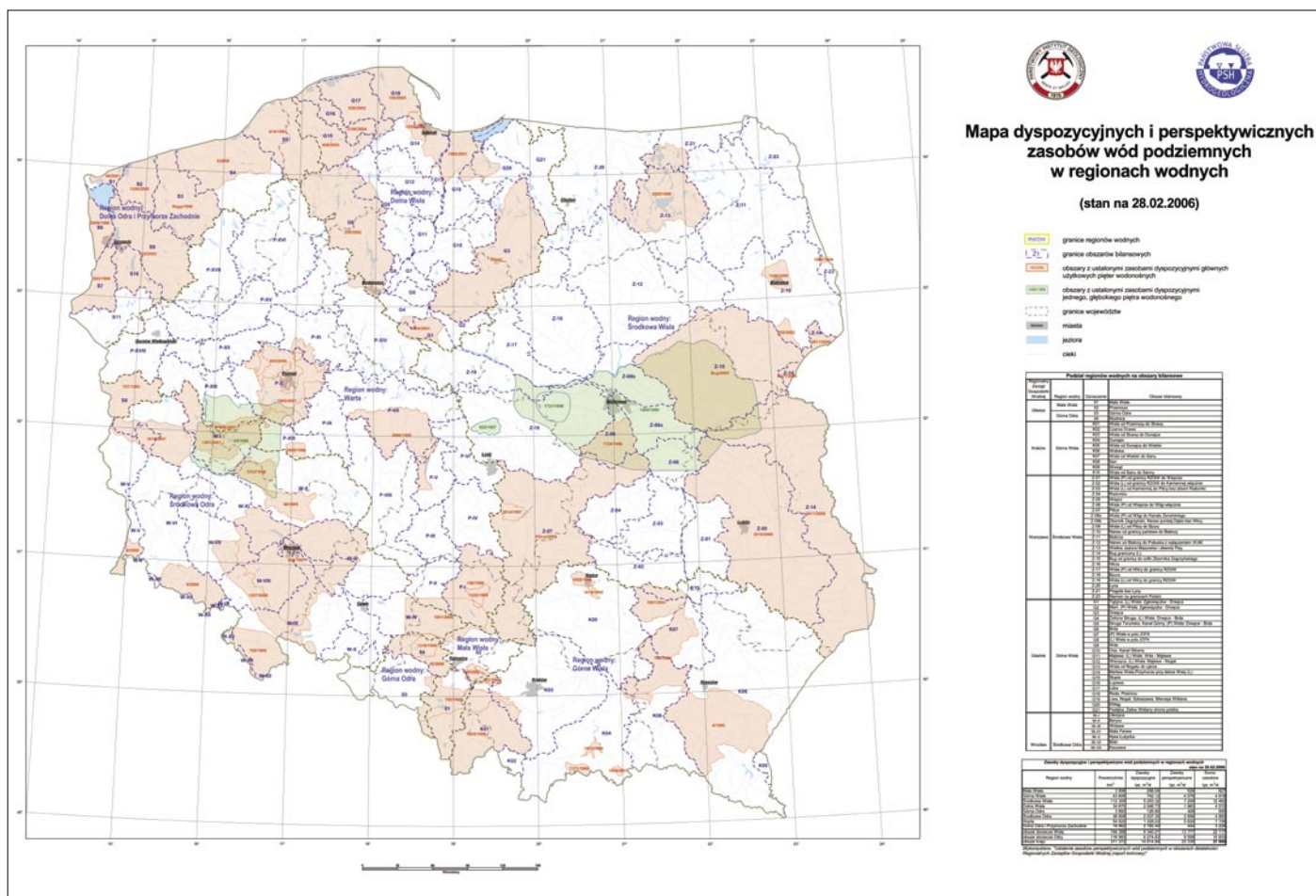
consultations on those programmes, and finally, reporting on the implementation progress to the EU European Commission. There were also actions undertaken for the Polish legal acts harmonization with the European Union ones.

The State Hydrogeological Survey, incorporated into the Polish Geological Institute, was since its establishment engaged in the water directives implementation, the Water Framework Directive and the so-called Nitrate Directive, between others. After the adoption of the directive on water pollution by the European Parliament at the end of 2006, the State Hydrogeological Survey became responsible for its implementation, too.

