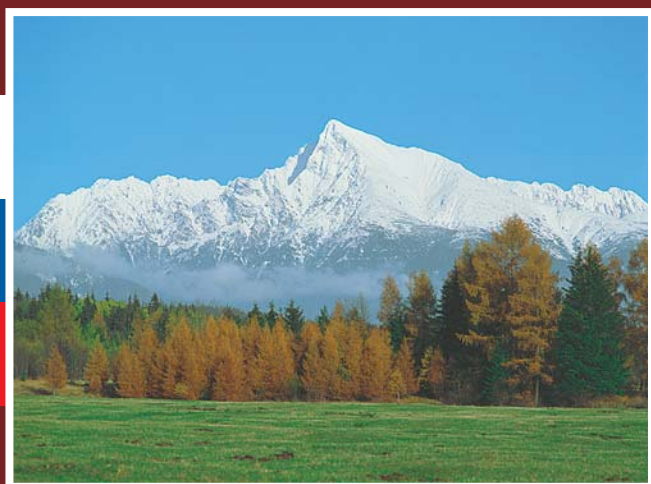


***Ministry of the Environment
of the Slovak Republic***



***STATE OF THE ENVIRONMENT
REPORT
SLOVAK REPUBLIC 2007***



***Slovak Environmental
Agency***





*The purpose of this law is to establish the principles of **protection and rational exploitation of mineral resources**, especially by carrying out geological researches, openings, preparation and breaking of mineral deposits, enrichment and refining of minerals, performed in relation with their extraction, as well as providing for security of operations and environment protections during these operations.*

§ 1 of the Act on Protection and Exploitation of the Mineral Resources No. 44/1988 Coll. (Mining Act) as subsequently amended

• ROCKS

Geological environmental factors

Partial Monitoring System - Geological Factors (PMS - GF) as part of environmental monitoring in Slovakia, is focused mainly on so-called geological hazards or harmful natural or anthropogenic geological processes that threaten the natural environment and eventually the humans.

From 1.1.2006 data are monitored:

- 01: Landslides and other slope deformation
- 02: Tectonic and seismic activity of the territory
- 03: Anthropogenic sediments of environmental loads sediments
- 04: Influence of mineral exploitation upon environment
- 05: Monitoring of the volume activity of Radon in the geological environment
- 06: Stability of massifs underlying historic objects
- 07: Monitoring of stream sediments
- 08: Volume unstable soils

Summary of the major outcomes from the monitoring activities in 2007:

In 2007, monitoring of three basic types of **slope movements** was carried out – slides, creep, and signs of activated falling movements. Measurements were for in 15 selected sites.

For **tectonic movements** in 2007, movements to the surface of the territory and along faults were monitored. Macro-seismic activity was thoroughly assessed in the territory of northern Slovakia and the adjacent part of Poland. Seismic activity of the Slovak territory was assessed. Operation of the Slovak spatial observing service was launched, taking advantage of global navigation satellite system

equipment. The service carries out monitoring at 21 geodetic points. One of these points is in Gánovce and is part of the European monitoring system. In 2007, movements along faults were monitored at these 7 sites: Košický Klečenov, Branisko, Demänovská cave of Freedom, Ipeľ, Vyhne, Banská Hodruša, Cave pod Spišskou. Greatest movements were recorded at the Košický Klečenov site, while other sites showed lower speeds of movements or their stabilization. More attention should be given to the Branisko site where the ongoing movements still threaten the tunnel insulation. In 2007, reports from seismic stations supplied for interpretation more than 5 721 tele-seismic, regional, or local seismic phenomena. 62 earthquakes were localised with the epicentre in the focal area of the Slovak Republic. Macro-seismic monitoring in Slovakia did not detect any earthquake in 2007. On March 2, 2007, there was an accident reported at the Nováky site in Slovakia, which was detected by most National seismic station network sites in Slovakia, some local seismic nuclear power plant stations, as well as several stations in the surrounding countries.

In 2007, the following limits for **anthropogenic sediments** were exceeded at the following monitoring stations: chloride limits (Myjava, Nové Mesto nad Váhom, Šulekovo), cyanides and crude oil products (Prakovce, Devínska Nová Ves, Šaľa), as well as contents of As, Cu, Sb, Pb, Zn, Ni, Ba (Halňa), Fe, and ammonia ions (Šulekovo).

