

Strategic directions and main tasks for groundwater use and protection management in Lithuania

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In 2002, Government of the Republic of Lithuania approved “The Strategy of Groundwater Use and Protection”, in which only the main strategic directions are outlined.

The paper offers a more extensive review of the past and present groundwater management status, elucidates the issues of groundwater protection and use, protection measures while preparing the background for the strategy of necessary investigations and establishing the principles of rational groundwater use and management.

Key words: groundwater use, strategy, management, protection

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INTRODUCTION

In March 2000, environmental ministers of many nations met in The Hague to discuss Water Vision Declaration – the document focused mainly on improvement of water management, ensuring the right of society to have enough clean water safe for human health and environment.

Lithuania is probably the only country in Europe to use exclusively groundwater resources for potable water supply. Their use and protection therefore should be an environmental task of the first priority. In the strategy of environmental protection accepted in 1996, the main environmental tasks are foreseen, the ways and order of their solution are determined. Most of the planned work has been implemented already, whereas accomplishment of some measures is still ongoing.

In 2002, the Government of the Republic of Lithuania approved Groundwater Use and Protection Strategy for 2002–2010 (Domaševičius ir kt., 2002). This strategy was developed taking into account the requirements of Water Framework Directive 2000/60/EC and is part of Environmental Strategy of Lithuania. It describes more detailed plans in the field of groundwater use and protection. The document did not appear in a blank space. In 1993 the Government approved the programme of geological investigations named “Geology for Society”. The paramount tasks of the programme remained unchanged until now. The major task of the state geological investigations is to provide to society an information on the subsurface and resources available there. This information is needed for development of industry and agriculture, environmental protection and nature formation. The perception of groundwater management, however, is

wider and requires not only activities of the geological society but also extended participation of many other institutions of the country. Accomplishment of the strategic tasks will allow to satisfy the needs of society for safe and high-quality drinking water and enable to save water for future generations.

1. GENERAL DIRECTIONS OF GROUNDWATER USE AND PROTECTION

The main strategic directions of groundwater investigations and protection are influenced by several circumstances. **Firstly**, after the re-establishment of independence and implementation of market economy relations, a new structure for fresh and mineral groundwater use based on principles of economical feasibility has been established. For the rational management of the use and protection of groundwater resources in the new economic conditions appropriate hydrogeological information is needed, prepared in compliance with the national legislative concepts and the EU directives. **Secondly**, preparation of the strategy for rational groundwater protection from contamination and deterioration, planning and implementation of environmental protection measures and actions on different management levels would be impossible without investigations of natural groundwater protection conditions, assessment of the anthropogenic impact and forecast of long-term consequences of this impact.

Keeping in mind the above-mentioned circumstances, three main strategic directions for actions and activities in the field of evaluation of groundwater resources and rational management of their use and protection are foreseen (Domaševičius ir kt., 2002):

- investigations of the quantitative and chemical status of groundwater resources;
- assessment of natural conditions for groundwater protection and the influence of anthropogenic impact;
- dissemination of information about groundwater resources and their protection.

1.1. INVESTIGATIONS OF THE QUANTITATIVE AND CHEMICAL STATUS OF GROUNDWATER RESOURCES

Groundwater resources on the territory of the country are investigated unevenly. Most widely used and therefore well investigated are fresh groundwater resources. Most of the questions to be solved are also related to the management of fresh groundwater use and protection. Part of these questions are related to the structural changes in the sphere of fresh groundwater use and the others to the management system of ground-

water resources and their use. Previous investigations of groundwater resources were directed to large centralised drinking water supply systems. Therefore almost for all the territory of the country, with minor exceptions, we have a detailed information on abundant groundwater resources of deep aquifers. At the same time information is lacking on the shallow, easily accessible aquifers containing smaller groundwater resources. This disproportion of investigations is very important during transition to the conditions of market economy. It is clear already now that huge centralised drinking water supply systems of the Soviet time economically are not rational. Drinking water supply will split into smaller parts together with the development of small wellfields and extension of the net of private water supply wells. It is necessary, therefore, to summarise all available information on shallow, easily and cheaply accessible aquifers suitable for drinking water supply. Of course, one should not forget that those shallow aquifers are more vulnerable to pollution than deeper ones.

