

# modern geological

research and development  
organisation working  
worldwide



Polish Geological Institute  
National Research Institute



# experience worldwide

**Geology knows no borders** – the development of structural units and processes which govern the Earth's face continues irrespective of political borders, and thus the progress in geology is strictly dependent on cooperation between geologists all over the world.

Therefore, for many years, PGI-NRI has maintained international cooperative links in all branches of Earth science.

**We are a partner in 40 agreements  
on cooperation in scientific research.**

**We host over 100 foreign scientists  
yearly for scientific consultation  
and participation in conferences  
and training organized by the Institute.**

**In 2013, our staff, individually or in groups,  
participated in 210 visits abroad.**

**We have already conducted research  
projects on every continent.**



The graphic consists of three dotted globes arranged horizontally. A dotted line starts from a black dot to the left of the first globe, extends horizontally to the right, then turns vertically downwards, ending with a small black arrowhead pointing to the map of Poland on the second globe.

# how to get in touch

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# who we are

**Polish Geological Institute is the National Research Institute (PGI-NRI), supervised by the Polish Ministry of Environment. PGI-NRI is one of the largest geological R&D units in Europe, with nearly 100 years of experience in establishing and maintaining geological inventories and records, mineral resources prospecting and assessment, as well as monitoring and research. It is entrusted with tasks of the Polish Geological Survey and the Polish Hydrogeological Survey.**

The tasks are implemented by the staff of over 800 highly skilled employees. Among the priority areas of work count: energy security, geology for land use planning and construction, raw materials security and supply, geohazards, geotechnologies, marine geology, climate and environmental change, geoinformation, groundwater, geological mapping, geodiversity conservation and geotourism, and international cooperation.

PGI-NRI acts as the national legal entity responsible for ensuring the domestic safety in supply of minerals and hydrocarbons (conventional and unconventional), as well as for monitoring and management of groundwater resources and natural geohazards, e.g. mass movements and landslides. The Institute also provides solutions of vital importance for climate policy (e.g. the carbon capture and storage technology) and sustainable development. The related relevant studies cut across thematic areas of environmental protection, geoenvironmental and geochemical cartography, waste management, soil and water contamination, and best practices in remediation.

Moreover, PGI-NRI is the custodian of much of the country's geoscientific information and runs the state geological archives. It is also the largest Polish editor and publisher of geological maps compiled in digital standard.

PGI-NRI cooperates with scientific-research centers, institutes, organizations, industry, public administration, and geological surveys from over 40 countries all over the world. In years 2009-2013, the Institute was engaged in implementation of 18 international projects under contracts with the European Commission and the European Regional Development Fund. Their topics cover almost all branches of the Earth sciences, first of all Earth observation and natural hazards, geoenergy, mineral resources, water resources, marine geology, spatial information, carbon capture and storage, and geoheritage.

**An important platform for international cooperation of the PGI-NRI is the EuroGeoSurveys (EGS). The EGS is an international not-for-profit organization of over 30 national geological surveys of Europe which work mainly for the public interest.** Its main aim is to provide the European institutions with expert, unbiased, balanced and practical advice and information as an aid to problem-solving, policy, regulatory and programme formulation in areas such as management of natural resources, identification of natural hazards of geological origin, environmental management, waste management and disposal, land-use planning, sustainable urban development, etc. PGI-NRI participates in works of practically all the EGS Expert Groups.

# what we do

energy security	4
geology for land use planning and construction	8
mineral resources	12
geohazards	16
geotechnologies	20
geological mapping	24
marine geology	28
hydrogeological analysis and prognosis systems	32
hydrogeohazards	36
groundwater monitoring	40
groundwater resources protection	44
environment and climate change	48
geodiversity conservation and geotourism	52

# energy security

“The most intensely developing activities include sedimentary basin analysis and modeling of subsidence and thermal history in relation to hydrocarbon generation...”



## WHAT WE DO - EXAMPLES OF PROPOSED COOPERATION AREAS

**We contribute to ensuring energy security by conducting research on geological constraints for the occurrence of energy resources such as hydrocarbons (conventional and unconventional), lignite, hard coal and radioactive elements.**


We also carry out prospecting activities, as well as planning, supervising and documenting work in the areas of drilling operations and geophysical surveys. As a result, it has become feasible to create a factual basis for the use of renewable energy sources, especially for the construction of closed geothermal systems – Hot Dry Rocks (HDR) and Enhanced Geothermal Systems (EGS).

The related projects comprise: selecting the location, designing internal structure of underground storage facilities and monitoring systems of landfills, as well as defining characteristics of the geological formations for a safe CO<sub>2</sub> storage. All the research projects are implemented by experienced, multidisciplinary team of geologists specializing in the fields of stratigraphy, sedimentology, organic and inorganic petrology, petroleum geology, economic geology, tectonics, geomechanics, geochemistry (Rock-Eval 6 Analyser), subsurface geological mapping, geophysics, and geothermal energy.

**The most intensely developing activities include sedimentary basin analysis and modeling of subsidence and thermal history in relation to hydrocarbon generation.**

All our specialists have expertise in conducting and coordinating large interdisciplinary research projects (including international ones), scientific work and publishing, as well as in geological prospecting for mineral resources abroad, e.g. in: Germany, Norway, Ukraine, Saudi Arabia, Mongolia, Ethiopia, Angola, and the North Sea area.



A satellite view of Earth at night, showing the Western Hemisphere. The Americas are visible, with city lights glowing across the continents. The oceans are dark, and the overall image has a deep blue and black color palette with yellow and white highlights from the lights.

WORLD'S ENERGY DEMAND IS GROWING.  
THIS PROCESS WILL ACCELERATE IN THE HITHERTO  
WEAKLY URBANIZED REGIONS DUE TO ONGOING  
INDUSTRIALIZATION. THE GEOLOGICAL SURVEYS ARE  
RESPONSIBLE FOR IDENTIFICATION OF NEW RESOURCES  
OF FOSSILS FUELS, THERMAL WATER AND HOT DRY  
ROCKS POTENTIAL TO MEET THIS DEMAND.



# geology for land use planning and construction

“ Our experience helps the administration to compile various scenarios to optimize costs of planned urban and industrial investments on the basis of analysis of natural environment...”



## WHAT WE DO - EXAMPLES OF PROPOSED COOPERATION AREAS

The planning and realization of large-scale national and regional investments requires geological analysis.

**Without the underlying geological examination, the success of strategically important infrastructure projects (e.g. construction of power plants, highways, pipelines, storage sites) may be thwarted.**

The PGI-NRI accommodates these needs by performing advanced analyses in form of case studies at different spatial scales corresponding to the scale of planned investments.

We are committed to upholding the highest possible standards of our research and cooperation with public administration, local governments, geological administration units, and crisis management centers.

In our research we integrate scattered data and conduct geological case studies as well as a review and compilation of all available sources of information on geological environment and hazards. We also maintain a database of geological and engineering data which covers more than 250,000 boreholes. In addition, we have produced geological atlases of major Polish cities.

