STATE OF THE ENVIRONMENT REPORT – SLOVAK REPUBLIC

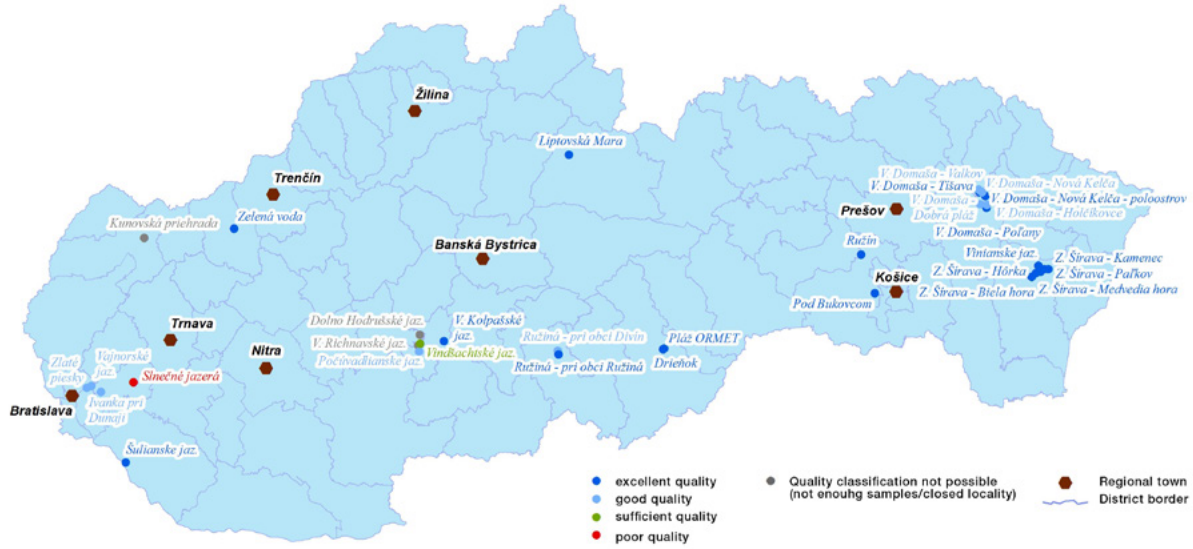
2018

25th anniversary of annual reports

MINISTRY OF ENVIRONMENT OF THE SLOVAK REPUBLIC

SLOVAK ENVIRONMENT AGENCY

Map 008 I Quality of bathing water during the 2018 summer tourism season



Source: Public Health Authority SR, European Commision, Slovak Environmental Agency

ROCKS

KEY QUESTIONS AND KEY FINDINGS

What geological risks most threaten the environment and, ultimately, also human beings?

SSlope deformations are one of the most significant geodynamic processes. In the SR, 21 190 slope deformations covering an area of 257 500 ha, or 5.25% of Slovak territory, have been registered. Landslides accounted for the largest share of slope deformations (19 104).

In recent years, as a consequence of unfavourable climatic conditions, the greatest risk is posed by slope deformations that often directly endanger the lives and property of the population. During 2018, there were several situations when the State Geological Institute of Dionýz Štúr reported emergencies ascertained through monitoring, respectively in 12 cases provided an opinion based on requests from municipalities. In 2018, 9 slope deformations were registered.

In 2018, 5 earthquakes were observed macroseismically in Slovakia, of which 4 with an epicentre in Slovakia and 1 with an epicentre in Poland.

What is the status of use of geothermal energy in the SR?

Geothermal energy has significant potential in the SR. At present, geothermal waters are used at 48 localities mainly for recreation, but also for heating. The total thermal energy potential of geothermal energy is estimated at 6 234 MWt.

ENVIRONMENTAL GEOLOGICAL FACTORS

In 2018 the monitoring of measurements within the framework of **PMS-Geological Factors (PMS GF)** continued in the following subsystems:

- **Landslides and other slope deformations,**
- **Tectonic and seismic activity in the territory,**
- **The impact of mining on the environment,**
- **Monitoring of radon volume activity in the geological environment,**
- **The stability of rock massifs under historical sites,**
- **River sediment monitoring.**

Using the monitoring results, we can monitor emerging threats and subsequently adopt measures sufficiently in advance to prevent emergencies, and thus protect people's lives and health and prevent property damage.

In 2013 the **Landslide Risk Prevention and Management** Programme **(2014-2020)** was adopted and subsequently updated in 2018. Its key goal is to reduce the risk of landslides to lives, property and the environment and prevent degradation of the natural environment, ecosystems and their services by 2020. One of the goals of **Envirostrategy 2030** is to effectively monitor and minimize geological hazards and risks.