Fresh groundwater resources in Lithuania were evaluated 20 years ago (Lietuvos geologija, 1994). Since then a lot of new hydrogeological information has been collected, assessment technologies have been improved and, what is most important, the attitude to the use of natural resources has changed substantially. Concepts of sustainable development of the society described in the EU directives impose rather strict requirements on the policy of groundwater use and protection, which in turn is a driving force for investigations of the resources.

The management of groundwater use and protection has been changed after the re-establishment of independence and will change even more in the course of the EU approximation. These changes will also rise appropriate requirements to the investigation degree of groundwater resources.

Resources of mineral water are well investigated only in large health resorts. However, reliable information is missing on the distribution of mineral water on the territory of the country.

It is necessary to make a general evaluation of industrial (brines) and thermo-energetic waters. This information will be useful for planning the economical development of the country and will encourage business development in this field (Juodkakis et al., 1997).

Further in this chapter the main strategic tasks are described. Concrete projects for solving these tasks together with the institutions involved and time schedule are presented in the following chapter.

1.1.1. Regional assessment of fresh groundwater resources

From “The 2002–2010 Strategy of Groundwater Use and Protection”

1. It is necessary to investigate regional fresh groundwater resources, adhering to the principle of balance hydrodynamic systems. Mathematical models of each balance hydrodynamic system, covering certain parts of the territory of Lithuania, will be prepared. The models will help implementing the objectives related to the use and protection management of water resources.

2. It is necessary to investigate regional fresh groundwater resources in order to establish:

2.1. groundwater resources that may be extracted in the territory of Lithuania to satisfy the needs for drinking water without causing damage to the status of other geospheres (including the underground hydrosphere);

2.2. tendencies of a change in groundwater quality, natural conditions and factors of economic activities determining this change.

3. The result of the investigation of groundwater resources and their quality will be preparation of a fundamental database for attaining the objectives related to the use, protection and management of fresh groundwater resources.

Regional assessment of fresh groundwater resources is one of the most important tasks of the groundwater strategy. Regional fresh groundwater resources indicate the drinking water potential in the country and are important for territorial planning and solving other strategic tasks of economical development. Similar investigations have been or are being carried out in almost every country. The USGS since 1991 carries out systematic investigations within the National Water Quality Programme, based on the regional evaluation of groundwater resources in separate aquifer systems or administrative districts. In principle it is a permanent rotational programme: every 6–7 years the same areas are reviewed and changes evaluated. Several years ago regional evaluation of groundwater resources should have been accomplished in Denmark. To a smaller or larger extent regional groundwater assessment has been or is being carried out also in other European countries.

The main tasks of fresh groundwater assessment are divided into two groups:

- Assessment of groundwater resources that can be used for potable water supply on the territory of

the country without damaging other geospheres, including the underground hydrosphere;

- Quantitative and qualitative assessment of groundwater quality changes related to natural and human impact.

This work could be done through mapping of groundwater resources. The most important result of the work is preparation of the fundamental database for the rational use, protection and management of groundwater resources on a scale of the whole country and separate districts, for preparation of the national laws.

Groundwater resources of each balanced hydrodynamic system are evaluated separately. From the hydrodynamic point of view, a balanced hydrodynamic system is a unified part of the hydrosphere, covering one or several aquifers separated by low permeable layers and encompassing groundwater recharge, transition and discharge areas (Юдказис, 1980). There are four such systems in Lithuania: Upper-Middle Paleozoic, Upper Paleozoic, Cenozoic-Mesozoic and Quaternary. Beside them, locally spread aquifers make a separate group. For various reasons they cannot be included into the described balanced hydrodynamic systems. Alluvial and in some places shallow unconfined groundwater are among them. Thus, for regional assessment of fresh groundwater resources five independent projects are needed; depending on availability of specialists and financial possibilities, they could be implemented gradually or all together.