PGI-NRI experts apply a wide range of modern research methods, including geotechnical, geophysical, and laboratory ones. Our offer comprises an independent and objective expert support for the sake of investment security and success. The solid embedment of the Institute in the public sector guarantees unbiased approach and the highest research standards.

PGI-NRI has a fairly large experience in cooperation with regional and local administration in land use planning by providing a wide range of information and conducting problem analyses. This cooperation facilitates introduction of special safety programmes for protection of recharge areas of the main groundwater reservoirs. Our experience helps the administration to compile various scenarios to optimize costs of planned urban and industrial investments on the basis of analysis of natural environment. In particular, we specialize in the fields of engineering and environmental geology.

### 1. engineering geology

Analysis of elements of geological environment and forecasts of its changes,

Maintaining a geological and engineering database,

Visualization of geological and engineering data in form of cross-sections, 3D models, maps, etc,

Geological, engineering-geological, geothermal, and geoenvironmental mapping,

Spatial analysis in the GIS system (in particular for the purpose of case studies),

Identification of geological threats and risk analysis,

Studies (field and laboratory) of physic-mechanical and filtration characteristics of grounds, in particular of problematic ones: organic, subsiding, heaps, swelling, weathering, etc,

Geophysical investigations with the use of most modern methods of surface geophysics,

Assessment of slope stability, documentation of landslides for the purpose of ensuring their security, assessment of slope stability of anthropogenic embankments and open pit mines,

Assessment of shallow geothermal energy potential,

Evaluation of site suitability for construction and assessment of engineering-geological conditions,

Interventions in case of failures and disasters caused by geological factors,

Support for local governments in intervention actions and in solving problems relevant to public interest and investment planning,

Preparation of projects of geological works, engineering-geological and hydrogeological documentation, as well as studies and assessments for the building sector, crisis management units, and spatial planning and environmental protection authorities.

## 2. environmental geology

**In this field, following aspects are of our particular interest:**

### 2.1. Anthropogenic hazards:

Analysis of chemical composition of land and water in post-industrial and post-mining areas,

Designing and conducting environmental monitoring of soil and water in the potentially dangerous areas, i.e. industrial plants, landfills, sewage treatment plants, fuel depots, airports, transport bases, military units,

Projects of recultivation works in the contaminated areas and supervision of their implementation,

Tests for migration of contaminants from landfills, post-industrial and post-mining areas to the soils, surface water and groundwater,

Examination of ground and water in the areas of exploration of hydrocarbon resources (including shale gas plays).

### 2.2. Research on the state of natural environment:

Water chemistry tests and evaluation of water condition,

Determination of threats to water,

Quality and quantity monitoring of groundwater,

Diagnosis and monitoring of impact of identified and potential pollution sources on groundwater quality,

Delimitation of groundwater protection zones,

Projects of local monitoring of groundwater and assessment of their effectiveness,

Assessment of impact of natural disasters (i.e. floods) on water quality,

Collection of bottom sediments in watercourses and surface reservoirs, and the study of concentrations of organic and inorganic compounds contained in them,


Research and evaluation of soil and land quality,

Measurement of concentrations of radon and C<sub>1</sub>-C<sub>4</sub> hydrocarbons in the soil air, as well as their laboratory analysis at the PGI-NRI (it is one of the largest certified laboratories in the country).

### 2.3. Geo-environmental mapping:

Maps of distribution of elements and compounds in soils, sediments, groundwater, and surface water,

Spatial analysis of conditions for location of objects potentially hazardous to the environment, i.e. landfills.

An aerial photograph of a city skyline, likely Warsaw, featuring a prominent cable-stayed bridge in the foreground crossing a river. The bridge has multiple white cables fanning out from a central pylon. The city below is a mix of modern glass skyscrapers and older, more traditional buildings. The sky is filled with large, dark, dramatic clouds, suggesting an overcast or stormy day. A large, semi-transparent purple circle is overlaid on the bottom left of the image, containing white text.

BY THE END OF XXI CENTURY THE MAJORITY  
OF THE WORLD'S POPULATION WILL LIVE IN LARGE  
URBAN AGGLOMERATIONS. IT IS A CHALLENGE FOR  
GEOLOGISTS WHO HAVE TO DELINEATE SAFE LOCA-  
TIONS FOR TRANSPORTATION FACILITIES, UNDERGROUND  
INFRASTRUCTURE, AND SITE DEVELOPMENT  
FOR RESIDENTIAL AND INDUSTRIAL AREAS.

# mineral resources

“ PGI-NRI has a long tradition and experience in effective prospecting, exploration and exploitation of mineral resources in Poland. This is well evidenced by discoveries of several major mineral deposits, especially in the 20<sup>th</sup> century...”





## WHAT WE DO - EXAMPLES OF PROPOSED COOPERATION AREAS

PGI-NRI is also deeply interested in opening and cultivating cooperation in sustainable management of mineral resources. The appropriate use of domestic base of mineral riches and safety of their supplies are nowadays widely recognized as the issues of utmost importance for national economies in Europe and other parts of the world.

PGI-NRI has a long tradition and experience in effective prospecting, exploration and exploitation of mineral resources in Poland. This is well evidenced by discoveries of several major mineral deposits, especially in the 20<sup>th</sup> century. The key to these successes has always been our capability to combine **three elements:**

### **1. tradition**

### **2. use of modern approaches and methods in prospecting and exploration**

### **3. cooperation and exchange of experience with partners in the country and abroad**

**The Institute is deeply interested in exchange of experience and scientific research cooperation in joint projects, as well as in scientific consultancy, expertise, geological works and surveys. In particular, we are committed to supporting central and local administration in establishing policy of sustainable management of mineral raw material resources, including:**

Exploration and assessment of mineral resources,

Compilation of maps of mineral deposits  
(e.g. metallogenic maps),

Compilation of mineral resources – spatial – planning  
conflicts maps as a tool for sustainable development  
of mining and land-use,

Assessment of environmental impacts of mining,

Preparation of concepts and projects on reclamation  
and revitalization of post-mining areas,

Sustainable management of primary and secondary  
mineral resources including mining waste and rejects.







THE DEVELOPMENT OF ALL CIVILIZATIONS OVER CENTURIES HAS RELIED ON MINERAL RESOURCES. THIS HAS NOT CHANGED FOR THE PRESENT SOCIETY. ESPECIALLY MODERN ADVANCED TECHNOLOGIES REQUIRE A CONSIDERABLE RESOURCE INPUT. THE POLISH DEPOSITS OF COAL, COPPER, SILVER AND OTHER MINERAL RESOURCES CONSTITUTE AN IMPORTANT REPOSITORY FOR NATIONAL AND WORLD'S INDUSTRY.