The compliance with the Water Framework Directive objectives: the groundwater protection and betterment, and the conditions of the directly dependent ecosystems, as well as the insurance of the good water supply to the population, required detachment of the groundwater bodies areas.

The modern water management is carried out in the specifically defined systems: river catchments, with the proper consideration of the natural and ecological limitations, of the water supply requirements as well as its safety in case of drought or flood. Obtaining the good water status in each catchment is the State obligation. The necessary actions should be undertaken for both surface water and groundwater, which means that the rivers catchments are becoming the spatial units for the groundwater, as well. The defined groundwater bodies should, therefore, fully coincide with the country subdivision into rivers catchments.

The Polish Geological Institute has fulfilled these obligations in 2004, in mutual consultations with the Regional Water Management Authorities, the Chief Environment Protection Inspectorate, and with the Water Management Office. The result



Map of the disposable and prospective groundwater reserves in Poland



*Beautiful water well in Nysa of Lower Silesia Region
(photo Z. Modliński)*

of those actions was the organisation of the groundwater bodies' spatial data bank. In total, 161 groundwater bodies have been defined, with the areas of between 24, 58 km² and 9.034 km².

The groundwater bodies with the areas of up to 1 000 km² are dominant in the country. They correspond mostly with

partial catchments of the larger rivers. In southern Poland are smaller water bodies. It is caused by the existence of the fissure and (or) karst-fissure water reservoirs as well as by the considerable changes within the natural water circulation systems, connected with the excessive exploitation of the water intakes, and with the mines dewatering.

According to the Water Framework Directive, the EU Member States are obliged to the identification of the groundwater bodies, and to the preliminary assessment of their conditions within the particular catchments, which is necessary for the water management plans.

The regional level activities require preparation of the water management plans as well as the balances of the water-economic programs for the particular river catchments. It is necessary to carry out systematic monitoring of the surface water and groundwater conditions, as well as to prepare the annual reports on the groundwater bodies conditions. There is also an obligation to calculate, within the groundwater bodies areas, the trends of the water quantity and chemistry changes. For that purpose, the several years' stationary observations should also be used.

The Water Framework Directive implementation in the transboundary areas of Poland, Germany, and Czech Republic has been made possible due to the activity of the established in 1996 *International Committee on the Odra Protection against Pollution*. An agreement between Poland, Ukraine, and Belarus has also been reached, in the frame of TACIS programme, on the co-operation in 1999-2003 within the Bug river catchment. There were several pilot projects carried out testing the common strategy on the Water Framework Directive implementation: firstly for the Nysa Łużycka river, and then for the Upper Vistula and Bug rivers. The representatives of the State Hydrogeological Survey have also participated in those projects.

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THE UTILISATION VALUE OF THE MAIN GROUNDWATER RESERVOIRS



In 1980-ties, the Polish Geological Institute co-operated with the Mining and Metallurgy Academy in Cracow on the construction of the Main Groundwater Reservoirs Map in the 1:500.000 scale. During that assignment, it has prepared in 1988 a general concept of the groundwater valorisation. Later, during the up-dating of this map, and as the chief executor of the Hydrogeological Map of Poland in the scale of 1:50.000, it has prepared a preliminary valorisation of the Main Groundwater Reservoirs.

This valorisation was based on the usefulness value of the water contained by the reservoirs, and on the required protection measures. The Institute has also developed a Main Groundwater Reservoirs classification based on their water supply importance, on degree of their anthropological changes, on their pollution resistance, on the required protection measures costs, and on the foreseen water fee indicator.

The classification has been developed in 2002-2003 by the Hydrogeology and Engineering Geology Department of the Polish Geological Institute, in co-operation with other

research centres specialists. For this task, there have been used the results of the hydrogeological and other reports, of the available regional ground water reserves reports, and the data contained in the *Main Groundwater Reservoirs Map*, and in the *Hydrogeological Map of Poland*, both in the 1:50.000 scale.

For the reservoirs explored in detail, the valorisation of the Main Groundwater Reservoirs has been done through the comparison of the prognostic and available data. The additional criteria for the valorisation and establishment of the protection zones have also been developed. For the reservoirs recognized

only in general, the valorisation assessment was made more carefully, as it was necessary to establish a ranking list of the reservoirs to be explored further or to be left aside.

