POLISH GEOLOGICAL INSTITUTE – NATIONAL RESEARCH INSTITUTE

POLISH GEOLOGICAL INSTITUTE
MENTE ET MALLEO
1919
NATIONAL RESEARCH INSTITUTE

100 YEARS
1919 2019

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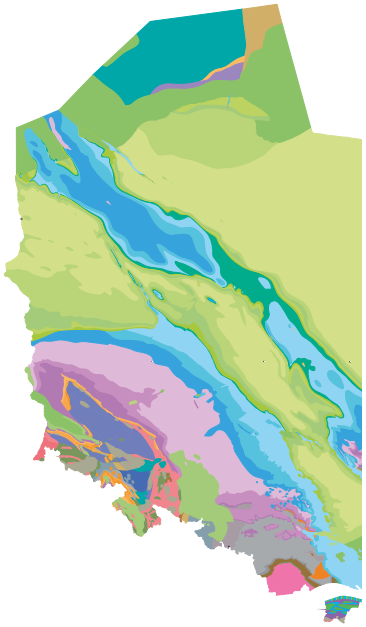

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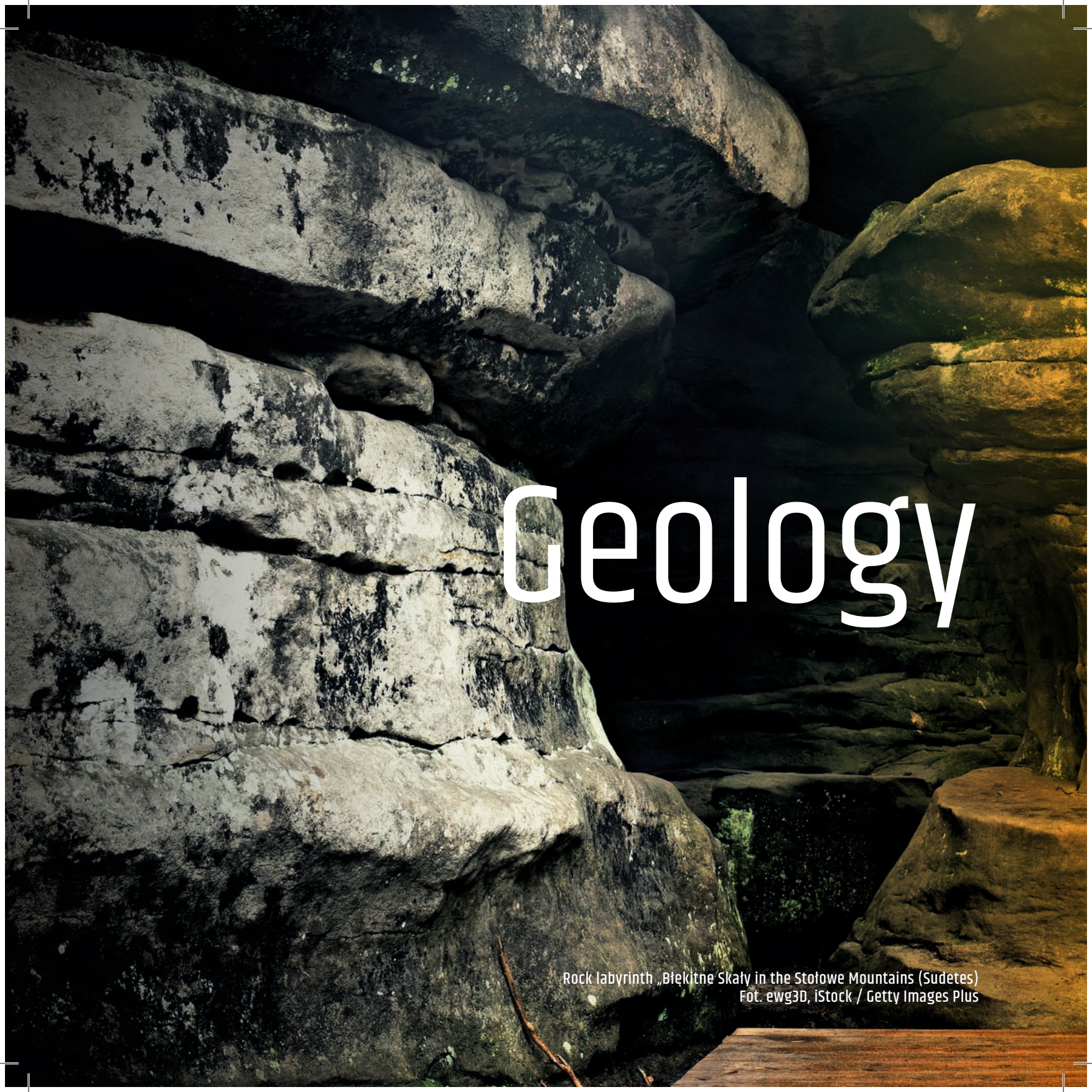
Geology



Rock labyrinth „Błękitne Skały in the Stołowe Mountains (Sudetes)
Fot. ewg3D, iStock / Getty Images Plus

Geology is present in almost every part of the economy, playing a key role in many of its sectors. Sustainable economic growth requires a regular supply of energy, mineral resources, and water. Knowledge about the country's geological setting provides said vital information and is a requirement for city and municipal development, at the same time aiding the protection of the natural environment.

The Polish Geological Institute – National Research Institute, by fulfilling the tasks of the Polish Geological Survey and the Polish Hydrogeological Survey, ensures the safety of the State in those main aspects. While surveying Poland's geological setting and natural resources, it directs underground space management in order to best develop the national economy. It also monitors and predicts such phenomena as flooding, droughts, and landslides, which may pose a threat to society and infrastructure.

History

Kazimierz Kowalewski working in the field base
in Kielce at 29 Żeromskiego (home of Jan Czarnocki), 1930.
Photo Jan Czarnocki, item no. MNKi/D/1039 – the National Museum in Kielce

7 May 1919
Ceremonial opening of the Polish Geological Institute (PGI) in a temporary location at the Staszic Palace in Warsaw

30 May 1919
The Polish Geological Institute established by the Legislative Parliament of the Second Polish Republic

1928
Drilling Archive established

1930
PGI moved from the Staszic Palace to a newly constructed building (designed by M. Lalewicz) at Wiśniowa Street in Warsaw (currently the location of the Geological Museum of the Polish Geological Institute)

31 March 1938
Decree by the President of the Republic of Poland on the establishment of the Polish Geological Survey, consisting of the Polish Geological Council and Polish Geological Institute

1952
Completed construction of the Institute building (designed by M. Leykam) at 4 Rakowiecka Street in Warsaw

1968
Launching the multi-volume monograph "Geology of Poland"

1994
The legal and organizational confirmation of tasks and role of the Geological Survey in the statute of the Institute

