EIA REPORTING ON MINING ACTIVITIES IMPACT ON ABIOTIC COMPONENT OF ENVIRONMENT –
CASE STUDIES FROM NÍZKE TATRY MTS., SLOVAKIA

K. VRANA[1], V. HANZEL[2] and M. SLAVKAY[2]

[1]HYDEKO–KV, Planckova 4, 851 01 Bratislava, Slovakia
[2]State Geological Institute of Dionyz Stur, Mlynska dolina 1, 817 04 Bratislava, Slovakia

ABSTRACT: A brief overview of EIA reporting regarding the deposits Dúbrava-Magurka, Jasenie, and Horná Lehota-Lom from the Nízke Tatry Mts. is presented concerning the first stage of EIA evaluation process, i.e. introductory environmental study.

KEY WORDS: mining, exploration, environmental impact assessment

Introduction

In the second half of decade 1990 – 2000 a series of environmental studies have been realised in Slovakia in relation to new exploring and mining activities. Among these activities one of the most extensive were those of the First Canadian - Slovak Mining Company Ltd. Realised **in the Nízke Tatry Mts**. After obtaining assignment of the exploration areas in 1997 company started with geological exploration works at the **deposits Dúbrava-Magurka, Jasenie, and Horná Lehota-Lom.** After having studied archived materials and accomplished reconnaissance of the field, ore materials some geochemical sampling and analyses have been accomplished with positive conclusions. Results from these works supported the company´s plan for drilling works on deposits in.

Since 1994 such activities had to be evaluated in sense of so called “EIA” law, which in Slovakia followed an overall trend of environmental impact assessment studies in EU countries. According to above mentioned law everybody interested to launch new exploration and mining activities is obliged to fulfil reporting on relevant environmental issues to the Ministry of Environment, the main decision making body in the EIA evaluation process.

In the presented contribution a brief overview of EIA reporting from the Nízke Tatry Mts. is presented concerning the first stage of EIA evaluation process, i.e. introductory environmental study.

Although studied **exploring areas** (Fig. 1) Dubrava – Magurka (exploring area Liptovské Kľačany and Partizánska Ľupča), Jasenie and Horná Lehota-Lom, represent part of the Nízke Tatry National Park (NAPANT) and of its protective zone, the localities (potential mining areas) are known by mining activities for several centuries, and they were extensively exploited in past decades, as well.

Regional geology and metallogeny of area

From the geological point of view, the Nízke Tatry Mts. region is part of a belt of core mountains and geological building is described in Explanations (Biely et al., 1997). The western part of the Nízke Tatry Mts. (Ďumbierske Tatry) is built by granitoid pluton in northern part and metamorphic rocks in south and preserved remnants of the sedimentary cover of Lower Triassic and Middle Triassic rocks (Tatricum). The pluton intruded the Lower Paleozoic metasedimentary sequences in Upper Paleozoic is represented by biotitic tonalite – granodiorite (the Ďumbier type), white mica-biotitic granodiorite – granite (the Prašiva type), biotitic and bimicaceous granite (the Kralička type), the muscovitic or biotite and bimicaceous granite (the Latiborská type) and biotitic granodiorite – tonalite with nebulitic structure.

The crystalline schists are represented by biotitic and bimicaceous gneiss, biotitic paragneiss and orthogneiss (the Struhár type). The amphibolite and amphibolitic gneiss form comformable bodies several hundred meters long. The crystalline schists containing a narrow beds of metavolcanites with small intercalations of metaanthracite.

There are bodies of pegmatite, aplite, porphyrite and lamprophyre in both granitoides and crystalline schists there.

The crystalline rocks are covered by autochtonous Upper Paleozoic and Mesozoic rocks, and overlain by Mesozoic units (Veporicum - Križna nappe in the west and north and Hronicum-Choč nappe on northern and southern slopes of the Ďumbierske Tatry Mts.). Remnants of the sedimentary cover (Lower and Middle Triassic rocks) are preserved in deeply folded structures into the crystalline masive, following the NE – SW direction.

The Tatricum Unit consist of quartzy arcosic and graywacke sandstones and quartzite – Lužna formation (Scythian), variegated schales and sandstones – Werfenian beds (Scythian), rauchwackes (Scythian – Anissian), grey limestone – Gutenstein beds (Anissian).

The Veporicum Unit consist of Ramsau dolomite (Anissian – Carnian), dark-gray and organodetrital limestone (Anissian – Ladinian) and dolomites with silicites (Carnian – Norian).

The Hronicum Unite consist of the volcano-sedimentary Ipoltica group composed by sandstone, silstone, shale, tholeite basalt and andesite (Lower Paleozoic – Permian) and Triassic rocks predominantly shale, sandstone, limestone and dolomite of the Čierny Váh series and Triassic carbonatic rocks of the Biely Váh series.