For the regional assessment of fresh groundwater resources, mathematical models covering separate parts of the country will be compiled for each balanced hydrodynamic system (Gedžiūnas et al, 1999). These models should be adapted to the information system of GSL, at the same time evaluating the technical possibilities for model compilation of a connected regional active water exchange zone and the feasibility of the solution of practical tasks in the sphere of the use and protection of groundwater resources.

1.1.2. Preparation of information for solving problems of drinking water extraction and supply

From “The 2002–2010 Strategy of Groundwater Use and Protection”

It is planned to prepare the following information for decision making in drinking water abstraction and supply:

1. *On the national scale – to determine and meet the needs of territorial planning, to implement the regional groundwater protection measures, to plan the use and protection of aquifer resources in the border areas.*

2. *On a municipal, county scale – to prepare plans of water management, to determine and implement local protection measures of groundwater resources in compliance with the following provisions:*

2.1. *considering that the productive aquifers presently used for public water supply are thoroughly investigated, to focus on resources of shallow, less productive aquifers – to create conditions for the development of drinking water use, when there is a growing tendency to decentralise water supply and water use decrease;*

2.2. *to solve problems related to supplying of the rural population with good quality drinking water. In rural areas drinking water is extracted from unconfined aquifers which because of their position are most sensitive to surface pollution. Wells of residents contain water of low quality. With the improvement in the economic situation of Lithuania, the rural population must be supplied with drinking water of good quality from deeper aquifers.*

3. *Information necessary for the use of groundwater resources of river basins, for determining their protection measures.*

Hydrogeological investigations provide fundamental information on groundwater resources. The second step is preparation of this information for decision making in the field of groundwater use and management. It is planned to use information for the following purposes:

- Territorial planning of the country
- Preparation of water management plans
- Management of water resources according to the river basins
- International co-operation in the use and protection of common transboundary aquifers.

Information should be prepared for decision making on the national, county and municipal levels. When preparing the information, several most important questions should be answered in each particular case.

Firstly, taking into consideration that productive aquifers used for centralised water supply are quite well investigated, it is necessary to focus on shallow less productive aquifers, preparing the basis for the development of market relations in the field of drinking water use in the conditions of decentralisation and reduced water consumption.

Secondly, the problem of water supply in rural areas should be considered. It is known that drinking water in rural areas is being extracted from shallow aquifers, which due to their location close to the surface are vulnerable to pollution. It is no secret that water quality in the domestic wells is bad. The concentrations of nitrates, total dissolved solids and other drinking water components exceed the permissible limits. At present, this situation is being tolerated, but with the economical evolution of the country rural inhabitants will more widely use deeper aquifers for drinking water supply. This question will have to be solved as in the EU documents it deserves a special attention foreseeing possibilities of financial support, e.g., through a special programme for the development and support of agriculture.

The **third** question is associated with groundwater quality, vulnerability of groundwater resources and their protection issues. Problems of groundwater quality improvement and water treatment are related to these issues.

1.1.3. Mineral water resources

The most important strategic task in the field of mineral water use is preparation of information database for the extended use of mineral water resources in the conditions of present market economy. Work is planned to be organised in two directions. **The first** direction is evaluation of mineral water resources in the main health resorts of the country, solving at the same time questions of protection of mineral water resources, including optimisation of groundwater monitoring in the mineral water fields, establishment of sanitary protection zones and regulation of human activity. **The second** direction is mapping of mineral water resources (scale 1:200 000) that will satisfy practical planning of mineral water production. Together with mapping, the possibilities of water production should be evaluated and recommendations for rational water use and quality protection elaborated.

1.1.4. Use of groundwater resources for industrial and energy purposes

As this is a new sphere of activities, the main task is preparation of an information database on water resources suitable for industrial use. Another point is evaluation of the potential of the underground hydrosphere in liquid waste disposal. According to the national laws it is prohibited to bury industrial waste in the underground hydrosphere. Meanwhile in the EU directives this issue is treated more libe-

rally, establishing conditions where it is allowed to bury waste. Keeping this in mind, it is planned to review the perspectives for disposal of liquid waste in the deep aquifers not suitable for drinking and domestic purposes.