2003
Commencement of Polish Hydrogeological Survey tasks by PGI

2009
PGI granted the status of a national research institute

2011
PGI–NRI entrusted with the function of the Polish Geological Survey, by means of legal act

Big Discoveries

Dr. Jan Wyżykowski,
who discovered the Great Polish Copper

1922
Discovery of a pyrite deposit in Rudki
(the Holy Cross Mountains)

1924
Discovery of a phosphate deposit in Annopol

1939
Discovery of exploitable coal deposits in Bug river basin

1947
discovery of the "Kłodawa" rock salt deposit by drilling

1952
Discovery of numerous lignite deposits in central Poland, Greater Poland and Lower Silesia

1953
Discovery of a sulphur deposit near Tarnobrzeg

1953
Discovery of iron ore deposits in Łęczyca
(Łódź province)

1957
Discovery of the Legnica-Głogów Copper Belt deposit

1962
Discovery of iron, titanium and vanadium ore deposits in NE Poland

1964
Discovery of polyhalite deposits in the Bay of Puck

1974
Discovery of a natural gas-bearing region in the Western Carpathians (Obidowa IG 1)

1986
Discovery of molybdenum, molybdenum-tungsten-copper and copper ores in the Poraj-Mrzygłów region (Silesia)

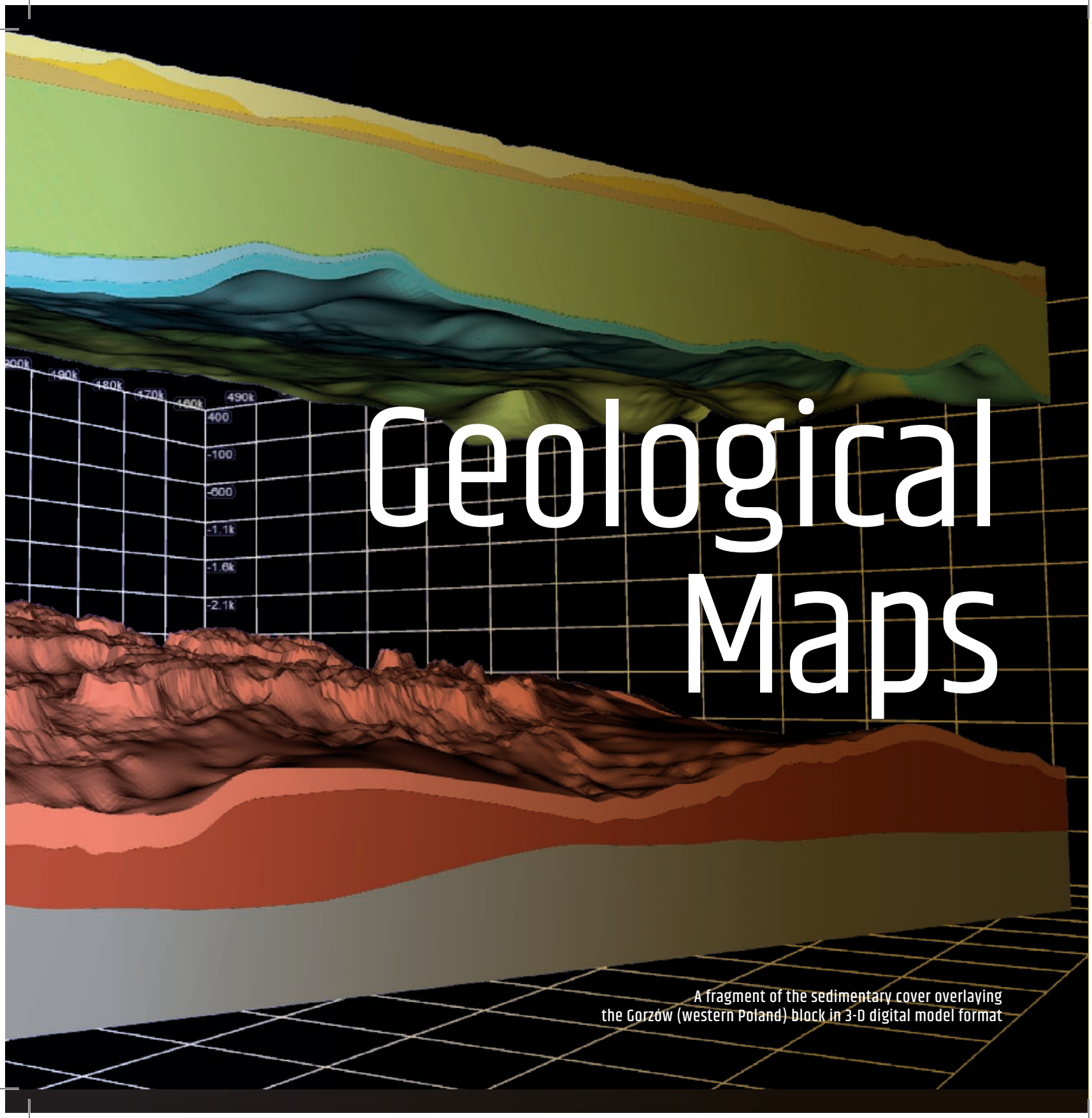
Regional Geology of Poland

Dolina Pięciu Stawów Polskich, Tatra Mountains
Fot. Glim, iStock / Getty Images Plus

Our country is a mosaic of geological regions – structural units of various elevations size, with different types of structure, stratigraphy and tectonics. The geological divisions do not always coincide with the geographical ones, as many structural units stretch underground for miles at a time. Learning about the hidden structures reconstructing their dynamics and history of their formation, and establishing mutual dependencies and position in the general history of the Earth are all critical to the development of science and the economy. Regional research has been the main task of the Polish Geological Institute since its establishment in 1919. PGI's first statute defined the main mission of the Institute to be research on the general geological structure of Poland and, based on this, the solution to the increasing demand for mineral resources.

Field work was (and still is) based on outcrops, quarries and core samples; the work was carried out mainly in Poland and in adjacent areas. The great compilations of regional research are: the monumental, multi-volume "Geology of Poland", as well as numerous geological atlases (including the latest "Geological Atlas of Poland").

WITHOUT THE KNOWLEDGE CONTAINED IN MULTIPLE MONOGRAPHS, PALAEOGEOGRAPHIC MODELS AND STRATIGRAPHIC TABLES, CREATED IN THE COURSE OF BASIC RESEARCH, IT WOULD NOT BE POSSIBLE TO PROPERLY DESIGN THEMATIC MAPS, PROSPECT FOR MINERAL RESOURCES OR ENGAGE IN EFFECTIVE ENVIRONMENTAL PROTECTION.



Geological Maps

A fragment of the sedimentary cover overlaying the Gorzów (western Poland) block in 3-D digital model format