Sediments of the Paleogene and neogene are developed only in marginal parts of the Ďumbierske Tatry Mts. Quaternary sediments are wide-spread on the whole territory and consist of (Beňuška, Halouzka a Maglay in Biely et al. 1997): - periglacial block seas and block accumulations on the northern slopes of Chabenec Hill, debris and talus deposits predominantely located under the slopes of glacial valey, glacigene bouldery-blocky moraine sediments and moraine ranges, glacifluvial sandy bouldery gravels (Pleistocene); - Fluvial flood loams and gravelly loams in the recent flood plains and the flood fans, organic and fluvio-organic sediments (Holocene); damps of overburden, tailingspiles (Anthropogene deposits).

The most important ore deposits in the western part of the Nízke Tatry Mts. are situated predominantely in the granitoids and crystalline schists, whereas in the Lower Triassic silicate rocks and Middle Triassic carbonate rocks are less widespread. The mineralization is represented by the siderite formation with mineral associations: veins of Alpine type, scheelite, siderite, Cu-sulphides, sphalerite - galenia, Fe-sulphides, antimonite, barite and precious metals (see Chovan et al., 1996, Slavkay & Chovan, 1996). Most of the ore bodies outcrop at surface.

Distribution of the associations forms distinct zonal arrangement in this area (Slavkay 1985, 1989, Slavkay & Petro, 1993). This zoning is independent on the Variscan granitoid pluton, but it controls the tectonic Alpine border between pluton and its metamorphic mantle (ENE – WSW strike). There is internal tungsten and iron ± Au zone in the area of this structure (**Jasenie** - Kyslá W, Štefan prekop Fe, Pod Struhárom Fe). Following zoning is at both sides of this structure: zone of base-metal mineralization Pb-Zn-Cu ±Ag (Jasenie - Soviansko Pb, Ag; Ždiar - Dve Vody Pb, Ba), and marginal zone of antimony mineralization ±Au (**Dúbrava, Magurka, Lom**).

Environmental problems and EIA evaluation process

The range of activities planned in individual exploration areas was as follows:

Dúbrava-Magurka (Sb, Au) - ore exploration and mining

Jasenie (W, Pb, Au, Ag) - ore exploration and mining

Horná Lehota-Lom (Sb, Au, Ag) - ore exploration and mining

Activities evaluated in the EIA evaluation process:

- drilling from surafce, category of boreholes: till 300 m
- underground drilling in Dubrava (verifying of deposit continuation into depth)
- selective mining of relevant parts of deposit
- explosive works for mining goals.

In the abstract some aspects of EIA evaluation process in case of Dubrava-Magurka deposit is presented, other two localities (Jasenie and Horná Lehota-Lom) will be presented in the congress programme.

In case of Dubrava – Magurka deposit, although studied area forms a visual entrance to the central part to the Nízke Tatry National Park, the mining area does not and cannot serve as a tourist gateway. The landscape and scenery is disturbed by previous uncontrolled mining partly recovered thanks to man-made and natural re-cultivation and regeneration of this area. Any resumption of exploitation in the original manner will once again disturb the land itself and its scenery. But, if carried out sensitively, and in co-operation with the National park's administration, the works planned in both exploration areas would have no major adverse impacts on environment in question.

Following aspects were evaluated in this locality in EIA evaluation process: Population, Rock environment, Topography, Water, Soil, Air, Fauna and Flora, Landscape and Scenery, Safety Measures, Assumed Cross-Border Impact, Assumed Cross-Border Impact, Induced Consequences with Regard to the Current State of the Environment in the Area in Question, Other Possible Risks Related to the Implementation of Activities, Measures to Alleviate Adverse Impacts of the Activity, Assessment of Expected Development of the Area if Planned Activity is not Implemented, Assessment of Compliance with Land-Use Documentation, and Further Progress of Impact Assessment with Specification of Crucial Problems.

Assessment of Assumed Impacts

The assumed consequences for respective constituents of the environment were summarised in Introductory environmental report as follows:

Population - planned activities will not considerably affect the population.

Rock environment - impact on the rock environment depends on the type of works to be performed, their duration, as well as methods and technologies applied. Surface drilling will entail some impact on the rock environment. Pipes will have to be mounted to supply water for drilling fluid or alternatively water will have to be supplied by tankers. The rock environment can also be polluted by fuel leaked from engines and vehicles. The noise of drill rigs, bulldozers, means of transport and blasting will clearly be limited in time and space. If exploration takes place in pre-existing mine workings, barren rock removed from them will have to be dumped in old stopes, adits and chutes rather than outdoors. If ore is treated directly on the spot, the area can become contamintaed by concentrates spilled during transport, leaked flotation refuse and material leaked through ruptured dykes of a dump.

Topography - drilling and mine workings to be done will only have a small impact on topography which will mostly be limited to surface ground works.

Water - communication with groundwaters in the crystalline unit (Tatricum) and Mesozoic will be limited due to an impermeable mylonite filling of a tectonic Contact between granitoids and envelope sequence as well as because of the presence of an impervious shale formation. Water of the crystalline unit is not drained through Mesozoic sediments, but can be drained through Quaternary sediments in stream valleys and therefore pollutants from the mining area and exploration areas could only appear in springs at the base level of the streams Križianka and Ľupčianka. In the past, natural environment was only locally contaminated by mine waters, because under local conditions pollutants in surface streams are diluted and eliminated close to the place of origin. Some contamination of surface and groundwater can result from the operation and maintenance of drilling rigs, means of transport and other equipment employed in exploration and mining.