1.2. ASSESSMENT OF NATURAL VULNERABILITY OF GROUNDWATER AND ANTHROPOGENIC IMPACT

Exploration of ambient groundwater protection is closely related to investigations of groundwater resources where questions of groundwater vulnerability are unavoidably encountered. Nevertheless, we lack general groundwater vulnerability investigations that could create a basis for planning rational measures of groundwater protection and their implementation on a regional and particularly on a local scale.

Groundwater within the territory of the country is naturally protected from the direct intervention of human activities. Conditions of vulnerability, however, depend on a number of hydrogeological conditions and are different in separate regions. Therefore, for solving the identical issues of groundwater protection in different conditions of ambient vulnerability, different complexes of protection actions and measures are needed. Most often groundwater vulnerability is exaggerated. For this reason, too extensive protection measures are being planned and implemented and too strict limitations of economical activities established, leading to economical and often social consequences. And *vice versa* – very little attention is being paid to regional problems of groundwater protection, in spite of the fact that protection of future groundwater resources of satisfactory quality depends first of all on a rational regional policy of their protection. Organisational aspects of groundwater protection on a regional scale are discussed or at least have to be discussed in the documents of territorial planning, but for that purpose a proper evaluation of the degree of ambient vulnerability is required.

Exploration of groundwater vulnerability comprises a separate strategic direction for investigations.

1.2.1. Regional and territorial investigations of ambient groundwater vulnerability for solving water protection problems

From “The 2002–2010 Strategy of Groundwater Use and Protection”

Regional and territorial investigations of natural vulnerability of groundwater are carried out seeking to establish the following:

1. *Regional conditions of natural vulnerability of groundwater*
2. *The impact of climatic and anthropogenic factors under different conditions of natural vulnerability of groundwater*
3. *Conditions of natural vulnerability in specific territories (karst region, cities, vulnerable ecosystems).*

For the assessment of ambient groundwater vulnerability several tasks should be solved. The **first task** is evaluation of regional conditions of ambient groundwater vulnerability.

Due to a different degree of ambient vulnerability, the effect of human activities on groundwater quality are uneven in various districts of the country. This is very important for planning and implementing the groundwater protection framework. On the other hand, at the moment a lot of care is being taken on the local groundwater protection issues while regional issues are often disregarded (Klimas, Zuzevicius, 1998)). For example, equal measures of human activity regulation are applied to groundwater recharge and discharge zones, although ambient protection conditions in both cases are very different.

Only the widespread regional conditions of ambient groundwater vulnerability are recognised on the territory of the country. Most of the maps of groundwater vulnerability of various districts, which have been compiled or are being compiled are formal, first of all for the simple reason that the degree of natural vulnerability in them is evaluated mechanically summarising the integral parts of a geological setting (thickness of the layers, lithology) and hydrogeological indices (depth to a water-table). In spite of that, maps of this type are very useful for evaluation of a comparative protection level of unconfined aquifer, as groundwater pollution is first of all related to the physical-geographical conditions of the territory: relief, soil type, vegetation cover, river network, amount of precipitation, thickness and lithological composition of the vadose zone, hydraulic relations with confined aquifers. However, these are not the only layers protecting shallow groundwater from contamination. There is a second group of factors such as various chemical and biochemical barriers, the main being oxidation and carbonates, defining the ability to store nitrates and organic matter in shallow groundwater and the rate of alkalinity increase (Климас, 1985). Another barrier is the sorption barrier protecting groundwater from heavy metals. Therefore the maps described above can and must be based on specific maps of groundwater che-

mical composition, with areas of water contamination, degree and type of pollution defined, relations with natural protection conditions outlined.