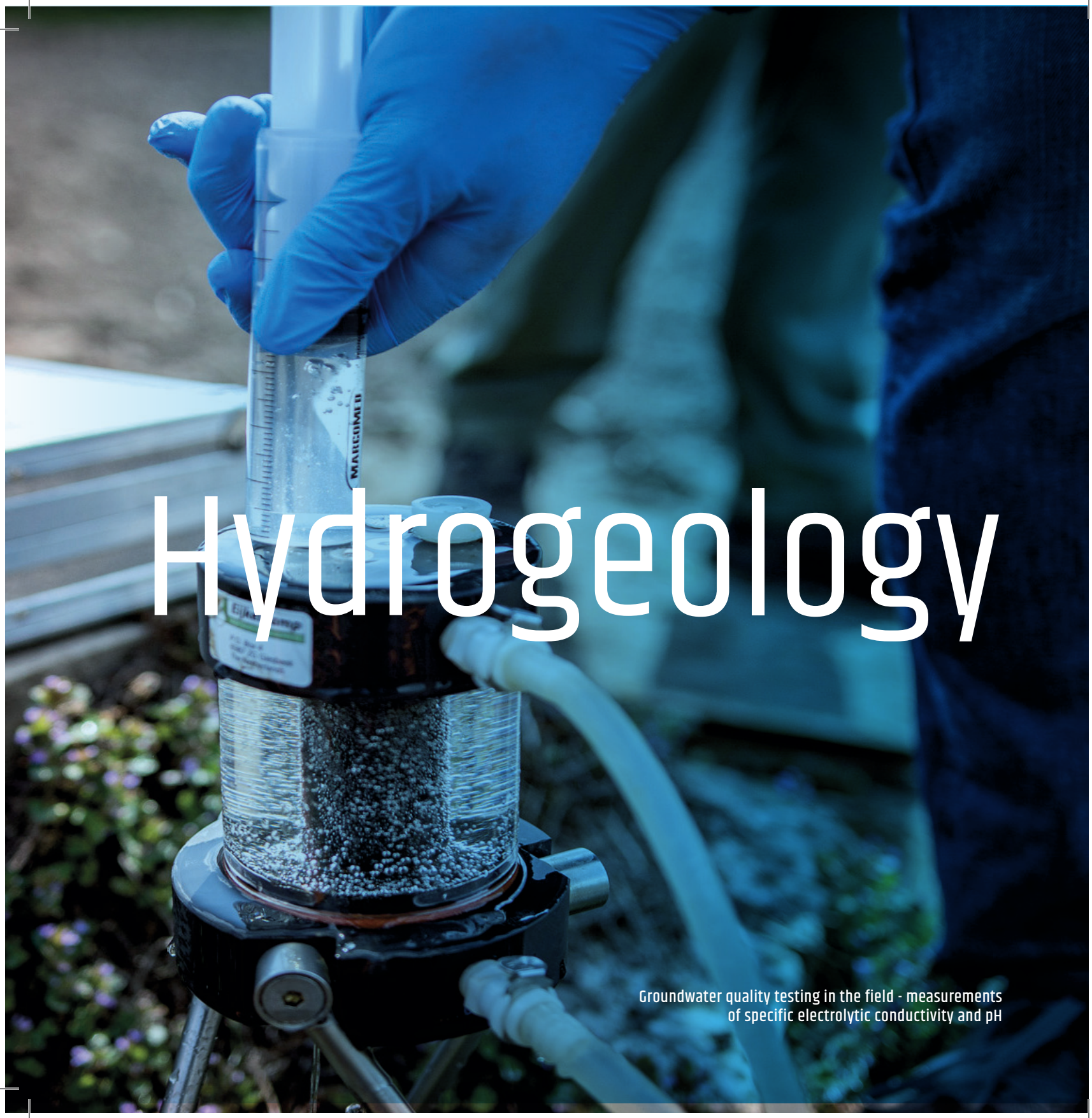
One of the main tasks of the Polish Geological Survey carried out by PGI is the widely understood "geological cartography". All the knowledge about the structure and history of our country's landscape and the achievements of many generations of researchers, are compiled together into geological maps.

IN ORDER TO KEEP THE GEOLOGICAL DATA ACCURATE, THE INSTITUTE INITIATES, COORDINATES AND COMPILES SERIAL DOCUMENTS OF GEOLOGICAL, HYDROGEOLOGICAL AND ENVIRONMENTAL CARTOGRAPHY COVERING THE ENTIRE COUNTRY, AS WELL AS REGIONAL AND THEMATIC DOCUMENTS ADAPTED TO VARIOUS NEEDS.

The foremost objective of modern geological cartography is to create an accurate representation of the country's geology, which is a critical requirement for managing natural resources and to utilize the environment in accordance with the principles of sustainable development. The maps created at the Institute are therefore essential for rational environmental management and constitute the basis for making key economic decisions in our country.

The Institute contributed to the creation of the most important cartographic documents, scale 1:50,000 – the brimstones of Polish geology – "The Detailed Geological Map of Poland", "The Hydrogeological Map of Poland" and "The Geoenvironmental Map of Poland". These three serial maps (that cover the entire country) and thousands of reference and thematic maps and atlases, showing various aspects of the geological environment, put us among the few countries in the world with such extensive knowledge of their own natural environment.

Moving into the future, the Institute implements the most modern methods to create cartographic documents, such as digital database cartography, synchronizing the geological database with external data, and the growing use of 3D cartography and modeling. 3D modeling is another milestone in the development of cartography, allowing not only to study and present the surface, but also to image subsurface geology in three dimensions. All these activities aim at adapting digital cartography data to international standards and preparing it for various analyses.



Hydrogeology

Groundwater quality testing in the field - measurements of specific electrolytic conductivity and pH

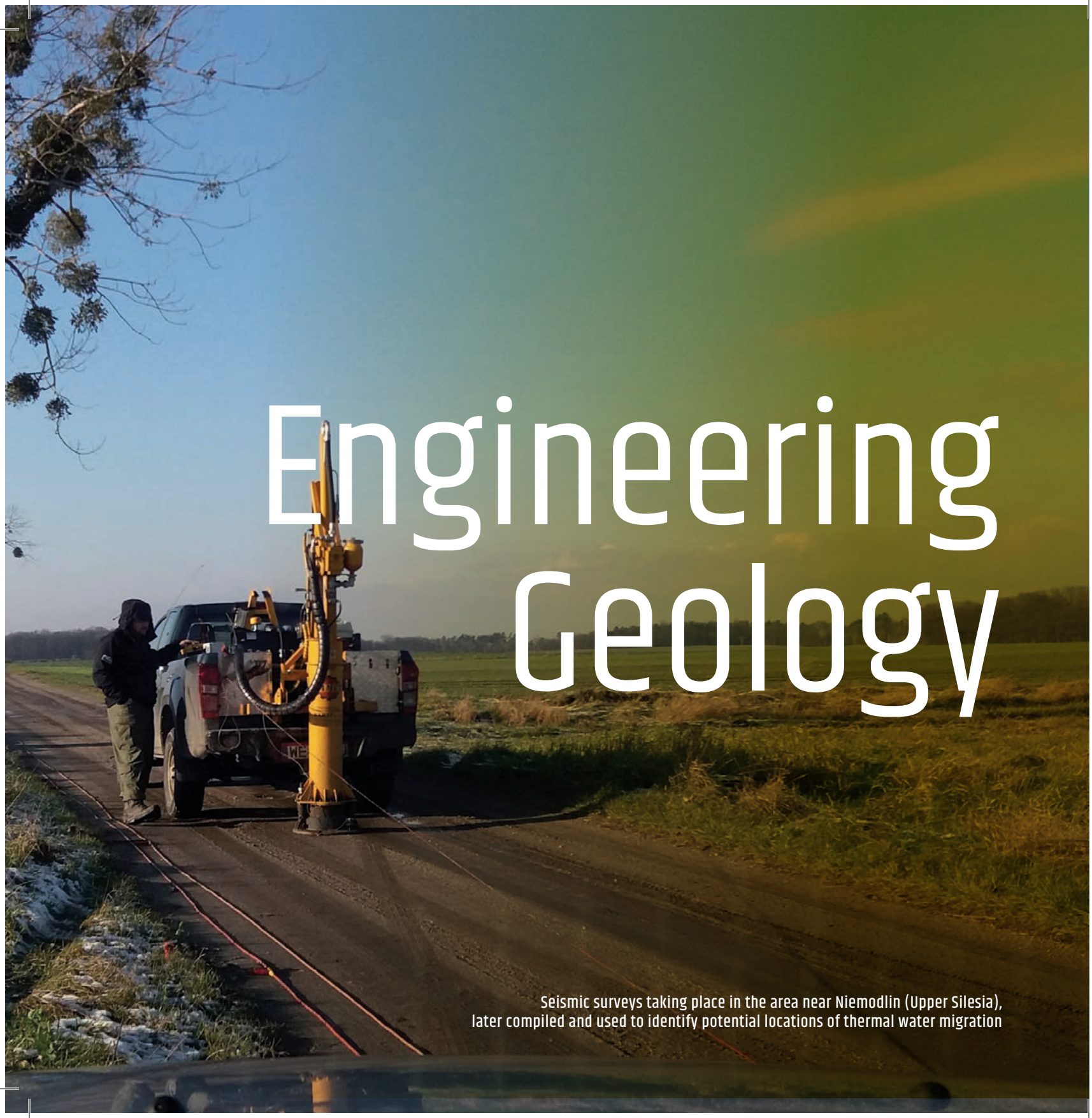
Due to the strategic importance of groundwater in meeting the water demands of society and economy, the PGI-NRI carries out large-scale projects, which aim is to identify the conditions needed for groundwater occurrence and define the criteria for its utilization and protection.