Attention within the process of **environmental impact assessment of extraction activities** was directed toward the area of ore deposits of Rudňany, Slovinky, Smolník, Novoveská Huta, Rožňava, and Banská Štiavnica, together with magnesite and talc deposits in Jelšava – Lubeník – Hnúšť'a and Košice – Bankov. Monitored areas of brown coal extraction include the area of Handlová – Cígeľ brown coal territory. Works were focused on introducing more precision and frequency to supplement measurements and to find out needs for adjustments to monitoring facilities. Works also dealt with assessment of hydro-geological, geochemical, and engineering-geological aspects.

Monitoring of the **volume activity of radon** in geological layers in 2007 continued at 14 sites distributed all over the whole Slovak territory. Monitoring of soil radon in 2007 were carried out at six sites that showed middle to high radon risk (Bratislava - Vajnory, Banská Bystrica - Podlavice, Košice-KVP, Novoveská Huta, Teplička, and Hnilec). Greatest average annual reduction in radon activity was detected at the Novoveská Huta site – almost by one third for major radon risk assessment parameters. Only the Hnilec site in the extreme radon risk group showed increased values of volume radon activity in soil. In the area of tectonically damaged site of Grajnár, the measurements of radon volume activity were conducted in soil air. Sampling and radon measurement in water was carried out at three springs of the Small Carpathian mountains, on the outskirts of Bratislava - Mária spring, Zbojníčka spring, and Himligárka spring, at Bacúch – spring of Božena Němcová, and at Sivá Brada near Spišské Podhradie – spring of St. Ondrej, spring Oravice near the OZ-1 bore hole, and in Zemplín – the Ladmovce bore hole

- preliv. Middle values in Radon concentration for all monitored springs in 2007 are higher than in the previous years. Variations to volume Radon activity at monitored ground water springs are of seasonal character.

In 2007, **monitoring of stability of rock massifs** below historic objects concentrated on the following sites: Spišský, Strečniansky, Oravský, Uhrovský and Lietavský castles, and castle Devín.

Within **stream sediments monitoring** exceeding the C category was detected (exceeding of this limit suggests impact of demolition activities) at Nitra - Chalmová (Hg), Štiavnica - river mouth (Pb), and Hornád - Kolinovce (Hg) sites. Snow solutions of most acidic character (with pH values around 4.4) were detected at the following sites: Starý Hrozenkov, Branisko, Donovaly, and Ľupčianska valley. As for the trace elements content, most prevalent in snow solutions in winter season are aluminium, nickel, and zinc.

Volume activity is shown either by reduced soil volume, known as sagging, or increased volume, known as swelling. In 2007, third phase of registration of impaired objects in the Východoslovenská lowland was carried out. Of total number of 950 registered objects in 71 municipalities, 16 most impaired objects were selected in 9 municipalities.

Geothermal energy

Regional **geothermal survey** was conducted in line with the approved Strategy of geothermal energy use in Slovakia by the end of 2007, which involved the following territories: Liptovská basin, Popradská basin, skorušinská plane, sites in Galanta, structures in Ľurkov, Žiarska basin, Hornonitrianská basin, Topoľčany záliv, and the Humenský ridge. At present, hydrogeothermal assessment of the Rimavská basin is underway.

Register of geological mapping

Registers of geological mapping (as of December 31, 2007)

| Registers of | Accumulation in 2007 | Total number |
|---------------------------------|----------------------|--------------|
| Surveyed territories | 47 | 514 |
| Surveyed territories drafts | 97 | 517 |
| Landslides | 11 | 11 406 |
| Wells | 3 048 | 738 205 |
| Hydro-geological wells | 333 | 23 314 |
| Landfills | 4 | 8 454 |
| Map drawing and purpose mapping | 81 | 9 698 |
| Geophysical mapping | 178 | 4 628 |
| Abandoned mining works | 7 | 16 576 |

Source: SGI DS

Abandoned mining works

Pursuant to Act No. 44/1988 Coll. on protection and exploitation of mineral deposits (Mining Act), as amended, MoE SR also ensures searching for abandoned mining works. The State Geological Institute of Dionýz Štúr in Bratislava was commissioned to maintain the Register.

Abandoned mining works as of December 31, 2007

| Type of abandoned mine | Number |
|------------------------|---------------|
| Mining shaft | 4873 |
| Pit (hole) | 517 |
| Chute | 65 |
| Cut, excavation | 88 |
| Pingo | 3 987 |
| Pingo field | 109 |
| Pingo draw | 128 |
| Dump | 6 125 |
| Old randing | 205 |
| Sink mark | 293 |
| Placer | 20 |
| Tailings dump | 10 |
| Other | 155 |
| Total | 16 576 |

Source: SGI DS

Survey territories

Under the geology legislation and pursuant to the GS SR status - the GEOFOND department keeps the register of survey areas for selected geological activities. In 2007, there were 47 survey areas and 85 registered proposals to designate a survey area. As of December 31, 2007, there were 132 recognised areas.