The same and in some respects even more complicated is the situation with confined aquifers (Klimas, 1998). They are protected from surface pollution by three barriers: physical, hydraulic and chemical (biochemical). Physical barriers are impermeable layers that can be relative (aquicludes) and absolute (aquitards). A hydrodynamic (hydraulic) barrier regulates the direction of the vertical groundwater flow. In recharge areas this flow is directed downwards and in discharge areas upwards. Therefore in the discharge zones the degree of groundwater protection from pollution is much higher than in recharge regions. There are data to show traces of human activities at a depth of 200 m within recharge areas (Gregorauskas et al, 1998). Among the chemical (biochemical) barriers, the oxidation-reduction potential is most important (Klimas, 2002). It defines the oxygen deficit driving the transformation of nitrates into ammonium, sulphates into sulphides, carbonic acid into methane, establishes appropriate concentrations of iron and manganese. The role of the latter ones (Fe and Mn) in relation to ambient groundwater protection conditions is not sufficiently reflected in the present vulnerability (protection) maps.

The second task is assessment of the climatic and anthropogenic impact on different ambient conditions of groundwater protection. The definition "groundwater status" is a dynamic one. The parameters describing it – water heads (levels) and chemical composition – change under the influence of a complex of climatic and human-induced factors. These are long-term changes often called trends. They can serve as indicators of groundwater protection as their intensity and character directly depends on hydrogeological conditions (Klimas, Gregorauskas, 2002). On the other hand, the trends show potential groundwater changes in a region and provide the basis for the planning and implementation of protective actions.

The main source of information for assessment of long-term variations is state groundwater monitoring. In Soviet time, an integrated evaluation of groundwater monitoring results had been accomplished every five years. Now 20 years have passed since the last evaluation. In this time a new economical structure has been established, global climatic changes have been noticed and these, in turn, have a relevant influence on groundwater resources. To evaluate the consequences of environmental changes, a complex assessment of long-term monitoring data is necessary. The tendencies of groundwater quality changes and their relations to environmental factors

and ambient groundwater protection conditions must be outlined. It is planned to do the work in two phases. Firstly, the impact of climatic changes on formation of groundwater resources has to be estimated and then, secondly, the integrated evaluation of the environmental impact on groundwater quality has to be accomplished.

The third task is evaluation of natural groundwater protection conditions on specific territories. Particular natural conditions and anthropogenic load on separate vulnerable areas make groundwater protection a very important issue. In this respect the karst region is of major concern. Some regional groundwater protection actions have already been implemented in the karst area, and specialised groundwater monitoring is being accomplished (Климас, Паукштис, 1990). During the last years, a more active development of the karstification process is being observed, expressed by more frequent collapses on land surface. The reasons for this phenomenon are not absolutely clear. They could be related to changes in the human activities, e.g., reduced groundwater extraction and pollution. On the other hand, some climatic changes such as the varying amount of annual precipitation could enhance this process. Anyway, karst intensification becomes a social problem, which requires proper decisions. For making such decisions, the reasons for the increased karst activity should be learned.

To specific territories some urban areas are attached, where evaluation of ambient groundwater vulnerability is directly related to the issues of potable water supply. This is first of all the planning and implementation of protection measures of available drinking water sources exposed to a heavy impact of anthropogenic load. On the other hand, the available hydrogeological exploration helps to develop the infrastructure of a city, prepare water management plans, etc. Urban as well as rural wellfields providing on the average more than 10 m³/day of groundwater or serving 50 and more consumers should have the sanitary protection zones. These zones should be included in the register of protected territories, human activities in them should be restricted.

Groundwater is the medium for existence of various ecosystems. Limitation of human activity within these ecosystems and their surroundings should be based on adequate hydrogeological information. This information is particularly important in the ecosystems given the status of reservations, e.g., the Čepkeliai and Kamanai wetlands. Some changes in such ecosystems are directly related to variations of the shallow groundwater balance, caused by the impact of human activities and climatic factors. Therefore, when planning and implementing complexes of protection means for the above-mentioned ecosys-

tems, it is necessary first of all to evaluate the hydrogeological conditions of the ecosystems.

Spatial (territorial) planning tasks should become a major focus of local municipalities.