REGIONAL HYDROGEOLOGICAL RESEARCH CONDUCTED FOR MANY YEARS RESULTED IN COMPILING NUMEROUS DOCUMENTS CONCERNING HYDROGEOLOGICAL CARTOGRAPHY, ESTIMATING THE AVAILABILITY OF GROUNDWATERS AND ASSESSING THEIR QUALITY

As part of the tasks conducted by the Polish Hydrogeological Survey, measurements and observations are made using the groundwater monitoring network, which consists of approx. 1250 monitoring points. Groundwater quality assessments are presented; cyclical announcements on the current hydrogeological situation and forecasts are published. In the case of a hydrogeological emergency, warnings are issued. Information on groundwater (regular, mineralized and possessing healing qualities) is collected and processed by IT systems .

Measurement of the bottom of a borehole performed as part of research monitoring of the border zone with the Czech Republic

Engineering Geology



Seismic surveys taking place in the area near Niemodlin (Upper Silesia), later compiled and used to identify potential locations of thermal water migration

Geological research for construction engineering purposes carried out by the Institute concerns itself with solving problems of spatial planning, the interaction between foundation soils and a structure, and sustainable use of the potential of the geological environment for intelligent solutions related to renewable energy sources (RES). This research contributed to the identification of geological engineering conditions concerning a large area of the country, including large urban agglomerations with regard to the idea of a Smart City.

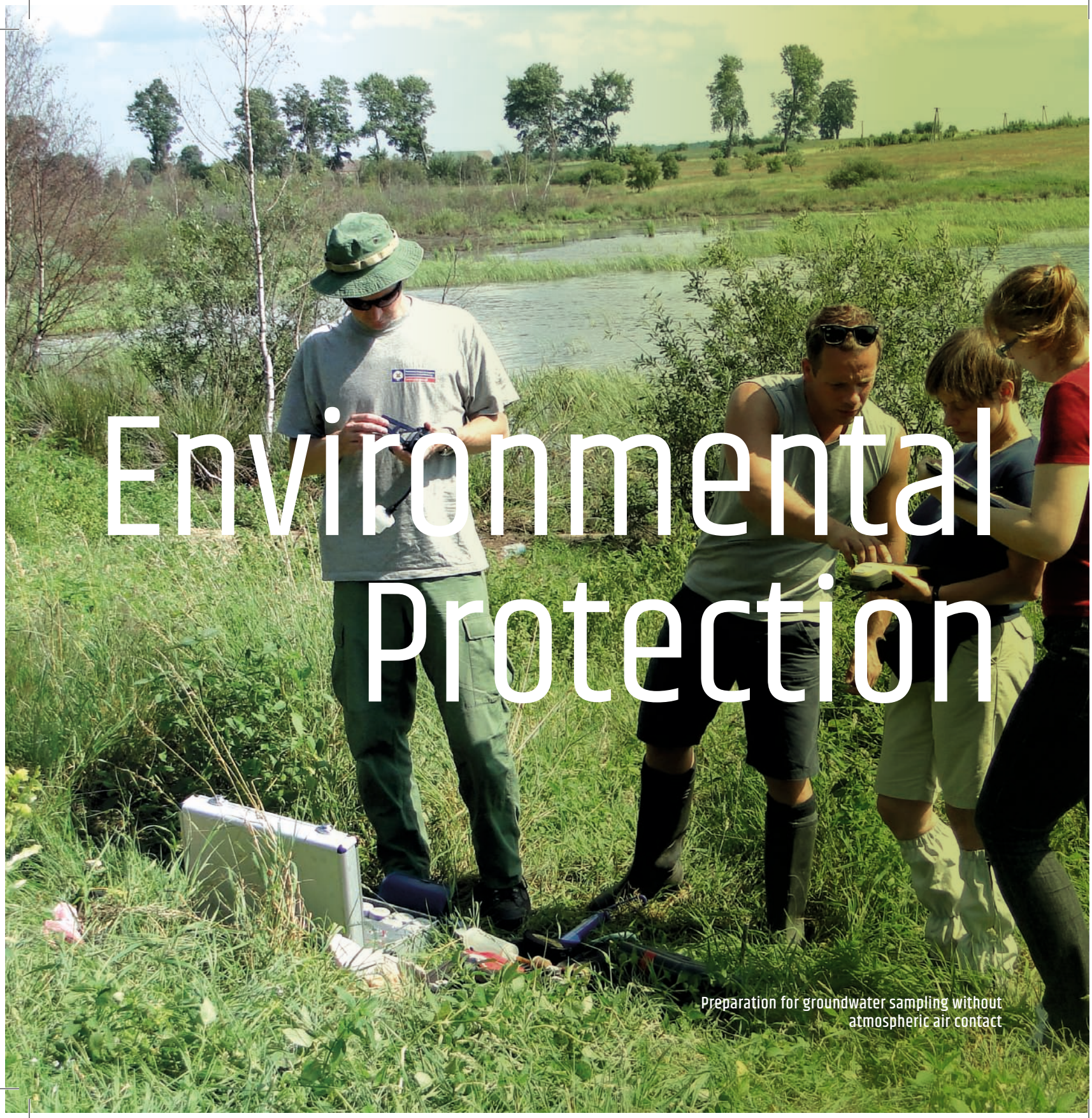
Geological standards were also introduced in order to implement investment management technology by using e-modelling tools for construction data, as well as by compiling maps of low-temperature geothermal energy potential for designing ground heat exchangers.

PGI-NRI also prepares guidelines and handbooks defining the principles for documenting geological-engineering conditions related to the implementation of construction projects on land and at sea, as well as the methodology of geological-engineering research concerning, among others, geophysical engineering and thermal properties of soils.

THE INSTITUTE HAS THE LARGEST COLLECTION OF DIGITAL DATA ON THE DESIGN AND CONSTRUCTION-ENGINEERING CONDITIONS IN POLAND – THE GEOLOGICAL – ENGINEERING DATABASE.