# geo- hazards

“ Our research focus is placed mainly on identification of scale and intensity of given hazards, evaluation and documentation of their range and accompanying negative effects, as well as on elaboration of measures to be taken to reduce adverse impacts of geohazards on humans...” ”





## WHAT WE DO - EXAMPLES OF PROPOSED COOPERATION AREAS

**PGI-NRI also deals with general issues related to geological hazards caused by natural processes.** This applies mainly to mass movements (which are, after river erosion, the most common geohazards in Poland) and surface deformation induced by both anthropogenic and non-anthropogenic factors. Our research focus is placed mainly on identification of scale and intensity of given hazards, evaluation and documentation of their range and accompanying negative effects as well as on elaboration of measures to be taken to reduce adverse impacts of geohazards on humans. An important task is also to monitor the identified geohazards in order to facilitate forecasting of their further developments. In a longer term, on the basis of the study of mass movements, it will be possible to design a prognosis system linked to meteorological data, which will enable a reliable identification of possible landslide hazards.

Our staff cooperates closely with government administration, as well as undertakes educational activities to raise public awareness of negative effects of various geological processes.

### The key research areas within this topic comprise:

#### 1. Mass movements in Poland

**The study of mass movements is carried out in the framework of SOPO project (Anti-Landslide Protection System project) whose implementation is foreseen for the period 2006-2025. The project activities include:**

- Identification and documentation of landslides and areas endangered by mass movements,
- Installation and operation of monitoring devices (underground and on surface) for chosen landslides,
- Delivery of expert opinions on design and documentation of security measures in the landslide prone areas,
- Maintenance of a database of landslides (with open access for all interested parties),
- Close cooperation and consultations with all relevant public administration entities at the national and local level.

**As an outcome of the above listed works, following products have been delivered:**

- A map of landslides and areas prone to mass movements (at scale of 1:10,000, prepared at the level of municipalities in the Carpathian region, and at the level of counties in the rest of Poland),
- Registration documents of landslides and areas prone to mass movements,
- Final documentation, including monitoring reports.

The SOPO project is aimed at creation of a nationwide information system on landslides and areas prone to mass movements, as well as at raising awareness of the society and policy makers (national and local governments, crisis management groups, urban planners, etc.) with regard to development of human settlements in landslide prone areas.

#### 2. Surface deformation (mainly vertical) in Poland

The studies of surface deformation are supported with the application of satellite radar interferometry. Currently, our experts conduct research on land subsidence in selected locations where hydrological fracturing (shale gas exploration) takes place (planned realization period: 2013-2015). In addition, similar fieldwork (land subsidence in the areas of salt domes) is planned for 2014-2017.


**PGI-NRI has successfully established itself as a leader in research on landslides in Poland.** In particular, it has developed a guide on the design of landslide maps at scale of 1:10,000 which is currently a reference document consulted by all relevant research and development units in Poland. Currently, the database maintained by the Institute contains above 40,000 registration documents. We are also proud of maintaining exemplary relationships and of continuing multi-faceted cooperation with various public sector entities. We created an opportunity for them to directly report their problems through our website.

**We act as a geological emergency service responding to all ad-hoc phenomena.** In particular, we proved our high competence in assisting the local communities in Poland during the landslide disaster in 2010.









LUCKILY, POLAND IS NOT SERIOUSLY THREATENED BY LARGE NATURAL DISASTERS SUCH AS EARTHQUAKES OR VOLCANIC ERUPTIONS. HOWEVER, THE GEOLOGIC STRUCTURE OF THE CARPATHIAN MOUNTAINS IS KNOWN TO BE HIGHLY SUSCEPTIBLE TO LANDSLIDES. THE GEOLOGICAL MAPPING AND MONITORING UNDERTAKEN BY PGI-NRI TO A LARGE EXTENT SAFEGUARDS THE DWELLERS OF THE SOUTHERN POLAND AGAINST LANDSLIDE HAZARDS.



# geo- technologies

“...we develop and implement methods for dynamic geological modeling which are crucial to understand, describe, and predict processes affecting rocks and pore mediums...”



## WHAT WE DO - EXAMPLES OF PROPOSED COOPERATION AREAS

**The tasks related to this research area focus on five major themes, which are:**

- Modeling of geological structures and processes,
- Remote sensing technologies,
- Monitoring systems,
- Geophysical tomography,
- Development and implementation of state-of-the-art methods for visualization and analysis of geological data.

**A special emphasis is placed on developing, testing, and implementing new methodologies for geological research, encompassing the abovementioned themes.**

Particularly worth mentioning are modern methods for visualization and analysis of geological objects and processes, e.g. the production of parametric, multi-resolution geologic models of units important for resources management, such as 3D models of coal basins. Moreover, we develop and implement methods for dynamic geological modeling which are crucial to understand, describe, and predict processes affecting rocks and pore mediums.

The related tasks comprise development and implementation of geodata visualization methods. This involves the use of geological data standards, such as GeoSciML (Geoscience Markup Language).

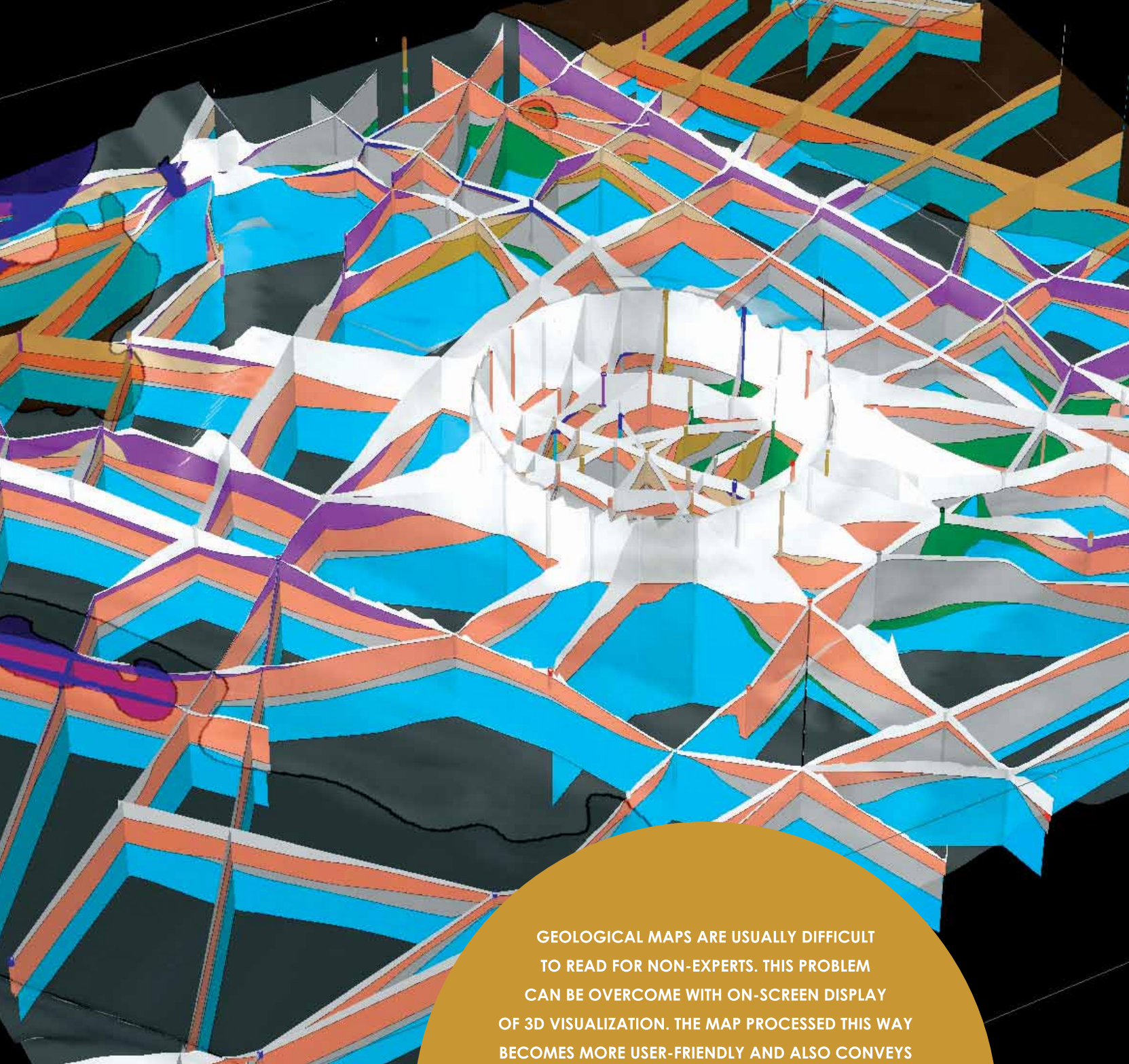
An important activity is also the application of remote sensing methods (satellite, aerial and terrestrial) to analyze the dynamics of ground changes in the view of geological and geodynamic processes.