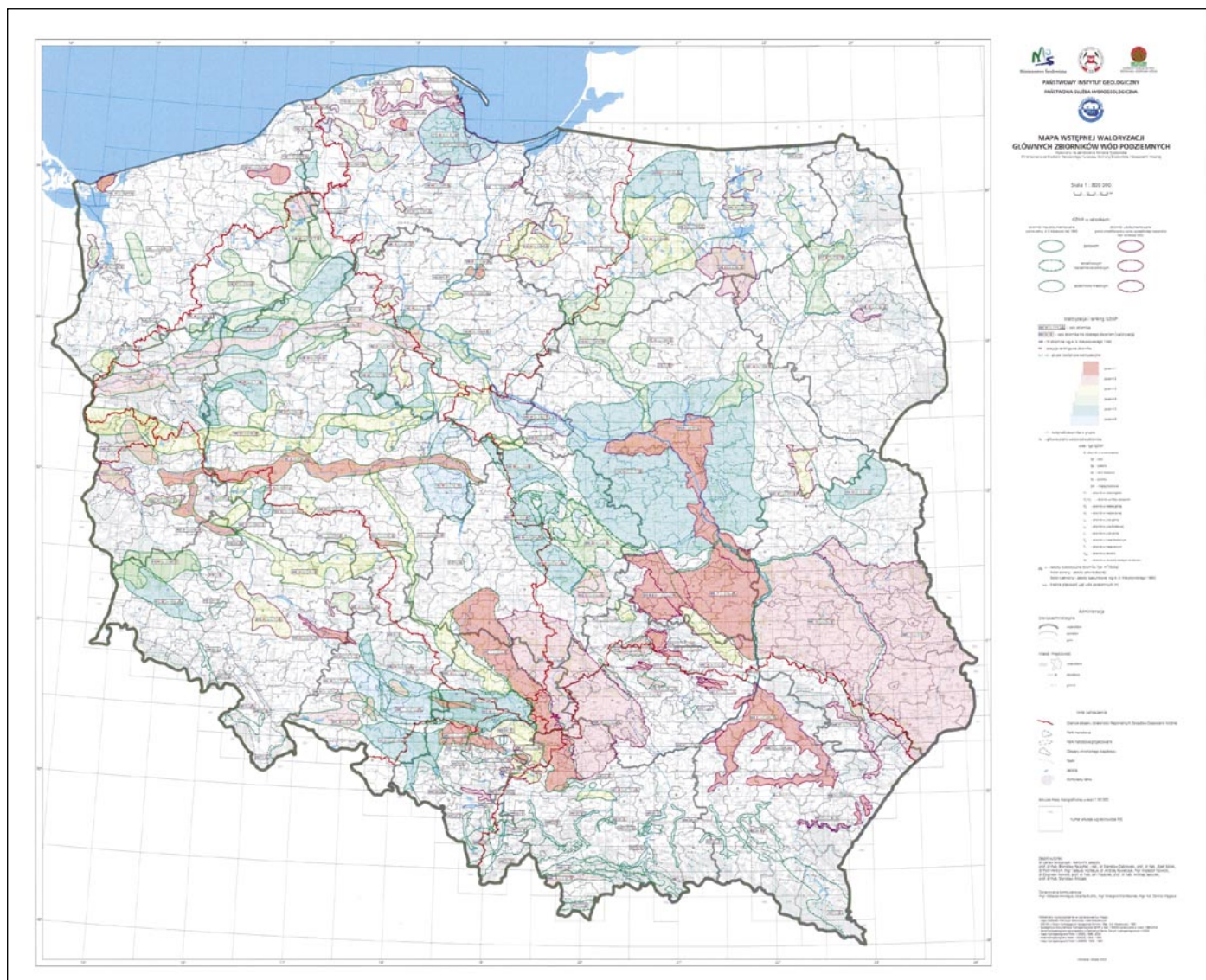
In this exercise of the reservoirs valorisation and ranking, based on their reserves and strategic water supply values, the 125 Main Groundwater Reservoirs have taken part in total (50 reservoirs explored, and 75 unexplored). The valorisation based on the Main Groundwater Reservoirs assessment which has taken into account the water abundance, strategic significance for water supply, and the threat of the groundwater pollution, especially of the reservoirs supply areas pollutyd through the actual economic activity. The degree of the anthropogenic changes of the area, of the reservoirs resistance to the pollution, of the economic aspects of the protection measures, and of the water fee indicators have been taken into consideration during the Main Groundwater Reservoirs classification. The carried out valorisation has proved that the explored Main Groundwater Reservoirs required very urgently the establishment of the protected areas.