Soil measurements using a static CPT probe

Environmental Protection



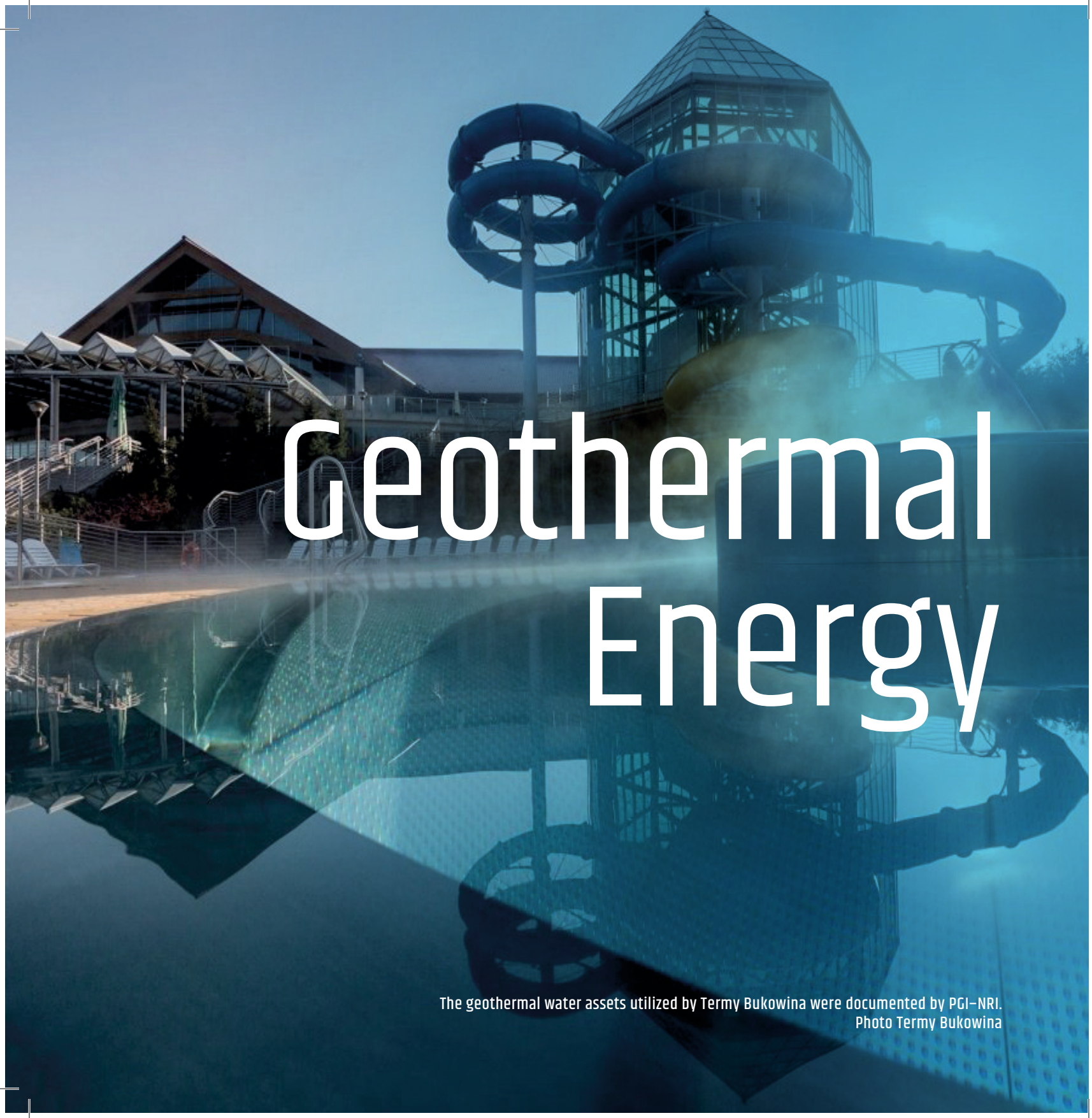
Preparation for groundwater sampling without atmospheric air contact

Environmental geology is one of the priority directions with PGI's achievements in this field being significant. The undertaken tasks concern many of its aspects – starting with an assessment of the environmental impact of various types of investments on the surface and underground, an assessment of the environmental risks and methods of risk mitigation, the identification of the changes occurring in the abiotic environment, and indicating mechanisms for said changes and ways in which they spread, the elimination of pollution sources dangerous to the environment, and suggesting best ways of restoration of degraded areas, and, finally, the protection of the most valuable geological sites.

EXTENSIVE GEOCHEMICAL CARTOGRAPHY EFFORTS MADE IT POSSIBLE TO ASSESS THE ENVIRONMENTAL SURFACE CONDITIONS FOR URBAN AND INDUSTRIAL AGGLOMERATIONS,WHILE WORK RELATED TO ENVIRONMENTAL THREAT ASSESSMENT AND EFFECTIVE PREVENTION RESULTED IN THE ELIMINATION OF POTENTIAL ECOLOGICAL DISASTERS IN MANY REGIONS OF THE COUNTRY.

The PGI's research makes it possible, among others, to map out and locate pollutants and indicate their spread in the natural environment. It allows for land-value estimation, rational spatial planning, waste management and it determines measures to be taken in order to repair damage and restore the balance.

Methane measurements in soil air



Geothermal Energy

The geothermal water assets utilized by Termy Bukowina were documented by PGI–NRI.
Photo Termy Bukowina

Poland – in comparison with other countries – has an average potential for obtaining geothermal energy from high-temperature groundwater. However, in many regions of the country, geothermal energy can be a valuable supplement to already existing, traditional heating systems.

PGI-NRI research made it possible to create detailed hydrogeological maps, determine groundwater temperature and the degree of mineralization. A map of heat flux intensity from the depths of the Earth reaching our country's surface was also created. There is ongoing research on the possibility of obtaining energy directly from the hot, dry rocks located at a depth of about 3 km and greater (HDR geothermal energy system). The Institute was the contractor of an international research project concerning the popularization of the use of ground-source heat pumps and methods of low-temperature geothermal energy potential mapping (GEOPLASMA CE). Currently, work continues on creating domestic maps of low-temperature geothermal energy potential and environmental conditions for ground-source heat pump technology.

GEOTHERMAL SYSTEMS ARE BEGINNING TO PLAY AN IMPORTANT ROLE IN SATISFYING EMISSION-FREE ENERGY NEEDS FOR CITIES AND VILLAGES, AT THE SAME TIME BEING ECONOMICALLY EFFICIENT FOR DISTRICT HEATING AND COOLING.

Hence, the PGI's experts focus on activities related to the use of geothermal technologies (both high and low-enthalpy) in district heating and cooling of the cities and in areas without said system, in order to reduce CO_2 emissions, increase the importance of renewable energy sources and thus mitigate the effects of climate change. The Institute runs the Central Database on Low-Temperature Geothermal Energy.

Field measurements of thermal conductivity of rocks

Natural Hazards

Work, including the development of landslide documentation, is often conducted in order to counteract the problem of landslides destroying infrastructure