**A successful example of our work in this field are the realized international projects co-founded by the EU on the monitoring and predicting the risks caused by subsidence in the coastal areas of European seas.** Another task of the Institute is the development of GMES (Global Monitoring for Environment and Security) products that are useful for monitoring, risk assessment, and prevention of geodynamic phenomena, such as landslides or ground subsidence. In our work we have used methods of modern processing of satellite data, among other techniques, in order to improve knowledge of the vertical ground movements.

In 2013, we commenced establishing a permanent network of geodynamic monitoring stations of Poland. The work is focused on planning the stations that will register seismic, magnetic, and gravimetric parameters along with permanent GPS monitoring. This will also be accompanied by a record of atmospheric conditions influencing measurement precision.

The survey methods being developed and implemented by the Institute include geophysical methods, mainly focused on resistivity imaging. The most remarkable results are obtained when surveying triggers of mass movements at the Baltic coast and Carpathian landslides.

We also pursue international cooperation opportunities, among which the Gocad consortium giving us access to state-of-the-art modeling tools is worth mentioning.



GEOLOGICAL MAPS ARE USUALLY DIFFICULT TO READ FOR NON-EXPERTS. THIS PROBLEM CAN BE OVERCOME WITH ON-SCREEN DISPLAY OF 3D VISUALIZATION. THE MAP PROCESSED THIS WAY BECOMES MORE USER-FRIENDLY AND ALSO CONVEYS MORE INFORMATION TO EXPERTS.





# geological mapping

“ One of the main tasks distinctive for the PGI-NRI is nationwide geological mapping, including spatial modeling...”



## WHAT WE DO - EXAMPLES OF PROPOSED COOPERATION AREAS

### One of the main tasks of PGI-NRI is nationwide geological mapping, including spatial modeling.

PGI-NRI is the largest Polish producer, editor and publisher of geological maps compiled in digital standard. We use the most advanced methods, software and tools such as remote sensing, GIS programmes, GPS, modeling of geological processes, particularly in geoenvironmental issues, structural analysis, and mineral resources prospecting.

PGI-NRI participates in international cartographic projects such as the digital Geological Map of the World (OneGeology) and Europe (OneGeology-Europe).

### With respect to geological mapping, we have several fields of interest:

Elaboration of geo-thematic maps (i.e. geological, geophysical, lithogenetic, geotouristic) at any scale – from field work to the GIS databases,

Compilation of digital geological series maps for the entire Polish territory (e.g. Detailed Geological Map of Poland at scale 1:50,000, Geological Map of Poland at scale 1:200,000),

GIS training, databases design and modeling,

Geological and geomorphological surveying,

Geological studies aimed at identifying sites for large-scale constructions, including nuclear power plants,


Studies on lithology, petrography and genesis of sediments,

Interpretation of geophysical data (electrical resistivity, shallow seismics and semi-detailed gravimetric surveys) aimed at identification of main subsurface structures (lithological, morphological, and tectonic) and selection of drilling sites,

Drilling supervision and drill core logging.





An aerial photograph of a coastal area with a rocky shoreline and mountains in the background. A large green circle is overlaid on the image, containing text.

GEOLOGICAL MAPPING IS ONE OF THE MOST IMPORTANT TASKS OF GEOLOGICAL SURVEYS. THE 1:50,000 SCALE BASIC GEOLOGICAL, HYDROGEOLOGICAL, AND GEOENVIRONMENTAL MAPS OF THE WHOLE COUNTRY, WHICH WERE COMPILED BY THE PGI-NRI GEOLOGISTS, ARE CRUCIAL TOOLS IN THE PROCESS OF LAND-USE PLANNING, ENVIRONMENTAL RESOURCE MANAGEMENT AND EXPLORATION OF MINERAL RESOURCES.

# marine geology

“ Some fundamental projects have so far been realized by us ,e.g. the investigation of the Cenozoic sedimentary cover of the Baltic Sea and its coastal zone, the geochemical mapping of the bottom sediments, and the preparation of resource documentation of gravel and sand, including sands for the beach nourishment... ”



## WHAT WE DO - EXAMPLES OF PROPOSED COOPERATION AREAS

In the field of marine geology, the Institute has continued a long tradition of the Polish geological research of marine areas. Some fundamental projects have so far been realized by us, e.g. the investigation of the Cenozoic sedimentary cover of the Baltic Sea and its coastal zone, the geochemical mapping of the bottom sediments, and the preparation of resource documentation of gravel and sand, including sands for the beach nourishment. The results of this work have been used to prepare geological maps and the geochemical atlas of the Polish zone of the Baltic Sea.

**This research cluster is built around  
three major topics:**

### 1. Marine geological cartography

We are a producer and editor of basic geological maps of Polish marine areas in GIS technology. The geological, geophysical, and geochemical information is gathered in digital databases. We participate in international projects such as EMODNET-Geology whose aim is to unify geological maps of European seas. We are also a national center of marine geological and geophysical data created within the framework of the international project Geo-Seas.

**We are interested in cooperation and offer services  
in the following areas:**

- Preparing maps (geological, lithological, geochemical) of marine areas at any scale,
- Processing and interpreting results of the seismoacoustic profiling in marine areas,
- Performing lithological and geochemical analyzes of marine sediments,
- Preparing geological and geoenvironmental operation projects and documentation for hydrotechnical constructions, both linear and cubature.