1.2.2. Local tasks for organisation of groundwater protection and management

From “The 2002–2010 Strategy of Groundwater Use and Protection”

1. Topical objectives of the organisation and management of groundwater protection are as follows:

1.1. to complete an inventory of polluted territories and other possible pollution sources, to evaluate their impact on the environment and groundwater, to prepare a programme of management of such territories;

1.2. seeking to prevent pollution of groundwater, to complete an inventory of technically neglected wells which are no longer in use, to prepare a programme of their management;

1.3. to establish sanitary protection zones of wellfields and improve protection, taking into consideration the conditions of natural vulnerability of groundwater.

The main strategic goal here is registration and management of polluted territories and potential contaminant sources. During the last decade more than two thousands of potential groundwater pollution sources have been registered. The list includes former military bases, landfills, pesticide warehouses and storages, fuel stations and oil bases. Preliminary investigations have proved that most of them contaminate groundwater, are hazardous to drinking water resources in the urban and rural settlements. Often polluted territories are returned to the owners or sold without assessment of their impact on the environment and groundwater. Up till now the programme for the management of such territories, requirements for their exploration, time schedule, etc. has not been prepared.

An equally important groundwater protection problem is the management of abandoned wells. In the database of the Geological Survey, information on more than 20,000 drilled wells earlier used for water supply is available. Part of them became insignificant during the land reform and part are not used any more. These drilled wells gradually turn into groundwater pollution sources. The owners and municipalities are responsible for their maintenance. To solve this problem, well inventory and regist-

ration is needed as well as preparation of a separate programme. Otherwise abandoned wells will become long-term groundwater pollution sources, and the local problem might develop into regional in future.

The second task is establishment of sanitary protection zones for the wellfields and improvement of protective actions, taking into account the ambient conditions of groundwater.

The sanitary protection zones (SPZ) occupy rather large areas and often do not correspond to the needs of the infra-structural development of a city. Taking into consideration the present possibilities of mathematical modelling, the boundaries of SPZ could be specified and protection actions regulated when needed.

Assessment of ambient groundwater conditions is also very important for planning groundwater protection regulation actions and measures for landfills, storages of oil products and other hazardous materials.

1.2.3. Groundwater monitoring

From “The 2002–2010 Strategy of Groundwater Use and Protection”

It is very important to optimise the system of groundwater monitoring, to adapt it to a river basin management structure. Links between the groundwater and the surface water monitoring systems must be established. It is necessary to expand the state monitoring of groundwater – to include sealed (reserved) observation wells and wellfields, to create a special regional surveillance network for the monitoring of nitrates.

The main strategic task for the whole three-level monitoring system endorsed by the law is the further development and improvement of groundwater monitoring.

The most important task in modifying the state monitoring system is its harmonisation with the EU requirements. The present state monitoring system has first to be adjusted to a river basin management structure. Secondly, links between the surface and the groundwater monitoring systems must be established. And thirdly, the spectrum of tasks for state groundwater monitoring should be extended. State groundwater monitoring has to be strengthened and a special regional monitoring of nitrates should be introduced.

The state groundwater monitoring programme is prepared for 5 years. As the integrated monitoring

structure for the EU countries is not yet clear, the national monitoring programme prepared in 2000 will be a transitional one. The programme includes the development plan of the monitoring network, which will consist of reserve observation wells and characteristic wellfields.

For the progress of **municipal monitoring**, some normative and methodical documentation is missing at the moment. Among them the statute for performing municipal monitoring, which has to be prepared by the Association of Municipalities, is to be mentioned first of all. Monitoring on the municipal and state levels described in the Law of Environmental Monitoring is almost identical. Differently from the state level, however, where strategic questions of environmental protection prevail, the municipal monitoring should be focused on solving the daily practical tasks. Environmental monitoring covers several different geospheres. To each of them the distinct monitoring objectives and their implementation ways will be prescribed. Groundwater monitoring on the municipal level most precisely could be described as an information system covering data of all observations accomplished on the territory of the municipality and applied for planning and implementation of protection actions for drinking (mineral) water sources and solving potable water supply tasks. The structure and standard functions of the system have to be described in the methodical recommendations.

