

Geochemical background and health status of inhabitants of the Slovak Republic

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Geological environment of the Slovak Republic was divided to 8 main geological units for the evaluation of its potential negative impact on health status of inhabitants: Paleozoic, Crystalline, carbonatic Mesozoic and basal Paleogene, carbonatic-silicate Mesozoic and Paleogene, Paleogene flysch, Neogene volcanics and Neogene and Quaternary sediments. Further, datasets of environmental indicators (contents of chemical elements/compounds in groundwater, soils) and health indicators (indicators of health status and demographic growth) were divided according to these geological units. Based on these data, rock environment built up by Neogene volcanics was identified as the most unfavourable while as the most favourable rock environment documented Paleogene sediments (sandstones, shales, claystones) are documented. The most significant differences between these two geological environments were documented mainly for following health indicators: mortality due to diseases of digestive and respiratory system (more than 100%), mortality due to cardiovascular diseases, mortality due to diseases of endocrine system (nearly 50%) and also mortality due to oncological diseases (nearly 30%). These associations are supposed probably to relate to deficit contents of Ca and Mg in drinking groundwater of Neogene volcanics that are on about half levels in comparison to groundwater Ca and Mg contents of Paleogene sediments.

The impact of geological environment on health status of residents of the Slovak Republic

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The geological environment of Slovakia is particularly varied. Diverse geochemical conditions have positive or negative impacts on human health. This project will focus on assessing the negative impacts of both natural (geological) conditions and anthropogenic contamination on human health.

The project's main objective is to reduce the negative impact of geological conditions on the health of the population of the Slovak Republic. Specific objectives are:

- To compile data on environmental indicators for groundwater and soil from the whole territory of the Slovak Republic;
- To compile data on the health indicators for the Slovak Republic that are most influenced by geological conditions;
- To link the environmental- and health- indicator data and assess their interrelationship;
- To identify and characterize the areas whose residents suffer from health problems associated with an unfavorable geological environment;
- To carry out environmental-health analysis by regions, and to define maximum levels for chemical elements/compounds in soil and groundwater based on negative human health effects;
- To draw up a proposal to reduce the negative environmental impact of geological conditions on the health of the Slovak population; and
- To implement the proposed measures.

The main result of the project will be gradual and long-term improvement of the health status of Slovak resident population.

Health risk estimate for groundwater and soil contamination in the Slovak Republic – a convenient tool for identification of risk areas

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A health risk estimate for environmental exposure of residents represents a convenient tool for identifying risk elements that can have a negative impact on human health as well as risk areas where adverse health effects can be expected. This presentation deals with estimation of the health risk to residents living in the Slovak Republic of exposure to contaminated groundwater and soils. The objective of this work was quantification of health risk for inorganic contaminants and further identification of potential risk areas within the country based on map visualization. Risk levels were quantified according to the methodology of "Health Risk Assessment" established by the US EPA. Two main toxic effects were assessed, chronic and carcinogenic, in relation to ingestion of contaminated groundwater and soil by resident population in the Slovak Republic (adults, children). The quantification of health risk was based on available national geochemical data for those chemicals found in groundwater and soils for which relevant quantitative information on their toxic effects to humans exist and is well-known (reference doses, cancer slope factors). Map interpretation of results was performed in the form of surface visualization of health risk levels for the whole territory of Slovakia (grid map) as well as for the administrative units of the country (as mean values). The results of health risk estimation indicate that arsenic and antimony pose the highest chronic risk for adults in case of groundwater and for children in case of soils. Arsenic was identified as a cancer risk in some areas in the case of groundwater and soils. The identified risk areas were mainly those with naturally increased contents of As and Sb in geological environment.

The presentation is supported by the EU financial instrument LIFE+ and contribution of Ministry of the Environment of the Slovak Republic (www.geology.sk/geohealth/).