Institute possesses advanced sampling devices for collecting samples of sand and clays which can further be used for tracing contamination in open waters and harbour channels.

### 2. Mineral resources

**We have also compiled documentation of the most important  
marine aggregate resources in the Polish zone of the Baltic Sea.**

**In that respect PGI-NRI offers:**

- Preparation of projects on prospecting and exploration works, prognoses of the mineral raw materials, and documentation of marine clastic resources,
- Investigation of impact of exploitation of clastic raw material on the marine environment.

### 3. Geohazards in coastal zone

**In addition, the Institute conducts geological research in the  
coastal zone with the view to sustainable management and  
protection of the coast, as well as it monitors the coastal erosion  
processes, with particular emphasis on:**

- Assessment of the possibility of occurrence of geological hazards in the coastal zone, including landslides,
- Assessment of hazards due to seacoast erosion,
- Creation of 3D morphometric models of the coastal zone variability in a function of time,
- Modeling of the lithodynamic processes of seashore.

In the studies on geohazards we use a precise method of terrestrial laser scanning.







EXTENSIVE EXPERIENCE IN MARINE GEOLOGY, WHICH WAS GAINED BY PGI-NRI DURING COMPREHENSIVE BALTIC SEA RESEARCH, IS CURRENTLY WIDELY USED ON A LARGER SCALE. OUR EXPERTS SUCCESSFULLY PARTICIPATE IN THE DRILLING PROGRAMMES OF ECORD (EUROPEAN CONSORTIUM FOR OCEAN RESEARCH DRILLING) AND IODP (INTERNATIONAL OCEAN DISCOVERY PROGRAM).



# hydrogeological analysis and prognosis systems

“...we implement tasks associated primarily with the acquisition, collection, and sharing of geological and hydrogeological information...”



## WHAT WE DO - EXAMPLES OF PROPOSED COOPERATION AREAS

**In this thematic area we implement tasks associated primarily with the acquisition, collection, and sharing of geological and hydrogeological information.** This involves maintaining databases, analyzing data, and forecasting hydrogeological situation of the country.

### **The following list summarizes our most important activities:**

Management of the Central Bank of Hydrogeological Data (Bank Hydro), which involves: gathering data from hydrogeological documentation, data storing, updating and verifying information sources, including investigations in the field which guarantee high quality of input. At the moment, the database contains more than 140,640 objects,

Determination of the isotopic composition of water for the purpose of representation and evaluation of groundwater dynamics,

Development of communications and forecasts with regard to hydrogeological situation in the country. They are compiled on a quarterly basis as a result of analysis of the current hydrogeological situation in Poland, as well as of broader hydrological and meteorological data. These studies show the characteristics of the groundwater system during the normal hydrogeological cycle, i.e. information on the groundwater level variations, changes in abundance of groundwater, and the existence of threats to groundwater resources (e.g. periodic lowering of water levels below the conventionally accepted limits),

Preparation of statistical analyses and annual publications on the groundwater resources and their use for the Central Statistical Office,

Documentation of groundwater resources.

**Another group of tasks we conduct relates to the occurrence and use of mineral waters (medicinal, thermal, saline).**

### **This involves:**

Management of a databank of mineral waters: collecting, updating, modifying, and sharing data,

Documentation of the mineral water,

Development of hydrogeological and economic expertise concerning the possibility and legitimacy of valorization of the mineral water resources,

Assessment of geothermal potential and economic viability of the exploitation of thermal water,

Support work and research conducted for the health resorts and spas in the country,

Research and work for the purpose of protection of quality and abundance of mineral water resources (healing, thermal, saline),

Development of maps of the use of medicinal, mineral, and thermal water in Poland,

Quality and risk assessment of groundwater resources classified as mineral deposits,

Determination of the age and origin of mineral groundwater resources, and assessment of their vulnerability to quantity and quality determination.



OVER 70% OF DRINKING WATER CONSUMED BY THE RESIDENTS OF POLAND COMES FROM UNDERGROUND SOURCES. SUSTAINABLE USE OF GROUNDWATER IS FACILITATED BY THE POLISH HYDROGEOLOGICAL SURVEY WHICH REPRESENTS A PART OF PGI-NRI.

PGI: Wykres poziomów wód podziemnych i temperatury

Selekcja punktów: Nowa grupa [ ] Pokaż

Wykres wieloletni

☒ Dane źródłowe

Od: 2006

Do: 2014

☒ hydrologiczny

☐ kalendarzowy

Pokaż

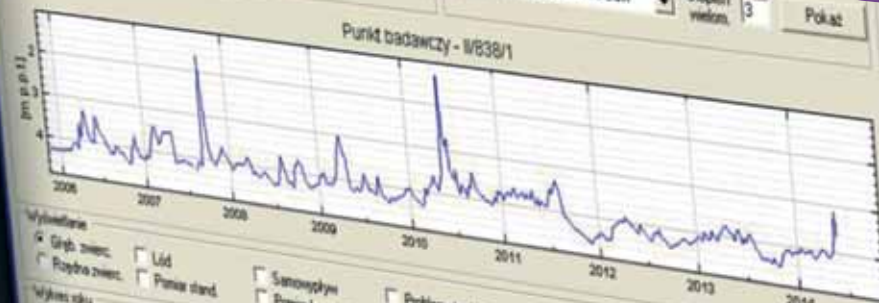
Linia trendu

Metoda najmniejszych kwadratów

Stopień wielom.

3

Pokaż



Wyświetlanie

☒ Główny zwierc.

☐ Rozdźnia zwierc.

☐ Lód

☐ Powisł stand.

☐ Samowypływ

☐ Powisł kontrolny

☐ Problemy techniczne

☐ Powisł automatyczny

☐ Brak wody

☐ Pobór próbki

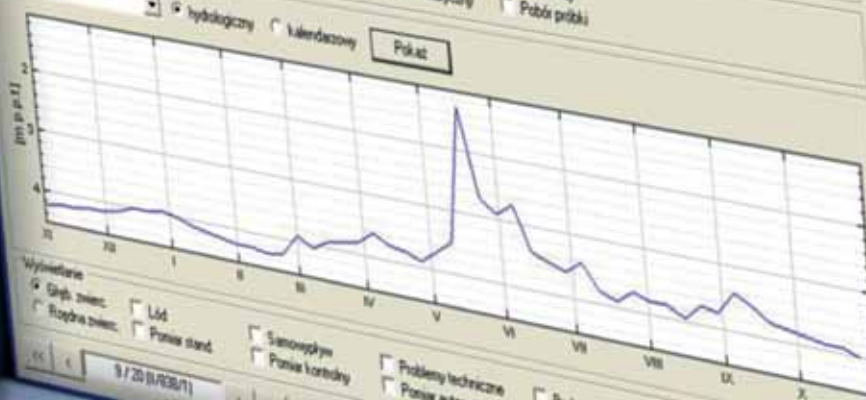
Wykres roku

Rok: 2010

☒ hydrologiczny

☐ kalendarzowy

Pokaż



Wyświetlanie

☒ Główny zwierc.