Landslides and other slope deformations

Table 009 I Fracturing of Slovak territory through registered slope deformations (Atlas, 2006)

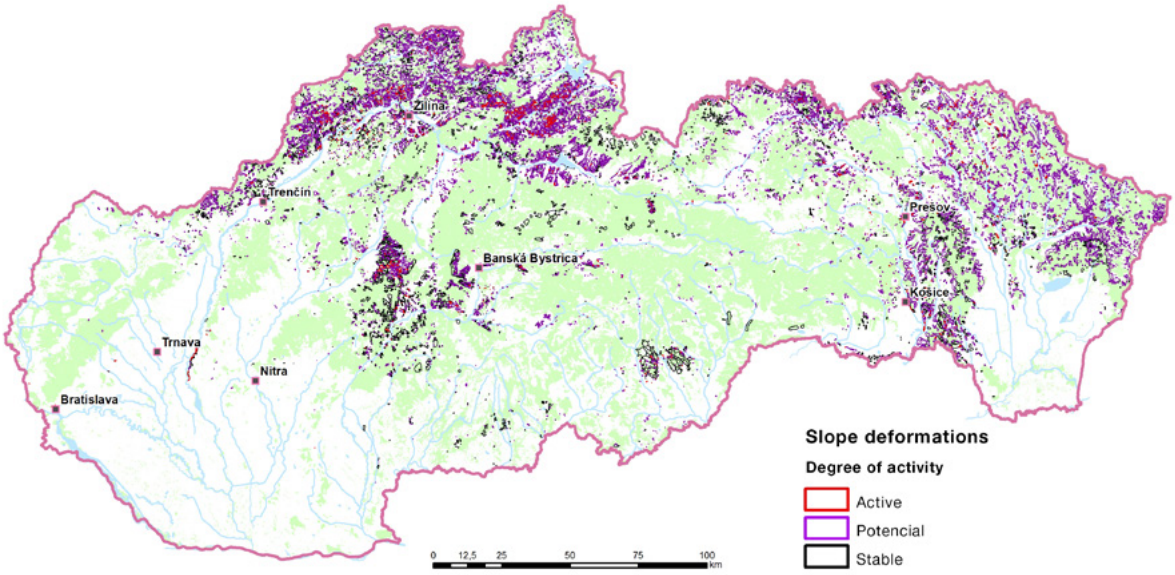
Area	Total area	Area of slope deformations	Fracturing through slope deformations (%)	
	(ha)	(ha)	of the total area	of the damaged area
Total area of the SR	4 903 347	257 591.2	5.25	-
Agricultural land	2 436 876	130 289.9	2.66	50.6
Forests	2 004 100	120 243.3	2.45	46.7
Other area	462 371	7 058.1	0.14	2.7

Source: Ministry of the Environment of the SR

In total, 5.25% of Slovak territory is impacted by slope deformations. 2.66% of the total area of agricultural land is affected, and 2.45% of forest land. However, due to the difficult conditions for machines, some agricultural land affected by slope deformation has ceased to be used for agriculture and is now overgrown, respectively is becoming overgrown, with wild grasses, bushes and even forest growth.

In 2018 a total of 42 localities were monitored. Monitoring of slope movements of the landslide type and indications of tilting activity was carried out.

Map 009 I Map of slope deformations



Source: SGIDS

Tectonic and seismic activity of the area

In 2018 measurements of the movement of the land surface at points included in the EUREF Permanent Network (EPN) were carried out. In addition to the points included in the EPN, on our territory there are other permanent stations suitable for the long-term monitoring of movement. The preliminary processing of the data for 2018 has not indicated significant movement activity at any of the points. 5 earthquakes were observed macroseismically in Slovakia, of which 4 with an epicentre in Slovakia (near Brezno, Komárno, Trenčianske Teplice and Záhorie) and 1 earthquake with an epicentre in Poland.

Neotectonic movements were measured at the Branisko, Demänová, Ipeľ, Banská Hodruša, Vyhne and Dobrá voda localities. The results of measurements taken in 2018 confirmed the long-term trend (since 2000) of a right-hand shear shift in the Branisko tunnel manifesting through the formation of open cracks on both sides of the break. The total shift in the tunnel tube has reached 2.127 mm. At other localities very slow movements, respectively the stagnation of movements between observed blocks, were confirmed.