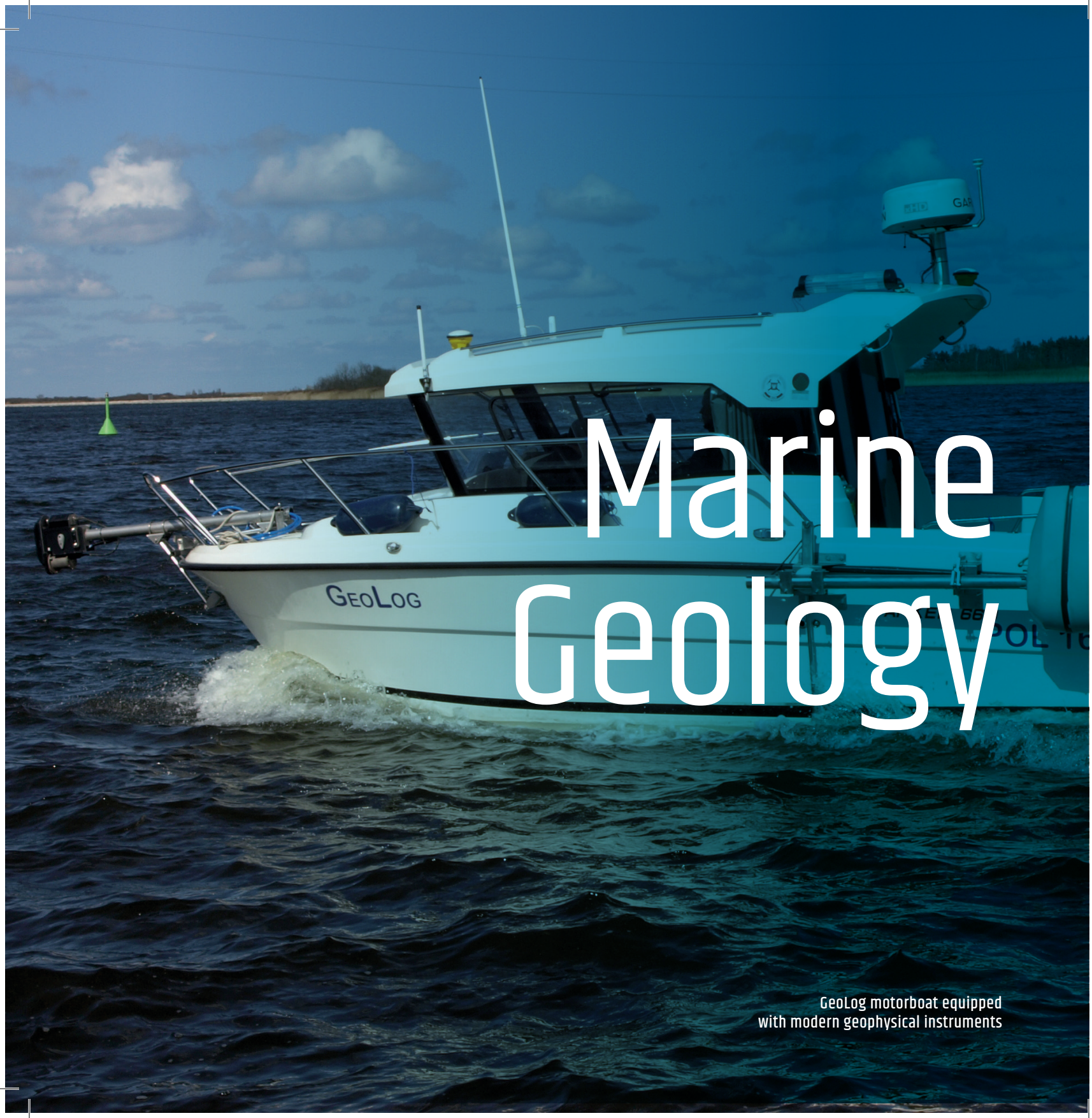
The Polish Geological Institute – NRI is the contractor for projects aimed at reducing risks related to geologic hazards. These tasks are coordinated by the Centre for Geohazards, which is engaged in identifying, monitoring and forecasting geohazards in a uniform manner throughout the country.

THE LARGEST ONGOING PROJECT IS THE LANDSLIDE COUNTERACTING SYSTEM, BY MEANS OF WHICH OVER 66,000 LANDSLIDES AND 5,600 HAZARD AREAS HAVE BEEN IDENTIFIED.

The produced "Maps of Landslides and Mass Movement Hazard Areas, scale 1:10,000" together with landslide documentation are used by the local administration for spatial planning. Comprehensive monitoring for selected landslides is carried out as part of the job and research is being conducted to create an early warning system.

As part of the Monitoring of Geodynamics of Poland, the Institute provides real-time information on seismic phenomena and changes in the magnetic field and in acceleration due to gravity. These tasks are carried out using latest measurement technologies, applying internationally recognized methodology, i.e. satellite radar interferometry (abbr. InSAR) for monitoring of topographical changes in Poland, with resolution in millimeters. Detected changes indicate current deformation caused by natural phenomena, mining or other underground activity.

Marine Geology



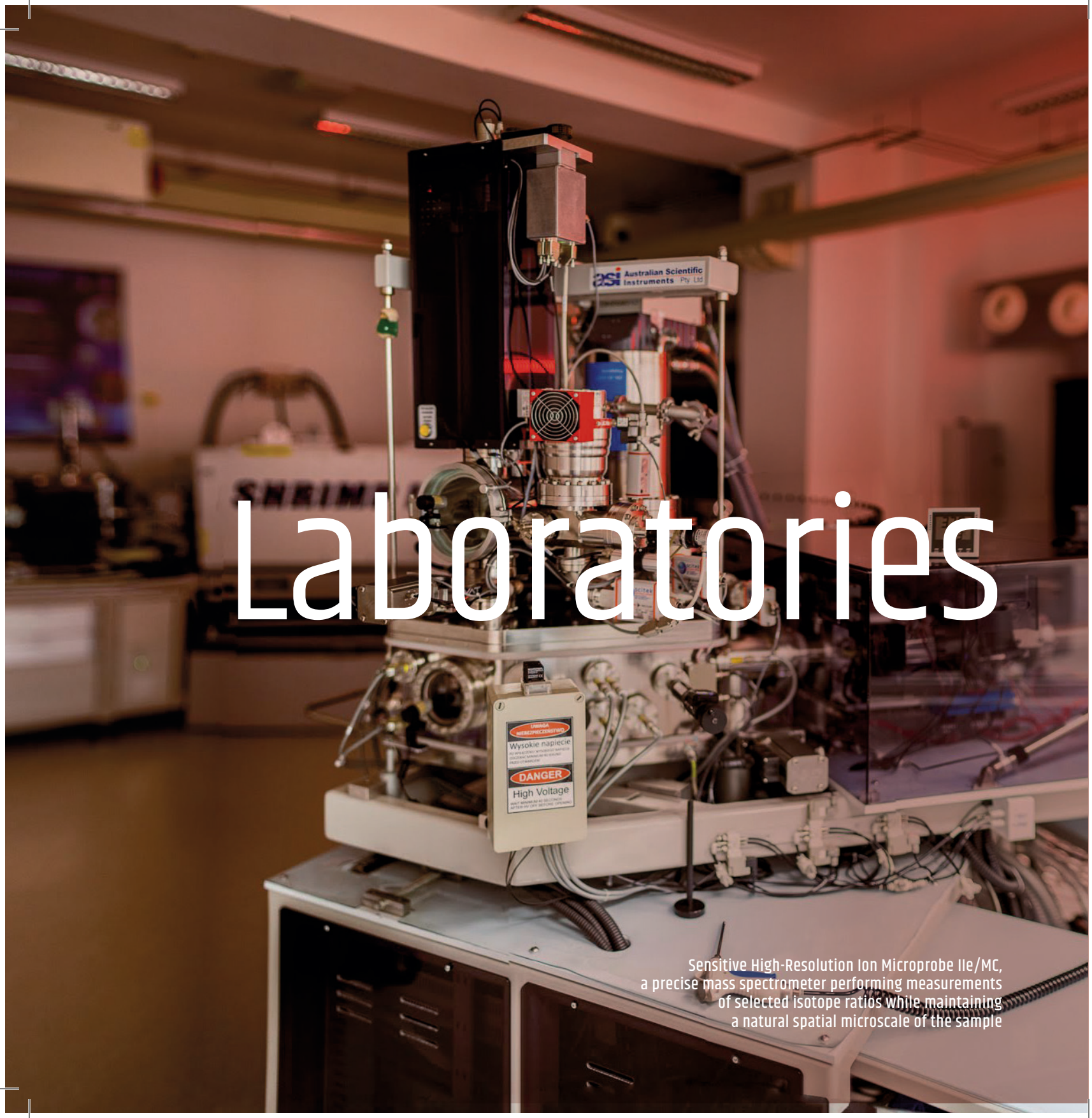
GeoLog motorboat equipped
with modern geophysical instruments

One of the tasks of the PGI is to identify the geology of the Polish maritime domain. The activities carried out so far in this field have resulted, among others, in identifying seabed geology, scale 1:200,000.

The current economic demands related to utilizing the maritime domain have caused the PGI to focus on detailed research and on the development of multi-thematic and high-resolution geological maps of the seabed and coastal zone.