☐ Rozdźnia zwierc.

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☐ Powisł automatyczny

☐ Brak wody

☐ Pobór próbki

9/25 (II/638/1)

Dane źródłowe

Informacje o punkcie

Zamknij

Minimum: 1.30  
Amplituda: 4.60  
Odch. stand.: 3.30  
Moda: 0.34  
Mediana: 4.1

Główny wykres liniowy

Statystyka roku 2010

Średnia arytmetyczna: 3.70

Maksimum: 1.30

Minimum: 4.30

Amplituda: 3.00

Główny wykres liniowy

# hydrogeo- hazards

“ ...focus on analysis and evaluation of groundwater hazards, research on hydrogeological conditions for exploring and using hydrocarbon beds, and identification of areas exposed to groundwater flood hazards...”





## WHAT WE DO - EXAMPLES OF PROPOSED COOPERATION AREAS

**In the framework of this research cluster, we focus on analysis and evaluation of groundwater hazards, research on hydrogeological conditions for exploring and using hydrocarbon beds, and identification of areas exposed to groundwater flood hazards.** Among others, our works are commissioned by commercial clients operating in the field of shale gas exploration and extraction in Poland.

### **In particular, in this thematic field following activities are performed:**

Preparing hydrogeological documentation and other studies, such as evaluations and expert opinions, based on geological and mining law regulations, water law, environmental protection and land use law, and considering hydrogeological conditioning for using fossil beds,

Developing, maintaining and implementing procedures for monitoring recording groundwater intakes in the country,

Keeping, updating and publishing database of groundwater intakes, and preparing spatial analyses and evaluations of groundwater use,

Collecting and analyzing data concerning groundwater quality changes and related hazards, as well as conducting identification and research work on pollution testing and hazards within groundwater recharge or intake zones,

Identifying areas exposed to groundwater flooding hazard,

Analyzing and evaluating groundwater hazard related to extreme climatic phenomena,

Cooperating with crisis management centers in hazard situations,

Preparing, processing and developing data for the purpose of reporting to the Ministry of Environment, National Water Management Authority, Chief Inspectorate for Environmental Protection and Chief Environmental Protection Directorate, and field bodies of central and local government administration,

Developing hydrogeological research methods, publishing and popularizing their results,

Performing hydrogeological cooperation in designing, coordinating and carrying out regional research, as well as keeping database of GIS projects completed by other organizational units of the Institute.

### **Moreover we have formed an intervention group whose task it to undertake immediate action in response to notifications of incidents in the areas of groundwater supply system and intake.**

Our team defines the nature and extent of contamination, tries to determine its source and to propose the necessary remedial action. In addition, we conduct work aimed at identification of potential risks to groundwater sources, occurring as a result of catastrophic events (both current and past).





An aerial photograph of a flooded landscape, likely a river delta or floodplain, with numerous small islands and channels of water. A large teal circle is superimposed in the center, containing white text.

LARGE-SCALE FLOODS, RELATIVELY FREQUENT  
IN LOWLAND POLAND, POSE A THREAT TO NOT ONLY  
THE PEOPLE AND INFRASTRUCTURE, BUT ALSO  
TO THE WATER INTAKES AND SHALLOW AQUIFERS.  
PGI-NRI CAREFULLY ASSESSES THESE RISKS ON THE BASIS  
OF KNOWLEDGE OF GEOLOGICAL  
STRUCTURE OF THE COUNTRY AND RESULTS  
OF HYDROGEOLOGICAL MONITORING.

# groundwater monitoring

“ The groundwater monitoring conducted by PGI-NRI is part of the national Environmental Monitoring Programme of Poland...”



## WHAT WE DO - EXAMPLES OF PROPOSED COOPERATION AREAS

PGI-NRI manages a groundwater monitoring observation network of wells and springs (hydrogeological stations) which covers the whole territory of Poland divided into groundwater bodies.

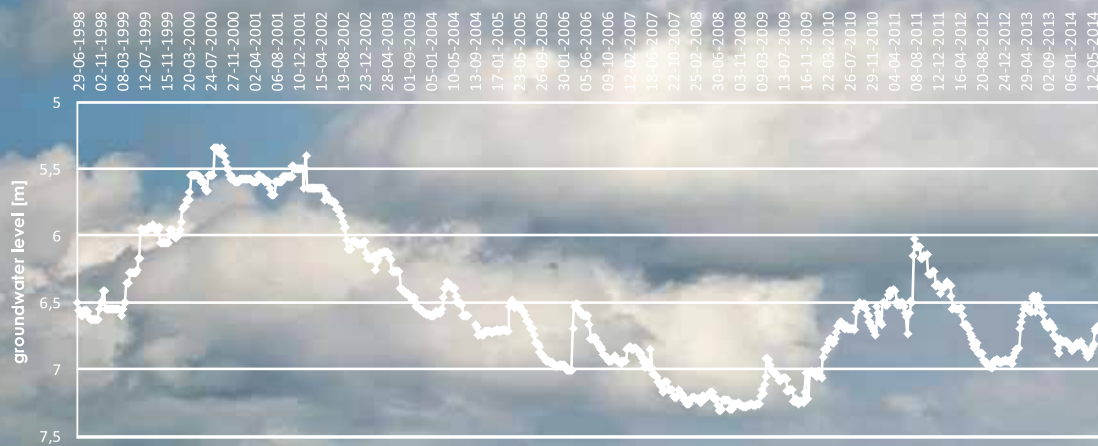
We differentiate between quantitative status monitoring (over 1,000 points), chemical status monitoring (surveillance or operational monitoring - in 2013 samples from almost 1,000 points were taken), groundwater monitoring in the boundary areas (about 200 points), and groundwater monitoring of areas polluted by anthropogenic impact (about 200 points).

The data and all kinds of monitoring results are collected in our database which is the basis for many reports and assessments. The groundwater monitoring conducted by PGI-NRI is part of the national Environmental Monitoring Programme of Poland.




# Groundwater level fluctuations

PGI-NRI hydrogeological station II/496/1







RESERVES OF GROUNDWATER IN POLAND ARE BIG ENOUGH TO SUPPORT A MUCH LARGER POPULATION THAN THE CURRENT ONE. IN SPITE OF THIS, DUE TO LOW LEVELS OF THE SHALLOW GROUNDWATER, DROUGHTS OCCUR IN SOME REGIONS OF THE COUNTRY. THE FLUCTUATIONS IN GROUNDWATER LEVELS ARE MONITORED BY THE POLISH HYDROGEOLOGICAL SURVEY WHICH REGULARLY DISSEMINATES THE RELEVANT RESEARCH RESULTS TO THE PUBLIC.

# groundwater resources and their protection

“ ...the overarching goal is to determine groundwater sources for the purpose of human population supply, as well as to recognize hydrogeological conditions essential to the preservation of environment and ecosystems associated with groundwater...” ”



## WHAT WE DO - EXAMPLES OF PROPOSED COOPERATION AREAS

### One of the most important tasks of PGI-NRI in the field of hydrogeology is to identify and document groundwater resources.

