
Geological Survey of Slovenia

Competences and skills/knowledge transfer possibilities

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Geological Survey of Slovenia

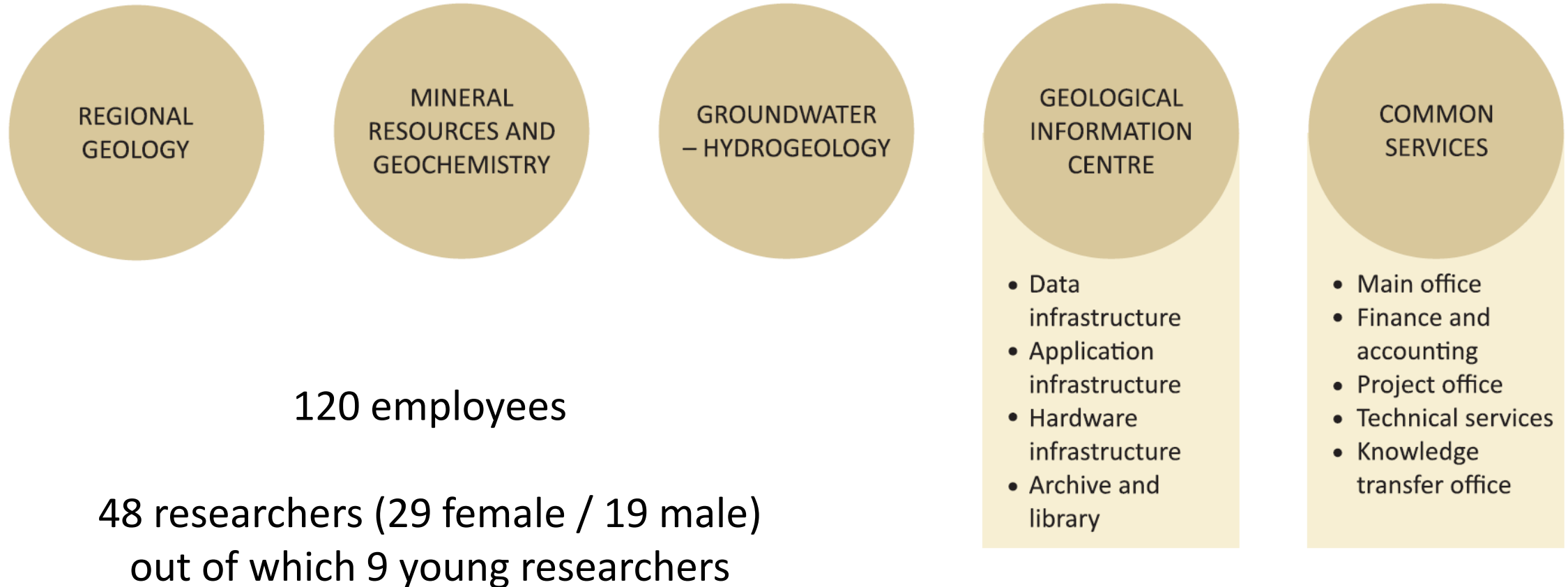
- Legal status:
Public Research Institute
- Owned by Republic of Slovenia
 - Ministry of Education, Science and Sport
 - Ministry of Environment and Spatial Planning
 - Ministry of Infrastructure (responsible for mining)
- **Founded: 1946**



Multidisciplinary activities in various fields of geoscience

- fundamental scientific research
- applied research, explorations, and studies
- international cooperation
- provision of public services
- transfer of the knowledge into practice to support national and local authorities' decisions and economy

Organization structure



Fundamental and regional geology



Fundamental geological research

- mineralogy,
- petrology,
- palaeontology,
- sedimentology,
- stratigraphy,
- geoarchaeology.



Expert reports, consulting and geological supervision

- support in infrastructure projects and construction works,
- analytical support in the elaboration of geological maps (laboratories),
- conservation and presentation of geological heritage.



Regional geological research

- structural geology, seismotectonics,
- geophysics,
- geomorphology,
- Quaternary geology.



Databases and archives

- geological field data,
- laboratory analyses,
- petrographic specimens,
- borehole data,
- archival geological maps.



Geological maps

- OGK (Basic Geological Map) of the RS,
- 3D models,
- thematic maps.

Geohazards



Fundamental geohazard research

- active tectonics and seismotectonic research,
- paleoseismology,
- Earth surface processes and climate change,
- landslide recognition and dynamics,
- landslide triggering factors.



Databases

- monitoring data, eTeren application,
- active faults,
- seismic sources.



Maps

- landslide hazard maps in various scales



Expert reports

- studies of the geological settings and stability of the ground in building construction,
- assessing landslide hazard using geotechnical, geological, hydrogeological and geodetic studies,
- remediation actions.



Monitoring and early warning systems

- Landslide movements observation and monitoring systems,
- Landslide prediction and early warning system – MASPREM



Online access to data from geological laboratories in the field



Access to the online GeoHazard viewer



Geochemistry and environmental geology



Macroscopic geochemical research

- local/regional background concentration of potentially toxic elements (PTE) for secondary materials (soil, sediments, urban dust) and the estimated anthropogenic load on the environment with respect to different geological environments,
- modelling PTE spread in the wider vicinity of major polluters,
- regional/continental PTE deposits in Slovenia and the wider region.



Databases and archives

- inventories and registers of abandoned mines and mining waste.



Maps

- geochemical maps with interpretation.



Microscopic geochemical research

- solid carriers of geochemical information and their properties as markers of PTE sources,
- determination of PTE geochemical groups in the environment,
- stability assessment of PTE and their solid forms and their transformations in different media,
- conceptual model of PTE material flow from sources through transport routes to sinks in the environment.