The 26 explored and 19 unexplored reservoirs have been included into the first and second ranking groups. They as the first require the establishment of the protected areas. Those reservoirs have no isolation from the surface pollution, reveal signs of the anthropogenic groundwater chemistry changes, and at the same time belong to the main sources of the people's water supply, having their groundwater reserves developed to a high degree.



A water well, Alwernia near Krzeszowice (photo P. Herbich)

Another 17 explored and 26 unexplored reservoirs, which require establishment of the protected areas, have been incorporated into the third and fourth ranking groups.



Map of the preliminary valorisation of the Main Groundwater Reservoirs in Poland

They contain good and fair quality water with no visible anthropogenic pollution, and belong to the main sources of water supply. They are partly isolated from the influence of the polluted surface water.

The fifth ranking group consists of two explored and 17 unexplored reservoirs, containing good and fair quality water, and are very well isolated from the polluted surface water.

Finally, four explored and five unexplored reservoirs were included into the sixth ranking group. They are the alternative water supply sources in their areas.

As the result of the valorisation action, the Main Groundwater Reservoirs database has been up-dated, and the *Map of the Preliminary Valorisation of the Main Groundwater Reservoirs* in the 1:500.000 scales has been constructed.

According to the European Union policy, the groundwater constitutes the strategic reserves for the surface water, and, therefore, should be protected. In present economic

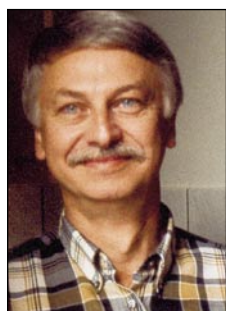
situation, however, the efforts should be concentrated on the protection of the most threatened Main Groundwater Reservoirs supply areas. Therefore, the establishment of the Strategic Groundwater Reservoirs should be the first urgent step. To achieve that, those Main Groundwater Reservoirs will be selected within territory of Poland, which are of the utmost importance for the water supply to the public and industry, especially in the crises situations.

The exploitation and protection rules for normal as well as crises situations will be prepared for the Strategic Groundwater Reservoirs. A very important part of the whole action will be to ensure a more effective water quality and reserves protection of the selected, most precious groundwater reservoirs. The State Hydrogeological Survey should complete this task as soon as possible.

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THE FIRST GROUNDWATER HORIZON AS A PART OF THE GIS DATABASE OF THE *HYDROGEOLOGICAL MAP OF POLAND 1:50.000*



The groundwater is an important part of the environment, and one of the main sources of the drinking water supply to the society. As such, it requires special protection. The complex assessment of the groundwater condition, and the preparation of the adequate protection and (or) the water condition betterment programmes are, therefore, the very urgent tasks carried presently out as a part of the European Union Water Framework Directive implementation in Poland.

One of the very useful and important tools for this action is the first edition of the *Hydrogeological Map of Poland 1:50.000*, constructed during 1996-2004. The map characterises the usable groundwater horizons through cartographic presentation of their occurrence conditions, hydrodynamics, water abundance, potential water wells output, water quality, and pollution threats. This is especially important for the main usable groundwater horizons constituting the main sources of the communal and production water supply, within the specific hydrogeological units' areas.

The information content of the map is, therefore, fulfilling the EU Water Framework Directive requirements concerning registering those groundwater horizons that can be actually or in the future used for drinking water supply.