Soil - provided that prescribed technological is maintained during exploration and possibly also mining, soil contamination with toxins is unlikely to exceed the current level resulting from mining in a distant past, but mainly over the past two or three decades. It is essential that barren rock and wastes stemming from selective mining are dumped underground rather than on new surface repositories. Surface drilling can not pollute water, on condition that prescribed technology is strictly maintained.

Air **-** The planned activities will only have a negligible effect on air quality and no special measures will be needed in this respect.

Fauna and flora **-** Activities planned in the mining area will have much smaller extent than previous ones. If sensitively performed without damaging vegetation, the works are unlikely to have major adverse impact on fauna and flora. Nevertheless, activities associated with drilling in exploration areas (access roads, storage areas, warehouses, movement of personnel and vehicles, use of water, fuel and oils) can adversely affect occurrences of precious plant species. Related phenomena, such as noise and greater movement of people, will negatively affect mainly birds of prey and other predators, notably in areas which serves as a precious refuge for big predators and as a substitute for devastated and developed extensive areas in Demänová Valley and its wide surroundings. These impacts can only be eliminated by careful selection of drill location and timing at a time when the above species are more tolerant of disturbances. This issue can be resolved only in close co-operation with the Nízke Tatry National Park Administration.

Landscape and scenery **-** Activity planned in a mining stage will take place underground and therefore will not affect the current character of the area. The landscape and scenery disturbed by past uncontrolled mining partly recovered owing to man-made and spontanneous natural recultivation and regeneration of this area. Any resumption of exploitation in the original manner will once again disturbe the land itself and its sceneries. This applies mainly to drilling plateaux, new dumps and the like. These adverse effects can be alleviated by a new approach to exploitation in the mining area based on compliance with aesthetic principles and criteria of extremely careful behaviour towards the country. This must be aimed to gradually improve and upgrade the landscape and sceneries with regard to their location in the national park's protective zone. If carried out sensitively, without permanent consequences (deforestation, dumps, remnants of equipment left behind) and in cooperation with the national park's administration, the works planned in both exploration areas will have no major adverse impacts on the landscape and sceneries on the area in question.

Safety Measures - main mining activities are planned below the earth's surface and therefore all safety measures are associated with the observance of all regulations and instructions for mining activities. Safety measures for surface works (largely drilling) are defined in relevant technological procedures. As regards environmental protection, the main measure to eliminate adverse impacts on the environment is the development of an effective purposeful monitoring system in close conjunction with the Nízke Tatry National Park Administration.

Assumed Cross-Border Impact

Given their character and extent, the planned activities cannot affect the environment abroad.

Induced Consequences with Regard to the Current State of the Environment in the Area in Question

With respect to the existing extent of the protection of the environment, natural resources and cultural monuments, a close co-operation with the staff of the Nízke Tatry National Park Administration is necessary.

In close conjunction with the District Office's Environment Department, local authorities of affected villages, but mainly with the Nízke Tatry National Park Administration, some impacts of the planned activities on rock environment, topography, water, soil and other components of the environment can be eliminated.

Other Possible Risks Related to the Implementation of Activities

Aside from those defined above, no other major risks are related to the planned activities.

Measures to Alleviate Adverse Impacts of the Activity

Main measures designed to alleviate adverse impacts of the planned activities include:

- careful design, notably of surface drilling and possibly also mineral processing, but first of all storage,

- strict compliance with working-discipline principles and prescribed technological procedures,
- close co-operation with the Nízke Tatry National Park Administration and the District Office's Environment Department in Liptovský Mikuláš,
- compilation of a purposeful-environmental-monitoring project,
- other measures of local importance defined in the introductory environmetal report.

Assessment of Expected Development of the Area if Planned Activity is not Implemented

The area in question now is an ecosystem affected by historic mining. Stabilised in many aspects, it essentially is a balanced country of exceptional quality. If the planned activities are not implemented, the ecosystem stabilisation will continue.

Assessment of Compliance with Land-Use Documentation

According to approved land-use plans for the Nízke Tatry area (Slovak Government ruling No. 79 dated February 1, 1996)

- Magurka area is not an exclusive deposit area for metallic ores,
- development of mineral extraction in the Nízke Tatry National Park is not planned,
- owing to its location, the Magurka area has been proposed for a limited development of sightseeing tourism, stationary recreation and rural tourism.

Further Progress of Impact Assessment with Specification of Crucial Problems

Environmental impacts outlined in the initial environmental study should be negotiated with the Liptovský Mikuláš District Office, local authorities at Liptovské Kľačany and Partizánska Ľupča as well as with the Nízke Tatry National Park Administration. This co-operation may result in a closer specification of possible impacts, and consequently working and technological procedures can be amended in accordance with requirements of these authorities.

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Fig.1: Scheme of localities