Impact of mining on the environment

Monitoring of the impact of mining on the environment continued in 2018 at 11 threatened ore mining localities: Pezinok, Štiavnicko-hodrušský rudný obvod, Kremnický rudný obvod, Špania Dolina, Liptovská Dúbrava, Rožňava, Nižná Slaná, Smolník, Slovinky, Rudňany and Novoveská Huta. At these localities the engineering/ecological, hydrogeological and geochemical aspects of the impacts of mining on the environment are monitored through the targeted observation networks of the monitored sites. Within the framework of the monitoring of engineering-geological aspects, the occurrence of new manifestations of surface instability related to undermining and the presence of mining works were recorded at two localities. At the Rudňany-Poráč locality a new roof fall was recorded in the central part of the Banisko roof-fall zone. At the locality Nižná Slaná (the Kobeliarovo deposit), further subsidence was recorded in the crack zone, manifesting through the development of existing, and the origin of new, cracks.

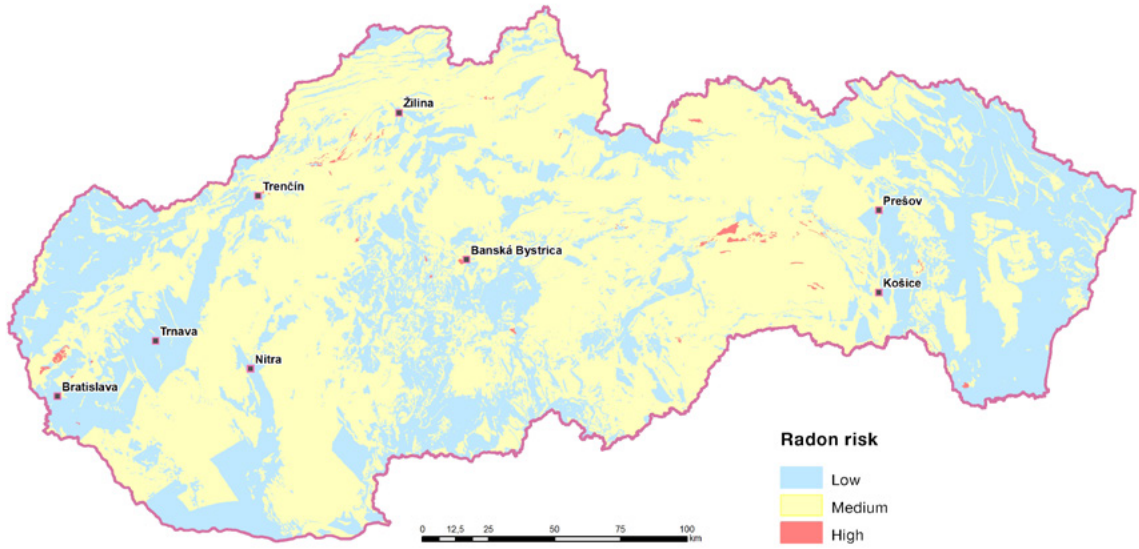
The monitoring of the hydrogeological aspects of the impact of mining on the environment in 2018 also focused primarily on control measurements of the quantity of runoff from the most important drainage sites. Measurements at 10 localities confirmed the sustained hydrodynamically stable runoff regime, closely tied to seasonal changes in total precipitation and air temperature. No changes to the runoff regime caused through human intervention or the collapse of mine corridors were recorded. There is currently a hydrogeologically unstable regime at the Manó siderite deposit in Nižná Slana, where flooding has been occurring since August 2011. A specific drainage status persists at Nová štôlni near Teplička nad Hornádom (Novoveská Huta deposit). Mine water continues to be pumped out with an unchanged regime at the gypsum deposit at Novoveská Huta and at the Mária mine in Rožňava.

In 2018 a persistent status of negative impact on the quality of local surface watercourses through mine waters, drainage waters from tailings ponds and seepage waters from heaps and natural deposit (geochemical) anomalies was documented in the monitored areas. The most unfavourable situation continues to be in the ore deposit areas, primarily Smolník, Liptovská Dúbrava, Špania Dolina, Pezinok, Slovinky and Rudňany.

Monitoring radon volume activity in the geological environment

Localities for measuring soil radon are situated in areas of higher radon risk for residential areas in the larger cities in Slovakia. The monitoring of radon volume activity at fractures was selected based on the results of assessments of basic radon volume activity measurements in soil air at some fracture sites in Slovakia. The monitoring of the concentration of radon in soil air above tectonic dislocations was continued in the Dobrá voda locality in 2018, where the tectonic and seismic activity is monitored. The selection of water sources for radon monitoring is targeted primarily on mineral and thermal springs where high radon values have been recorded in the past.