Expert reports

- environmental risk and pollution levels,
- SEM/EDS methods,
- advanced data processing and the use of remote sensing methods, linear and non-linear mathematical modelling and AI methods.

Groundwater



Fundamental hydrogeological research

- hydrogeological mapping and modelling,
- studies on the origin, properties and exploitability of groundwater,
- database of springs and wells.



Expert reports

- new and additional water sources,
- planning of spatial interventions and construction works,
- water protection areas delineation,
- risk analyses,
- pollution prediction and remediation,
- groundwater ecosystems.



Water management

- water balance and the determination of groundwater availability for various sectors,
- determination of the maximum sustainable groundwater yield,
- assessing the impact of climate change on the quantity and quality of groundwater.



Field and laboratory measurements

- groundwater monitoring,
- chemical and isotopic analyses of groundwater,
- groundwater level, temperature and flow rate measurement,
- microplastics in groundwater,
- geophysical measurements in boreholes and wells,
- and camera inspection of boreholes and wells.



Water supply

- design and construction of boreholes and wells for drinking, mineral, thermal, industrial and irrigation water,
- hydrogeological reports for obtaining water permits and concessions.

Geoenergy



Fundamental research

- modelling of geological structures, ore deposits, geothermal and hydrocarbon reservoirs,
- thermal response test (TRT) in geoprobes,
- quantifying shallow- and deep-geothermal energy potentials,
- researching sources of thermal and thermomineral water,
- hydrogeochemical research for determining the origin and quality of these groundwaters, coal and hydrocarbons,
- potential for underground storage of heat, CO₂, natural gas and hydrogen.



Databases

- geothermal database,
- information system for sharing data on geothermal heat pump use with the real estate registry,
- energy balance of geothermal energy use in Slovenia.



Expert reports, consulting

- local and regional geothermal potential and feasibility studies (wells, borehole heat exchanger, energy storage, thermal water),
- local energy concepts,
- environmental impact assessments,
- hydrogeological reports for the use of thermal water or geothermal energy source,
- studies on sources and reserves of geothermal resources.



Maps

- heat flow density maps,
- maps of temperatures at various depths below ground level,
- maps of depth and thickness of reservoirs,
- maps and cross-sections of deposits of energy sources.



Mineral resources



Fundamental mineral resource research

- deposits of primary mineral resources (dimension stone, pebbles and sand, natural stone, clays, metals) and energy resources (coal, uranium and hydrocarbons),
- deposits of secondary mineral resources (sources of critical and other mineral resources),
- provenience of stone construction materials from archaeological sites.



Expert reports

- mineral resource management and responsible land management,
- implementation of EU guidelines and directives regarding mineral resources,
- project documentation (expert reports on reserves, geological project documentation for mining research projects, reviews).



Public Mining Service

- sustainable mineral resource management policy,
- public mining book, research monitoring and sample storage,
- archive of closed mines,
- assessing the impacts of past mining,
- database of mineral resource deposits in the RS and a database of mineral deposits with granted mining rights,
- thematic maps.



Online access to the
Public Mining Book



Geoinformatics



Development, support and maintenance

- geospatial databases at the level of GeoZS and Slovenia,
- web and desktop applications,
- database maintenance according to the INSPIRE data specification,
- exchange/distribution of public data and metadata according to EU standards.



Fundamental research

- GIS,
- spatial modelling,
- remote sensing.



eGeology



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GeoZS's skills/knowledge transfer possibilities for students

- **Data**
 - **Internship position at Geological information center – skills:**
 - handle and analyze **Big Data and large datasets**, integrating multiple large datasets of different types and from different disciplines
 - coding abilities in **database, statistical and other programs**
 - data and digital literacy skills in **human-to-machine interface operations**
 - **evaluate data, data quality**, purpose of collecting data
 - proficiency in **geoinformatics software** (GIS, 3D modeling...)
 - **Internship position at Mineral Resources and Geochemistry – skills:**
 - **authentic research and collection of new information**
 - **neural networks for data processing**

GeoZS's skills/knowledge transfer possibilities for students

- **Mineral exploration knowledge and techniques**
 - **Internship position at Mineral Resources and Geochemistry – skills:**
 - **analytical chemistry** with regards to various **geological sampling techniques**
 - couple geochemistry with environmental studies concerning **environmental impact of mining**
 - **mining wastes and secondary raw materials analyses**, including sampling
 - **UNFC resource classification system**
 - **primary raw materials** (metal, non-metal and energy)
 - **SEM/EDS analyses** of rock and environmental samples
 - soil, stream sediments and rock sampling for **prospectivity assessments**

GeoZS's skills/knowledge transfer possibilities for students

- **Mineral exploration knowledge and techniques**
 - **Internship position at Regional geology – skills:**
 - **geological and structural mapping**
 - contemporary methods of surveying and conducting **field geology**
 - characterize of the **elemental composition of rocks** (XRF and other techniques)
 - **portable spectroscopic techniques** (hyperspectral, XRF, LIBS, SWIR)
 - **laboratory analytical techniques** and their limitations
 - **polishing and microscope techniques**
 - **geological model** design
 - **geophysical research technics**, interpretation of the geophysical logs, downhole surveys
 - complex **geophysical problems** by modeling and computer processed interpretation

Innovation Challenges / Topics at GeoZS

- Mineral raw materials deposits prospection and evaluation
- Geological modelling
- Robotics in mining
- Geochemical composition of secondary mineral resources (mining waste)
- Hydrogeological modelling
- Geothermal energy potential – geothermal power plants, geothermal boreholes and heat pumps
- Open geological data – web and desktop applications
- Geological laboratories in the field – geohazards, groundwater



Thank you for your attention!