In particular, the overarching goal is to determine groundwater sources for the purpose of human population supply, as well as to recognize hydrogeological conditions essential to the preservation of environment and ecosystems associated with groundwater. Another priority is the assessment of anthropogenic threats to the useable aquifers, as well as the forecasting of the impact of existing and planned projects on groundwater resources. We have extensive experience in the implementation of a number of studies and documentation in this regard. In particular, our experts perform following groups of activities:

#### Hydrogeological cartography:

Identifying and documenting the performance of aquifers, evaluating the possibility of their exploitation, conditions for their protection, and potential threats,

Identifying and documenting shallow aquifers in terms of environmental protection and potential impact and risks to ecosystems dependent on and related to groundwater,

Assessing groundwater vulnerability and potential anthropogenic impacts on groundwater,

Preparing thematic maps (printouts and digital),

Developing databases for hydrogeological mapping.

#### Hydrogeological modeling which covers preparation of hydrodynamic models (e.g. groundwater flow) and models of mass transport in groundwater (e.g. migration of contaminants)

#### Assessment of hydrogeological conditions for the purpose of various activities:

Preparation of hydrogeological maps of aquifers with an assessment of the impact on groundwater,

Water drainage in mining and construction industry,

Assessment of impact of projects on groundwater,

Development of protection strategies for groundwater, i.e. determination of water intake protection zones, and of areas requiring protection due to appearance of drinking water resources.

#### Documentation of groundwater resources, determination of resources which are useable, renewable, etc.

#### Development of plans for groundwater monitoring for a variety of projects and investments

### Our greatest achievements and most important outcomes include:

Hydrogeological Map of Poland (main aquifer) with a scale of 1:50,000 covering the whole country (coordination and implementation of works, database design and maintenance and verification of data),

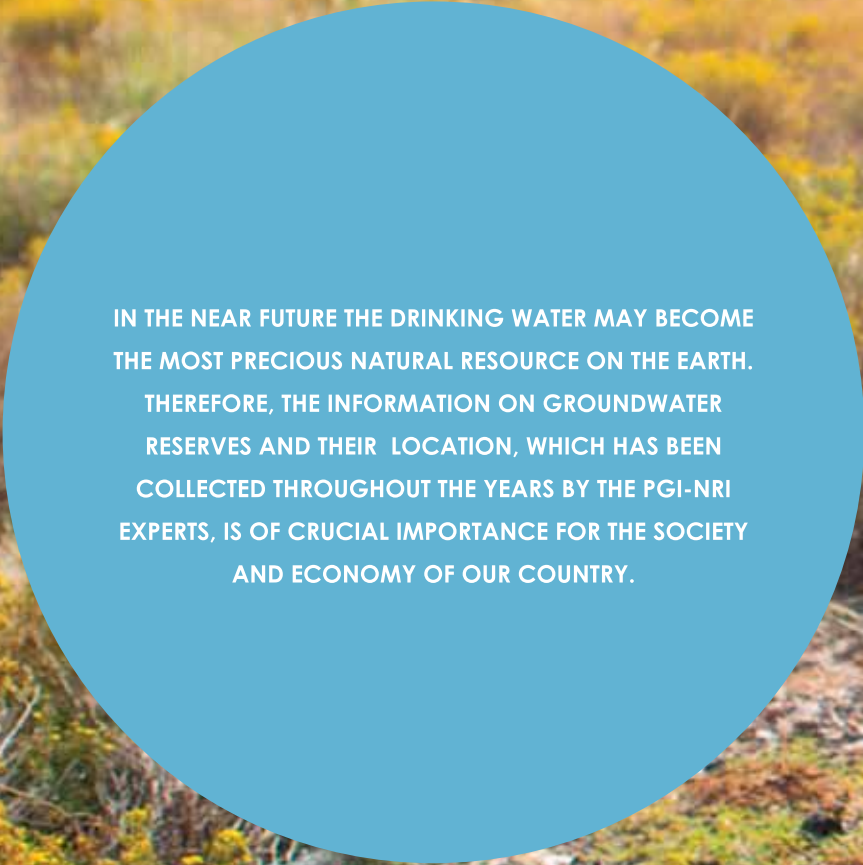
Hydrogeological Map of Poland (first aquifer) with a scale of 1:50,000 covering 2/3 of the country area (occurrence and hydrodynamics, quality, susceptibility to contamination),

Documentation of main groundwater reservoirs and areas of their conservation; design, development and maintenance of GIS database of major groundwater reservoirs,

Documentation of disposable groundwater resources; design, development and maintenance of GIS database of groundwater resources,

Documentation of groundwater resources classified as mineral (mineral and thermal water).





IN THE NEAR FUTURE THE DRINKING WATER MAY BECOME  
THE MOST PRECIOUS NATURAL RESOURCE ON THE EARTH.  
THEREFORE, THE INFORMATION ON GROUNDWATER  
RESERVES AND THEIR LOCATION, WHICH HAS BEEN  
COLLECTED THROUGHOUT THE YEARS BY THE PGI-NRI  
EXPERTS, IS OF CRUCIAL IMPORTANCE FOR THE SOCIETY  
AND ECONOMY OF OUR COUNTRY.





# environment and climate change

“ We investigate the impact of various natural factors on the life conditions on Earth. We also do modeling and forecasting of climate change...”



## WHAT WE DO - EXAMPLES OF PROPOSED COOPERATION AREAS

**The overarching goal of this research cluster is a broadly understood reconstruction of paleoenvironmental and paleoclimatic conditions and processes,** as well as search for fossil analogs of the presently occurring climate change.

We investigate the impact of various natural factors on the life conditions on Earth.

**We also do modeling and forecasting of climate change.** In particular, we are interested in circumstances under which the great biotic crises have occurred over the Earth's history, in the changes of sea levels, and in evolution of ice sheets, as well as in impacts of orogeny on climate.

**In particular, we offer cooperation in the following fields:**

Integrated petromagnetic and geochemical research and gamma spectrometry for the purpose of reconstruction of paleoenvironmental land and marine ecosystems,

Palinostratigraphic and palinofacial research,

Sedimentological study of carbonate rocks and clastic sediments, as well as Quaternary glacial deposits,

Interpretation of results from research on isotopic oxygen and carbon in sedimentary rocks and paleontological material,

Magnetostratigraphy,

Stratigraphy and paleoecology of conodonts and quaternary molluscs,

Paleogeography and the evolution of the Carpathian Basin.







ABRUPT CLIMATE CHANGE AND SUBSEQUENT  
ADAPTATION OF BIOSYSTEMS TO NEW  
CLIMATE CONDITIONS HAS OCCURRED SEVERAL  
TIMES THROUGHOUT THE EARTH'S HISTORY.  
THE PROFOUND KNOWLEDGE ABOUT THESE EVENTS,  
POSSIBLE TO ACQUIRE THROUGH COMPREHENSIVE  
GEOLOGICAL RESEARCH, SHOULD SERVE  
AS THE BASIS FOR A RELIABLE PROGNOSIS  
OF FUTURE TRENDS.