Monitoring on the economical entity level is applied in order to control the impact of economical activities on the environment. On the other hand, groundwater monitoring at the economical entity level is an important source of information on the anthropogenic load of the territory. This information is valuable for local municipal institutions making decisions on protection of drinking water sources. The municipalities actually are the main users of such information. In this respect, the most important task is establishment of legal links between the monitoring of municipal and local levels. The monitoring of economical entities could function as an integral part of municipal monitoring. In spite of the fact that some normative documents are prepared, methodical recommendations complying with the EU water directives are needed for the further development of groundwater monitoring of economical subjects.

1.3. DISSEMINATION OF INFORMATION ABOUT GROUNDWATER RESOURCES AND THEIR PROTECTION

From "The 2002–2010 Strategy of Groundwater Use and Protection"

It is necessary to constantly inform State institutions and agencies, residents about problems pertaining to groundwater use and protection. It is planned to issue many publications related to geology and hydrogeology, which would inform about groundwater quality and protection. Institutions exercising environmental investigations and control should publish information folders (leaflets) for State institutions and agencies, the general public (including schools and pre-school establishments). It is planned to disseminate information in Lithuania and abroad through the Internet in a specially designed website.

The main tasks are:

- to provide information needed for groundwater use and protection management;
- to disseminate information for the society.

The main principles of education of the society are outlined in the document "The strategy and action programme for environmental education of the society in the Republic of Lithuania". According to this document, the formal educational institutions as well as informal ones working in the field of environmental management could perform environmental education. Geological organisations belong to informal institutions.

Education of the society in water use and protection issues should be one of the priorities when disseminating information on geology and hydrogeology. Therefore it should be planned to publish many thematic papers on the basic topics of hydrogeology, informing the society on groundwater quality and protection problems. It is also important that beside papers the institutions performing environmental investigations and control could publish popular information leaflets for a wide part of society, schools and pre-school establishments.

An important role in disseminating information within the country and internationally will be played by the Internet.

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POŽEMINIO VANDENS NAUDOJIMO BEI APSAUGOS VALDYMO STRATEGINĖS KRYPTYS IR PAGRINDINIAI UŽDAVINIAI

S a n t r a u k a

Lietuva yra bene vienintelė Europos šalis, kurioje geriamajam vandeniui naudojami tik požeminio vandens išteklių, todėl jų eksploatacija ir ypač apsauga turi būti svarbiausias aplinkosaugos uždavinys. Dar 1996 m. patvirtintoje Lietuvos aplinkos apsaugos strategijoje buvo numatytos svarbiausios gamtosaugos problemos, jų sprendimo būdai ir eiliškumas. Daugelis šių priemonių buvo kryptingai įgyvendinamos, kai kurios jų tęsiamos ir dabar.

Lietuvos Respublikos Vyriausybė 2002 metų sausio 25 dienos nutarimu Nr. 107 pritarė Požeminio vandens naudojimo ir apsaugos 2002–2010 metų strategijai. Ši strategija parengta atsižvelgiant į pagrindinį vandens išteklių valdymą Europos Sąjungoje reglamentuojantį norminį dokumentą, nustatantį Bendrijos veiksmų vandens politikos srityje pagrindus – direktyvą 2000/60/EB. Ši direktyva, detalizuojanti požeminio vandens išteklių naudojimą ir apsaugos veiksmus, yra Aplinkos apsaugos strategijos dalis. 1993 m. Lietuvos Respublikos Vyriausybė pritarė geologinių tyrimų programai „Geologija – visuomenei“, kurios pagrindiniai tikslai liko tie patys. Bendras valstybinių geolo-

ginių tyrimų tikslas – informuoti visuomenę apie žemės gelmes ir jų išteklius. Ši informacija būtina pramonės ir žemės ūkio plėtrai, aplinkos apsaugos ir aplinkos formavimui. Požeminio vandens išteklių valdymas suprantamas plačiau, todėl, be geologinės visuomenės veiklos, aktyviau turėtų dalyvauti ir daugelis šalies institucijų.