3D scanning of the cliff coast in Orłowo using the method of terrestrial laser scanning (LiDAR)

Laboratories



Sensitive High-Resolution Ion Microprobe IIe/MC, a precise mass spectrometer performing measurements of selected isotope ratios while maintaining a natural spatial microscale of the sample

The PGI–NRI laboratories perform comprehensive analytical tests that determine the chemical composition and physical properties of solids and liquids, as well as mechanical and filtration properties and magnetic susceptibility of soils and rocks.

Precise trace element measurements and isotopic analyses, as well as qualitative and quantitative chemical analysis, are widely used in ore prospecting, identification and mining, as well as in creating maps showing the natural resources reserves and environmental pollution, and in issuing opinions and analyses concerning the fields of geology, mining, environmental protection, geodiversity, micropalaeontology, archaeology, and materials science.

PGI–NRI HAS QUALIFIED AND EXPERIENCED STAFF AS WELL AS UNIQUE INSTRUMENTS, SUCH AS THE SENSITIVE HIGH-RESOLUTION ION MICROPROBE IIE/MC, ELECTRON MICROPROBE CAMECA SX 100, AND SCANNING ELECTRON MICROSCOPES.

Research conducted using Zeiss Leo and Hitachi Su3500 with EDS detectors allow to determine the age of minerals, rocks, and chemical composition of mineral phases, which is widely used in the identification and documentation of geological processes, as well as in environmental research.

As of 2000, PGI–NRI laboratories have received accreditation from the Polish Centre for Accreditation for chemical research of water, soil, sediments, rocks, biological objects intended for research and agricultural products, as well as for chemical research and sampling of water and soil, and for research of physical properties of soil, sediments and rocks.

Equipment for oedometeric measurements

Organic compound analysis using gas chromatography (GC-MS-MS)

Scientific Achievements

Conodonts are used for multiple research and practical purposes, including exploration and study of hydrocarbon deposits

PGI–NRI's scientific achievements are closely related to its mission. Initially, it was the development of domestic geological model, which helped to formulate research projects, in turn leading to the discovery of mineral resources. Later, the discovered ore deposit genesis models were presented, followed by the structural geology synthesis. The documents pertained to the entire country, as well as to its large parts (natural geological regions). The palaeogeographic and tectonic development history of Poland was also reconstructed, and presented both in cartographic documents (atlases and maps) and monographs.

The latest scientific achievements are a consequence of the wide application of both modern, interdisciplinary methodologies (such as sedimentary basin analysis) and research methods (i.e. using the Sensitive High-Resolution Ion Microprobe). The results of such research constitute a large contribution by the PGI to the development of general knowledge and are published in some of the most renowned journals in the world.

Archives

Geological Samples Archive in Hołowno (SE Poland)
The archive contains 94,000 boxes with geological samples from 471 boreholes

The PGI–NRI is the main depositary of geological information and other environmental data in Poland under the "Geological and Mining Act" and "Water Act". Operating the central geological archive, and maintaining geological and hydrogeological databases are some of the main tasks of the Polish Geological Survey (PGS) and the Polish Hydrogeological Survey (PHS).

The archive is being operated by National Geological Archive (NGA), which collects, maintains and makes available geological, hydrogeological and geophysical materials, in particular geological documentation (on deposits, hydrogeological, geological engineering and other), field work data, geological maps and sets of data in analogue and digital form.

NGA also contains geological samples (including core samples) from boreholes. Apart from the geological documentation, this is the most valuable source of geological information, which, despite the passage of time since the field research was conducted, gives a "new" opportunity to discover the mysteries of geology.

OVER THE PAST THE CENTURY, THE INSTITUTE GATHERED ALMOST 400,000 ARCHIVAL DOCUMENTS AND MORE THAN 240,000 PUBLISHED AND UNPUBLISHED MAPS. THE GEOLOGICAL SAMPLE RESOURCES INCLUDE ALMOST 867 LINEAR KILOMETRES OF CORE SAMPLES FROM 5,611 BOREHOLES.

Drill core profiling

Databases

The geologia.pgi.gov.pl portal is a modern tool for data analysis, where spatial information is categorised and partially interpreted when needed for various issues and sectors of the economy

Geological information is traditionally made available in NGA's documentation reading rooms and core sample rooms, as well as (together with hydrogeological data and maps) in the form of raw data.

An increasing amount of information is also available via the internet through websites and portals as well as web applications (Geologia.pgi.gov.pl, GeoLog, SPD PSH, e-PSH, e-MGŚP, PGI-NRI metadata catalogue) providing access to metadata and database resources with spatial data services – The Central Geological Database (CGD) and other thematic databases from the Polish Geological Survey such as MIDAS, SOPO, INFOGEOSKARB systems and PHS data processing system.

GeoLOG is an application that provides access to data stored in the Central Geological Database. This database is run and developed by the Polish Geological Institute-NRI. It is the largest collection of digital data related to Earth sciences in Poland.

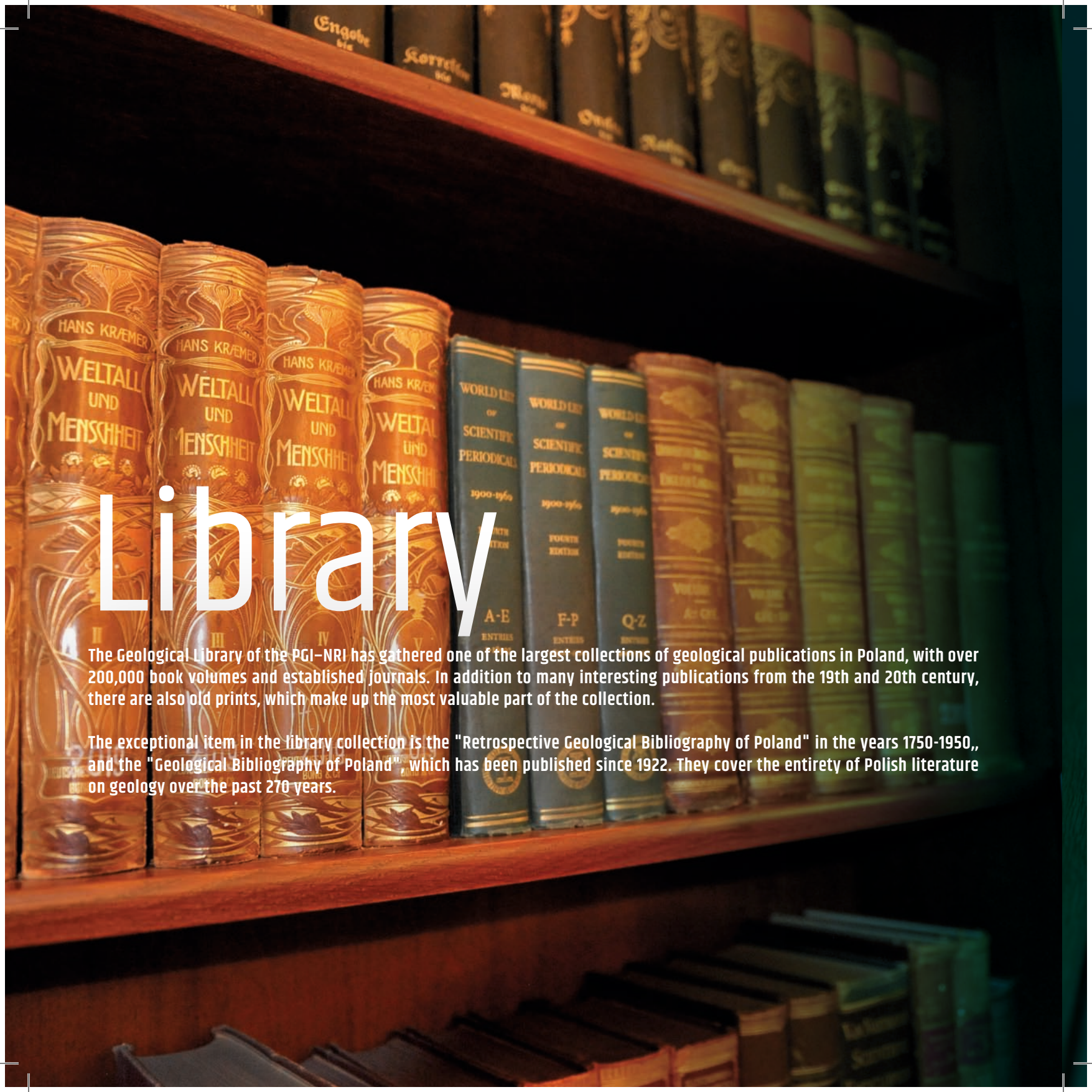
International cooperation

The participants of a training session organized as part of the PanAfGeo project examining a sinkhole located in the area of long-term underground mining activity (near Johannesburg)

The PGI–NRI actively participates on the international forum. A priority in the area of cooperation includes activities within the EuroGeoSurveys (EGS) and joint implementation of projects ordered by the European Commission.