Map 010 I Map of radon-related risks



Source: SGIDS

The stability of rock massifs under historic sites

In 2018 7 castles – their rocky cliffs – were monitored (Trenčiansky, Pajštúnsky, Uhrovský, Plavecký, Oravský, Spišský and Strečniansky castles), including defects in sites.

Monitoring of river sediments

From the perspective of contamination, streams of the Nitra suffer from long-term pollution (sample sites Chalmová, Lužianky, Nitriansky Hrádok), Štiavnica (mouth), Hron (sample sites Kalná nad Hronom, Kamenica), Hornád (sample site Krompachy) and Hnilec (sample site the inflow to the Ružín reservoir). The polluted Štiavnica, Hron, Hornád and Hnilec streams are geogenic-anthropogenic anomalies tied to the Banská Štiavnica and Spišsko-gemerský ore areas. Anomalous concentrations of some metals (Zn, Pb, As, Sb) indicate a relatively high burden on the area through potentially hazardous substances that persists even after the attenuation of mining in Slovakia. There are also significant levels of mercury and arsenic in the River Nitra originating from the intensive industrial activity in the Horní Ponitrí area. Of the detected content of organic substances, persistent high concentrations of polycyclic aromatic hydrocarbons (PCB) in the river sediments at Laborec (Lastomír site) appear primarily significant. There were repeated findings of high concentrations of polycyclic aromatic hydrocarbons in Kysuce river sediments (Považský Chlmec site) and Latorice (Lelleš site).

GEOTHERMAL ENERGY

In Slovakia there are 27 geothermal areas, respectively sites. These are mainly tertiary basins, or depressions in mountain areas, which are dispersed over a zone created by the Western Carpathians. The medium for the accumulation, transport and exploitation of underground heat from the rock environment is geothermal water, which appears primarily in Triassic dolomites and limestones of inner Carpathian tectonic units, but also in neogene sands, sandstones and conglomerates, respectively in neogeneic andesites and their pyroclastics. The indicated collectors of geothermal waters are located at depths of between 200 and 5 000 m with geothermal water temperatures from 20 to 240°C. The total thermal energy potential of geothermal energy in the defined geothermal areas has been calculated at 6 234 MWt. In these defined areas 152 geothermal wells have already been constructed, which have verified 2 100.4 l/s of water with a temperature at the well mouth of between 18 and 129°C.

Geothermal energy from 62 geothermal boreholes at 48 localities is used with a heat-recovery capacity of 181 MWt, or 1 126.1 l/s of verified geothermal waters. Of the verified amount, an average of 333.6 l/s of geothermal water is abstracted. The use of geothermal waters in Slovakia is focused primarily on recreation and heating.

OLD MINES

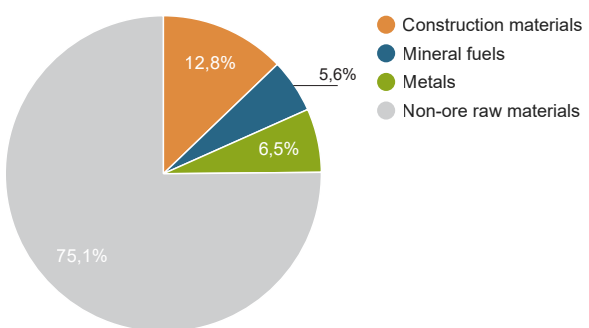
The register of old mining works contains 16 681 old mining works.

BALANCE OF MINERAL DEPOSITS

The Ministry of the Environment of the SR, pursuant to Section 29(4) of Act No 44/1988, on the protection and use of mineral wealth (the Mining Act) as amended, maintains summary records of reserves of reserved deposits and the inventory of mineral reserves in the SR. This deposits register is accessible in the form of an internet application at the website www.geology.sk.

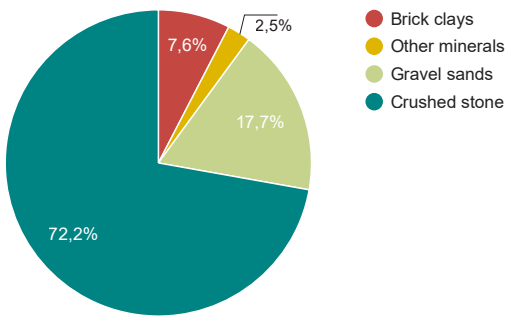
In 2018, geological mineral reserves reached 20 592 million tonnes in reserved deposits with a significant prevalence of non-ore raw materials. Geological reserves in non-reserved deposits were 2 999 million tonnes.

Chart 025 I Reserves of deposits of reserved minerals (2018)



Source: SGIDS

Chart 026 I Reserves of deposits of non-reserved minerals (2018)



Source: SGIDS