# geodiversity and geotourism

“ We are convinced that geodiversity must be protected for environmental, scientific or educational purposes. Different forms of protection exist to preserve geodiversity: national and landscape parks, nature reserves, monuments of nature, documentation sites, geological sites, geotopes, and geoparks...”





## WHAT WE DO - EXAMPLES OF PROPOSED COOPERATION AREAS

### **A further focus area of our research is the geodiversity conservation and geotourism.**

Experienced specialists from our regional offices across Poland are involved in tasks related to these topical areas.

We are convinced that geodiversity must be protected for environmental, scientific or educational purposes. Different forms of protection exist to preserve geodiversity: national and landscape parks, nature reserves, monuments of nature, documentation sites, geological sites, geotopes, and geoparks. The geoparks are areas of particular geological value. The idea of their establishment dates back to the 1990s. The geoparks have different ranks varying from those with local and national significance to those of European and global importance. The specialists from PGI-NRI took part in creation of the concept and documentation of the Muskau Arch Geopark which in 2009 was awarded the status of the first national park in Poland, and in 2011 was granted a certificate of the European Geoparks Network.

Since 2010, the Polish Central Register of Geosites and an internet-based application created by the Institute have been publicly available. At present, the database contains nearly 2,500 geosites in Poland and is successively updated.

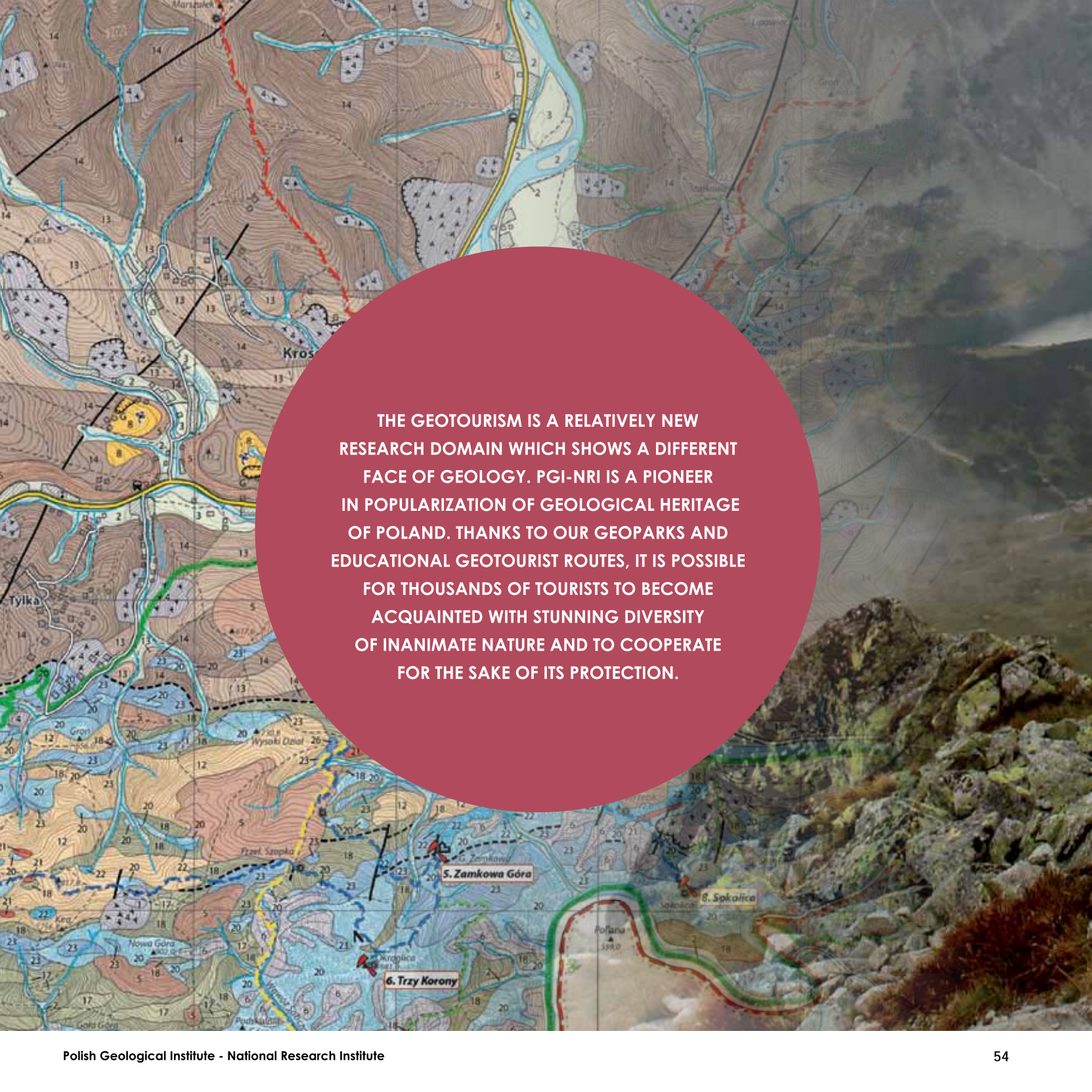
### **In the framework of this research cluster we provide:**

Assessment of the geotourism potential of regions,  
Geosite development designs for tourism purposes,  
Geopark designs,  
Designs of actual and virtual geological trails,  
Geotourism maps,  
Expert studies, documentation and valuations of geosites,  
Geodiversity conversation plans.

### **In Poland we cooperate with:**

Local governments,  
Regional directorates for environmental protection,  
Directorates of national and protected landscape parks,  
Tourism industry representatives.





THE GEOTOURISM IS A RELATIVELY NEW RESEARCH DOMAIN WHICH SHOWS A DIFFERENT FACE OF GEOLOGY. PGI-NRI IS A PIONEER IN POPULARIZATION OF GEOLOGICAL HERITAGE OF POLAND. THANKS TO OUR GEOPARKS AND EDUCATIONAL GEOTOURIST ROUTES, IT IS POSSIBLE FOR THOUSANDS OF TOURISTS TO BECOME ACQUAINTED WITH STUNNING DIVERSITY OF INANIMATE NATURE AND TO COOPERATE FOR THE SAKE OF ITS PROTECTION.





# about us:

**The Polish Geological Institute is a research institute having the status of a National Research Institute.** It was established in May 1919 and is supervised by the Minister of the Environment. Under the *Act on Geological and Mining Law*, and the *Act on Water Law*, it performs the tasks of the **Polish Geological Survey** and the **Polish Hydrogeological Survey**.

The Polish Geological Institute - NRI performs its mission through intense activities in all fields of earth sciences all over Poland. It is the main depositary and a source of knowledge, information and geological, hydrogeological and geoenvironmental data in Poland.

The Association of the Geological Surveys of Europe, EuroGeoSurveys, will remain the basic platform of international cooperation for the Institute.



**Polish Geological Institute**  
**National Research Institute**