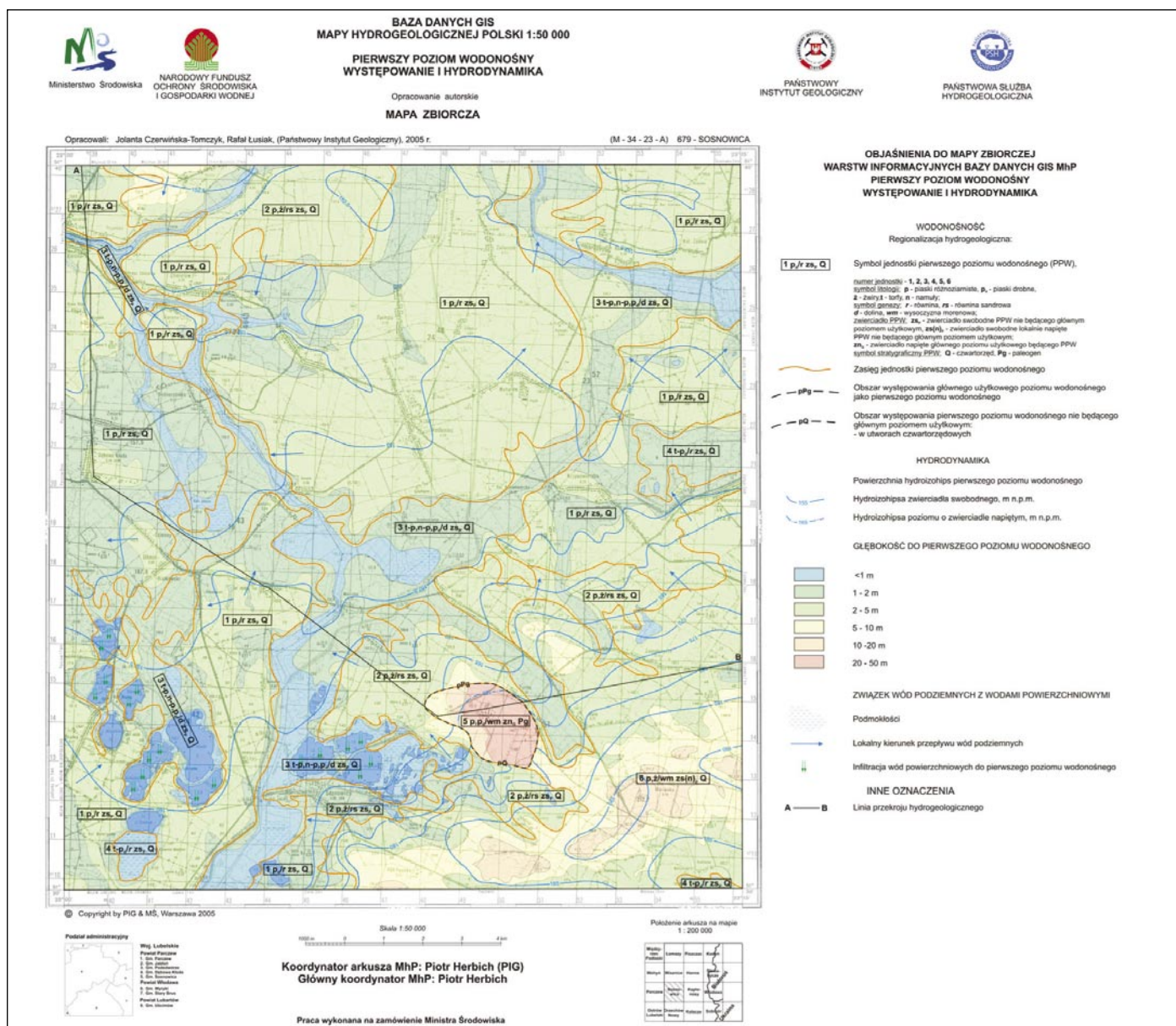
At present, the Polish Geological Institute carries out through the State Hydrogeological Survey an extensive work on the supplementing the *Hydrogeological Map of Poland* database with the first groundwater horizon characteristics. This covers its occurrences conditions, hydrodynamics, water quality, and its vulnerability to the pollution, as well as its interconnections with the surface water and with various continental ecosystems: wetlands, peat bogs, and forests. The organization of the first groundwater horizon database is a part of the *Hydrogeological Map of Poland* database development that is an important

State Hydrogeological Survey duty, assigned by the Ministry of Environment, and financed by the National Environment Protection and Water Management Fund.