The flagship project is the EGS cooperation with the Organisation of African Geological Surveys (OAGS); PGI–NRI is the technical coordinator for this project. Over the past three years of the project, which enjoys great interest from African countries, almost 1100 staff from geological surveys have been trained. Priority is also given to cooperation with geological surveys and scientific and research centres from neighbouring countries.

The monitoring of groundwaters at the Polish-Lithuanian border is also worth mentioning. In addition, the GeoEra project is implementing the task to building a numerical hydrodynamic model for the trans-border area.



Library

The Geological Library of the PGI–NRI has gathered one of the largest collections of geological publications in Poland, with over 200,000 book volumes and established journals. In addition to many interesting publications from the 19th and 20th century, there are also old prints, which make up the most valuable part of the collection.

The exceptional item in the library collection is the "Retrospective Geological Bibliography of Poland" in the years 1750-1950,, and the "Geological Bibliography of Poland", which has been published since 1922. They cover the entirety of Polish literature on geology over the past 270 years.

Publications

Publishing the results of the research conducted by PGI–NRI has always been an important task: throughout its existence, the PGI publishes journals (including such flagship items as "Geological Quarterly" and "Polish Geological Review") publishing series and books as well as maps, atlases and popular science items. Most of them are in open-access, which contributes to dissemination of research results. The impeccable level of the PGI publications is the result of the work of our experienced editorial team composed of professional geologists, who are also specialists in publishing.

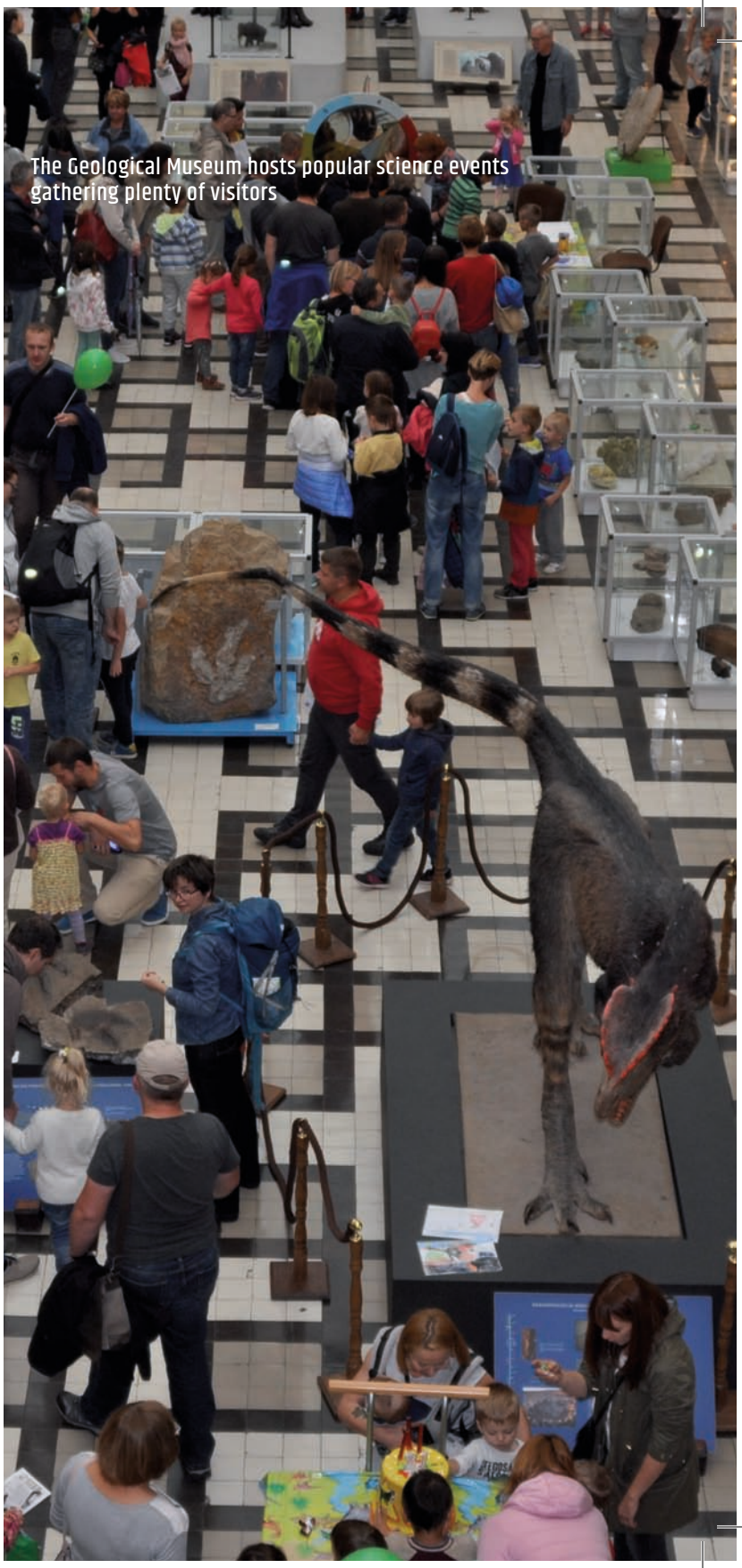
Promotion of Geoscience

Exhibition hall of the Geological Museum

THE PGI ATTACHES GREAT SIGNIFICANCE TO THE DISSEMINATION OF KNOWLEDGE ABOUT GEOLOGY. THE OBJECTIVE OF ALL THE PROJECTS CARRIED OUT IN THIS TOPIC, IS TO INCREASE THE LEVEL OF GEOLOGICAL KNOWLEDGE IN SOCIETY, CREATING A POSITIVE PUBLIC IMAGE OF THE PGI AND BUILDING A BRAND FOR POLISH GEOLOGY.

Every year, the PGI actively participates in popular science events, domestic and foreign industry events and organises national and international scientific conferences. Due to such diverse activity, it reaches both specialised expert groups and the general public, including the youngest members of our society.

The Geological Museum stores and exhibits a full range of scientific materials related to the geological structure and history of Poland. The most spectacular specimens are the skeletons of a woolly mammoth, a woolly rhinoceros, a cave bear, the Baszkówka meteorite, a monumental trunk of fossilized araucaria, and the world's first realistic reconstruction of a feathered dinosaur – dilophosaurus, all from the Pleistocene epoch. The vast majority of the specimens were discovered in Poland. The museum's warehouse holds over half a million specimens, many of them of unique scientific importance.



The Geological Museum hosts popular science events gathering plenty of visitors

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