Overview of deposits in Slovakia

Energy deposits (state to the date 31st December 2007)

Source: SGI DS

| Raw material | Number of deposits included into balance | Number of free balance deposits | Number of deposits for mining | Unit | Balance deposits free | Geological deposits |
|--------------------------------------|--|---------------------------------|-------------------------------|---------------------|-----------------------|---------------------|
| Anthracite | 1 | 1 | 0 | thous. t | 2 008 | 8 006 |
| Bitumen sediments | 1 | 1 | 0 | thous. t | 9 780 | 10 797 |
| Brown coal | 11 | 6 | 4 | thous. t | 141 601 | 464 718 |
| Flammable natural gas – gasoline gas | 8 | 6 | 1 | thous. t | 201 | 398 |
| Lignite | 8 | 3 | 1 | thous. t | 112 221 | 619 790 |
| Non-resinous gases | 1 | 0 | 0 | mil. m ³ | 0 | 6 380 |
| Underground stores of natural gas | 8 | 0 | 1 | mil. m ³ | 0 | 1 790 |
| Crude oil non-paraffinic | 3 | 3 | 0 | thous. t | 1 632 | 3 422 |
| Crude oil - semi-paraffinic | 8 | 4 | 4 | thous. t | 140 | 6 413 |
| Uranium ores | 2 | 1 | 0 | thous. t | 1 396 | 5 272 |
| Natural gas | 39 | 22 | 14 | mil. m ³ | 8 744 | 26 591 |
| Total | 90 | 46 | 25 | | 277 716 | 1 153 577 |

Ore deposits (state to the date 31st December 2007)

| Type of ore | Number of deposits included into balance | Number of free balance deposits | Number of deposits for mining in 2005 | Unit | Balance deposits free | Geological deposits |
|----------------------|--|---------------------------------|---------------------------------------|----------|-----------------------|---------------------|
| Sb ores | 9 | 1 | 0 | thous. t | 85 | 3 276 |
| Complex Fe ores | 7 | 2 | 0 | thous. t | 5 751 | 57 762 |
| Cu ores | 10 | 0 | 0 | thous. t | 0 | 43 916 |
| Hg ores | 1 | 0 | 0 | thous. t | 0 | 2 426 |
| Poly-metallic ores | 4 | 1 | 0 | thous. t | 1 623 | 23 671 |
| Wolfram ores | 1 | 0 | 0 | thous. t | 0 | 2 846 |
| Gold and silver ores | 11 | 4 | 1 | thous. t | 26 450 | 31 930 |
| Fe ores | 2 | 2 | 1 | thous. t | 15 049 | 19 316 |
| Total | 45 | 10 | 2 | | 49 848 | 185 143 |

Source: SGI DS

 Non-metallics deposits (state to the date 31st December 2007)