The development of the *Hydrogeological Map of Poland* database is a part of the general maintenance of the country's hydrogeological databases. This task covers also the collection and processing of the *Hydrogeological Map of Poland* data, their up-dating, and making them accessible. Besides, the State Hydrogeological Survey requires the *Hydrogeological Map of Poland* data for the current analyses and assessments of the groundwater conditions, and for the up-dating the actual situation as far as the groundwater reserves, its quantity, and pollution threats are concerned.

The *Hydrogeological Map of Poland* database is a basic hydrogeological information source essential for the development of several important country's programmes: the water-environmental programme, with the country subdivision into specific river catchments having been taken into consideration, and the water management programmes for the river catchments areas. It is also necessary for the Regional Water Management Authorities to prepare the regulations of the water use within the water regions and particular river catchments.

The two first information levels of the first groundwater horizon will be completed in 2007-2008, namely: occurrence



Map of the first groundwater horizon; an exemplary sheet of the 1: 50.000 map (sheet Sosnowica). Colours on the map: the intervals of the first groundwater horizon occurrence depth (in metres) : <1, 1-2, 2-5, 5-10, 10-20, 20-50. Blue lines: groundwater table contours (every 5 m).

and hydrodynamics (for 414 sheets of the Hydrogeological Map of Poland), and pollution sensitiveness and water quality (for 85 sheets of the same map). The Polish Geological Institute prepares a general methodology of the necessary mapping, and executes itself all the necessary work for the 80 sheets of the Hydrogeological Map of Poland. The Institute is also responsible for co-ordination of the eight geological enterprises mapping activities on 419 sheets of the Hydrogeological Map of Poland, for the reviewing and final acceptance of the results, and for the editing of all the sheets. Besides, the Polish Geological Institute incorporates all the obtained data into the GIS spatial Hydrogeological Map of Poland database.

The occurrence conditions of the first groundwater horizon, and its hydrodynamics, are characterised by the occurrence depth, local flow directions, the type of the first groundwater horizon connections with the surface water, and the intensity and extension of the anthropogenic changes in the water table position (sinking or raising).

A thematic subunit of the GIS spatial Hydrogeological Map of Poland database: *The first groundwater horizon – its vulnerability to pollution (quality and threats)* contains information on the anthropogenic objects threatening the first groundwater horizon, and the nitrogen compounds content of its water.

The data acquisition methods have based on the experience gained during the construction of the Map of the groundwater vulnerability to pollution 1: 500.000 (S. Witczak, Ed., 2005). The identification of the occurrence conditions and hydrodynamics of the first groundwater horizon is based on the field survey, and on the analyses of the published and unpublished reports.

The field hydrogeological survey is based on the measurements within the dug and drilled water wells, on the use of piezometers, and on the springs, seepages, marshes, wetlands, and surface water observations. The unpublished reports are also a very important source of information, after some corrections concerning the anthropogenic and natural water table changes. As the additional investigation, hand drillings are carried out in the areas lacking other observation points.

Presentation of the obtained information on the occurrence, hydrodynamics, quality, and vulnerability of the first groundwater horizon is made on the topographic map of 1: 50.000 scales with the use of special marks and GeoMedia Intergraph database programme, already used for the Hydrogeological Map of Poland database.

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RATIONAL GROUNDWATER EXPLOITATION IN POLAND



One of the strategic tasks of the country's water management, the aim of which is the sustainable water resources management, is the water exploitation monitoring, and balancing size of its present volume, accessible groundwater resources including.

The sustainable water management has the following priorities:

- the safety of the sufficient water quantity and quality supply,
- the protection against the excessive water exploitation,
- the maintenance of ecosystems dependent on water,
- water supply to agriculture and industry.

The above-mentioned water management priorities are directed towards such water protection that avoids unfavourable changes of surface water bodies, and takes into account the balance between the groundwater exploitation and its recharge. Their objectives are also covering the maintaining and (or) improving the appropriate level of the water quantity.