Straipsnyje apžvelgtos svarbiausios artimiausio dešimtmečio požeminio vandens tyrimų ir apsaugos kryptys, kurias lemia kelios aplinkybės. Pirmą, atkūrus nepriklausomybę ir perėjus prie rinkos ekonomikos santykių, klostosi nauja gėlo ir mineralinio požeminio vandens naudojimo tvarka, pagrįsta ekonominio tikslingumo principais. Siekiant racionaliai naudoti požeminį vandenį ir valdyti jo apsaugą naujomis ekonominėmis sąlygomis, būtina atitinkamo lygio hidrogeologinė informacija, parengta atsižvelgiant į šalies įstatymų nuostatas ir ES direktyvų reikalavimus. Antra, racionali požeminio vandens apsaugos nuo išsekimo ir užteršimo strategija, apsaugos priemonių ir veiksmų skirtingais valdymo lygiais planavimas bei įgyvendinimas neįmanomas be būtiniausių natūralios požeminio vandens saugos sąlygų tyrimų, antropogeninės apkrovos poveikio vertinimo ir ilgalaikių padarinių prognozės.

Atsižvelgiant į tai, straipsnyje plačiau pateiktos pagrindinės strateginės darbų ir veiksmų kryptys, skirtos įvertinti požeminio vandens išteklius ir racionaliai valdyti jų naudojimą bei apsaugą.

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СТРАТЕГИЧЕСКИЕ НАПРАВЛЕНИЯ И ОСНОВНЫЕ ЗАДАЧИ ПОЛЬЗОВАНИЯ И ОХРАНЫ ПОДЗЕМНЫХ ВОД ЛИТВЫ

Р е з ю м е

Литва – единственная страна в Европе, где в питьевых целях используется исключительно подземная вода. Использование и особенно охрана ресурсов подземных вод являются главной природоохранительной задачей. Природоохранительной стратегией Литвы ещё в 1996 г. были предусмотрены главные природоохранные проблемы, методы и порядок их решения. Большинство предусмотренных мероприятий были внедрены, некоторые из них имеют продолжение до сих пор.

Стратегия использования и охраны подземных вод на период 2002–2010 гг. была одобрена Правительством Литовской Республики решением № 107 от 25.01.2002. Стратегия была подготовлена в соответствии с главным нормативным документом Европейского Союза (ЕС) по управлению водными ресурсами, определяющим основы действий водной политики Сообщества с Директивой 2000/60/ЕБ. Настоящая Директива – часть Природоохранительной стратегии, в которой детализированы действия по использованию и охране ресурсов подземных вод. В 1993 г. Правительством Литовской Республики была одобрена программа геологических исследований „Геология – обществу“, главные цели которой не изменились до сих пор. Общая цель государственных геологических исследований – предо-

ставление информации общественности о недрах Земли и их ресурсах. Настоящая информация необходима для развития промышленности и сельского хозяйства, для формирования охраны природы. Однако под управлением ресурсами подземных вод подразумеваются более широкие действия, не только действия геологической общественности – должно подключиться большинство институций страны.

В статье представлен обзор основных направлений исследований и охраны подземных вод в будущем десятилетии. Основные стратегические направления исследований и охраны подземных вод обусловлены некоторыми обстоятельствами. Во-первых, после восстановления независимости и перехода к рыночной экономике формируется новый порядок по использованию пресной и минеральной подземной воды, основанный на принципах экономической

целесообразности. В целях рационального использования ресурсов подземных вод и управления ими в новых экономических условиях необходима геологическая информация соответствующего уровня, подготовленная в соответствии с законами страны и требованиями директив ЕС. Во-вторых, обоснование стратегии рациональной охраны подземных вод от истощения и загрязнения, планирование и внедрение охранительных мероприятий на разных уровнях управления не возможны без исследований натуральной защиты подземных вод, оценки воздействия антропогенной нагрузки и прогноза долгосрочных последствий.

Имея это в виду, в статье широко представлены основные стратегические направления работ по оценке ресурсов подземных вод, их рациональному использованию и охране.