Source: SGI DS

| Raw material | Number of deposits included into balance | Number of free balance deposits | Number of deposits for mining | Unit | Balance deposits free | Geological deposits |
|-------------------------------|--|---------------------------------|-------------------------------|-----------|-----------------------|---------------------|
| Anhydride | 7 | 6 | 2 | thous. t | 806 380 | 1 250 410 |
| Asbestos and aspestos rock | 4 | 1 | 0 | thous. t | 1 808 | 26 905 |
| Baryte | 6 | 2 | 2 | thous. t | 9 233 | 12 683 |
| Bentonite | 23 | 17 | 8 | thous. t | 29 182 | 42 462 |
| Cast basalt | 5 | 5 | 3 | thous. t | 22 837 | 40 012 |
| Decorative rock | 23 | 20 | 3 | thous. m3 | 22 196 | 27 754 |
| Diatomite | 3 | 2 | 0 | thous. t | 6 556 | 8 436 |
| Dolomite | 20 | 20 | 9 | thous. t | 609 303 | 635 770 |
| Precious stones | 1 | 1 | 0 | ct | 1 205 168 | 2 515 866 |
| Graphite | 1 | 0 | 0 | thous. t | 0 | 294 |
| Halloysite | 1 | 0 | 0 | thous. t | 0 | 2 249 |
| Rock salt | 4 | 4 | 1 | thous. t | 839 218 | 1 350 200 |
| Kaolin | 14 | 13 | 3 | thous. t | 54 554 | 59 836 |
| Ceramic clays | 38 | 35 | 4 | thous. t | 117 897 | 192 780 |
| Quartz | 7 | 7 | 0 | thous. t | 310 | 327 |
| Quartzite | 15 | 13 | 1 | thous. t | 18 351 | 26 950 |
| Magnesite | 11 | 6 | 3 | thous. t | 750 396 | 1 164 338 |
| Talc | 6 | 3 | 0 | thous. t | 93 709 | 242 273 |
| Mineralized I - Br waters | 2 | 1 | 0 | thous. m3 | 3 658 | 3 658 |
| Pearl stone | 5 | 5 | 1 | thous. t | 30 244 | 30 564 |
| Pyrite | 3 | 0 | 0 | thous. t | 0 | 18 717 |
| Gypsum | 6 | 5 | 3 | thous. t | 62 733 | 93 493 |
| Sialitic raw material | 5 | 5 | 2 | thous. t | 109 456 | 122 819 |
| Glass sands | 4 | 4 | 2 | thous. t | 411 424 | 590 150 |
| Mica | 1 | 1 | 0 | thous. t | 14 073 | 14 073 |
| Building rock | 133 | 128 | 81 | thous. m3 | 643 071 | 760 272 |
| Gravel sands and sands | 28 | 26 | 16 | thous. m3 | 177 914 | 197 840 |
| Brick clay | 42 | 37 | 12 | thous. m3 | 111 385 | 135 579 |
| Techn. usable miner. crystals | 3 | 1 | 0 | thous. t | 253 | 2 103 |
| Limestone – unspecified | 30 | 27 | 12 | thous. t | 1 971 214 | 2 314 973 |
| High-content limestone | 10 | 10 | 4 | thous. t | 3 196 102 | 3 360 024 |
| Zeolite | 8 | 7 | 2 | thous. t | 166 097 | 168 349 |
| Foundry sands | 6 | 6 | 2 | thous. t | 106 102 | 111 326 |
| Refractory clays | 14 | 14 | 1 | thous. t | 293 951 | 508 987 |
| Feldspars | 9 | 6 | 0 | thous. t | 3 105 | 5 487 |
| Total | 7 | 7 | 0 | thous. t | 17 658 | 18 896 |
| | 505 | 445 | 177 | | 11 905 538 | 16 056 855 |

Classification of mineral deposits by state of extraction (state to the date 31st December 2007)

| Extraction symbol | Characteristics | Number of deposits |
|-------------------|--|--------------------|
| 1 | <i>Deposits with developed extraction activity</i> include exclusive mineral deposits sufficiently open and technically apt for extraction of industrial deposit. | 212 |
| 2 | <i>Deposits with fading extraction activity</i> include extraction mineral deposits where extraction activity will cease in a near future (within 10 years) | 36 |
| 3 | <i>Deposits before completion</i> include exclusive mineral deposits with documented deposits that give basis to one of the construction phases (starting with the projection phase) | 40 |
| 4 | <i>Deposits with ceased extraction</i> include exclusive mineral deposits with definitely or temporarily stopped extraction activity. | 99 |
| 5 | <i>Non-extracted deposits</i> include documented exclusive mineral deposits soon to be constructed and extracted. | 60 |
| 6 | <i>Non-extracted deposits</i> include documented exclusive mineral deposits with no plans for their extraction. | 181 |
| 7 | <i>Surveyed deposits</i> include deposits of exclusive and non-exclusive minerals with various degree of mapping. | 12 |

Source: SGI DS

Non-limited mineral deposits (as of December 31, 2007)

| Raw material | Number of listed deposit sites | Number of sites with extraction activities |
|-----------------------|--------------------------------|--|
| Shale | 2 | 0 |
| Floating sand | 1 | 0 |
| Tailings, waste | 7 | 4 |
| Clays | 1 | 0 |
| Building stone | 153 | 42 |
| Ballast and sand | 201 | 86 |
| Brick raw material | 57 | 1 |
| Tuff | 2 | 0 |
| Dried sludge – brucit | 1 | 1 |
| Total | 425 | 134 |

Source: SGI DS

◆ Ground water volumes
Ground waters deposits in the SR (state to the date December 31, 2007)

| Category | A | B | C | Total |
|--|---|-------|----------|----------|
| Efficient deposits of the ground waters (I.s-1) | - | 96.06 | 2 841.10 | 2 937.16 |
| Efficient amounts of the ground waters (I.s-1) | - | - | 9 851.76 | 9 851.76 |

Source: SGI DS

Legend:

C calculated on the basis of assessment of the existing hydrogeological mapping

B calculated on the basis of hydrogeological mapping with long-term extraction test

A calculated on the basis of hydrogeological mapping with semi-operational test