Among the instruments helping the sustainable water resources management, the water management planning and appropriate water fees systems should be mentioned. They require preparation of the planning reports containing identification of the influences on the groundwater level changes, and specification of the water use conditions within a water region. These reports, in the case of groundwater exploitation, are taking under consideration some limitations that help to achieve the environmental requirements.

The obligations imposed by legal regulations, and the follow-up administrative procedures, have forced development of several actions aiming at fulfilment of the present and future water supply needs of the population. They are also taking into consideration the water exploitation inspection, the return of water services costs, and the implementation of the European Union law.

The inspection and systematic assessment of the groundwater exploitation volume are to prevent wasting water and its reserves. The bases of the inspection are the principles of the usual and specific water utilisation. These rules have brought into practice classification of the groundwater exploitation into the *unregistered exploitation* (it does not require direct recording and measurements with controlling instruments when quantity of the extracted water is not higher than five m³/day), and *registered exploitation*.

Taking into consideration the fact that a part of groundwater in Poland is extracted without any registration, the total water take off must be a subject of the assessment of the true water exploitation size. The total water takes off represents the true water exploitation, which takes the quantity of the registered (specific) and unregistered (usual) water exploitation into account. The unregistered exploitation dominates in the



A water well, Bujaków near Bielsko Biala (photo P. Herbich)

rural and agricultural areas, which cover about 70% of the country's territory, and where the water supply is almost in 95% based on groundwater.

The groundwater monitoring regards the registered exploitation, only. Each groundwater intake, extracting over 100 m³/day of water, is a subject to the systematic measurements with the inspection instruments. The quantity of water used by a user, that means delivered to the consumer, has to be also controlled.

The *Water Law Act* has specified the water resources management objectives that should fulfil the water requirements as well as impose the water use rules and ways. The *Law* has introduced a general water exploitation structure, based on the main users' groups specification (population, agriculture, and industry) as well as on the water



A water well, the Good Spring, Grabowiec (photo Z. Modliński)

Managements, because of the water-law permissions issuing, the Voivodships Marshall Offices, because of the environment users recording (in cases when the quarterly groundwater exploitation fee is higher than 200 zlotys); the Main Statistical Office, because of data inflow delivered by the groundwater intakes users, administrators or owners (especially the data concerning the sales of water delivered to the recipients).

The State Hydrogeological Survey runs the complete records of the registered groundwater exploitation. The State Hydrogeological Survey is bound to assess the available groundwater quantity within the groundwater bodies, and within other administrative water units, river catchments, water regions, groundwater basins, as well as within other water units not mentioned in the *Water Law Act* regulations.

The unregistered exploitation size cannot be precisely, but only approximately estimated. The only method of the approximate calculations is taking into the account the true exploitation quantity as well as the statistical data obtained from the Public Agricultural Roll, and from the National Population and Apartments Roll. Statistical data are up-dated every 15–20 years that means that the real water extraction can also be up-dated within the above-mentioned periods, only. In the meantime, only the lower limit of the total extraction can be specified, based on the up-dating of the water exploitation quantity registered in the annual balances of water taken off from the groundwater intakes.

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exploitation continuity through the year (seasonal or short-term).

There are two ways of water supply to the population: the common supply, for the housekeeping or agricultural farming, and the specific supply, which means the collective one. The agriculture uses water for its production (animals' husbandry, vegetable production) in the frame of the specific use of water. In case of groundwater use for vegetable production, there are additional exploitation types: irrigating with the use of rainwater tanks, and drainage. The industry belongs to a group of the specific groundwater users. In addition, drainage of buildings or earthworks as well as the mine constructions is separated additionally into a special group of the industrial groundwater users.

In accordance with the frame structure of the groundwater exploitation, the information sources of the registered groundwater exploitation are, as follows:

- for the water supply to population (housekeeping, public service buildings, economic activities, and industrial production) – the intakes' users, administrators, and owners;
- for the construction sites dewatering: below 50 m³/hour – heads of Districts, above 50 m³/hour – Voivodships Governors; in the scope of mines dewatering – the High Mining Office, in the scope of water use for irrigation – Voivodships Offices.

Data concerning the quantity of the extracted groundwater obliged to be recorded (registered exploitation) are collected by specific institutions. They are the following ones: the Regional Boards of Water



A public water well, Gorlice (photo P. Wesolowski)