Romanian mining industry and environment protection

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- yearly in the world are produced 28 billion tones of utility substances;
- the mining industry extracts each year around 60 billion tones of mining mass to obtain this quantity of utility substances;
- about 55 % of mining mass is represented by waste and residues ;
- The average of the quantity of mining mass by inhabitant is 4.8 – 8 tones;
- The mining mass extracted is 4 times bigger reported to the quantity transported by rivers in the sea and the oceans ;

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Present situation of the Romanian mining industry

- Romania has a surface of 237.500 km^2 and a population of 21,5 million inhabitants;
- The mining industry in Romania has been practiced for more than 2000 years;
- The first written document dates from the year 132 a.d. and it was found in Rosia Montana (Alburnus Major) , Alba county;

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- The situation of Romania's geological reserves is:
  - 3 billion tones of lignite;
  - 1 billion tones of huile;
  - 40 million tones of gold-silver ore;
  - 90 million tones of polymetalic ore;
  - 900 million tones of cooper ore;
  - 4 billion tones of salt;

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In the Romanian mining industry work in present 96 economics agents and the distribution of these is the following:

- 3 national companies for coal which have 40 mining branches;
- 2 national companies for polymetalic, gold and silver ores which have 44 mining branches;
- National Company for the Uranium ;
- National Society for Salt which has 7 branches;
- National Society for the Mineral Waters;
- 7 societies for non-metal ores;
- 10 societies for geological research;
- 5 research institutes;

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The production capacity of the mining activity in Romania is the following:

Type of substance	Yearly capacity Mil.tones
coal	52.00
polymetalic ores	21.00
▪ copper	13.80
▪ gold and silver	2.20
▪ polymetalic	3.60
▪ iron and manganese	0,80
▪ uranium	0.60
non-metal	8.00
salt	4.30

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Waters and environmental legislation in Romania regarding the mining activity is:

- Waters Law nr.107/1996
- Environmental Protection Law nr.137/1995 including modifications and additions, and subsequent regulations;
- Safety Dams Law nr. 466/2001 and subsequent regulations;
- Prevention and Integration Control of Pollution Law nr.645/2002 and subsequent regulations;
- Seveso Governmental Decision nr.95/2003;

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The mining industry impact on the environment refers to the following aspects:

- Emission of pollutants in air (NO_x ;CO; SiO_2 ;SO_2);
- Emission of pollutants on surface and ground waters (heavy metals, sulfates, chlorites, carbonates and others);
- Soil pollution;
- Hydrological changes in the area;
- Landscape changes in the area;

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- Occupation of a large area of terrain for the exploitation activity, industrial facility, waste deposits and tailing dam;
- Disturbing of natural habitats;
- Affects cultural and historical sites;
- Vibration effects caused by explosions;
- Long term effects over the environment during activity and after the closure of the mining activity;

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Emission of pollutants in air (NO_x ;CO; SiO_2 ;SO_2)

- MTS -120,000 tones/year;

Emission of pollutants in water:

- For each extracted ore tone a quantity 1.3 – 8.0 m^3 waste water is evacuated in surface waters ;
- Example : Cavnic Mine in Maramures county - the content of the pollutants in the acid drainage are the following: Cu- 0.05- 2.6 mg/l; Pb – 0.1- 0.3 mg/l; Zn – 14.6 – 96 mg/l; Mn- 10.8 -40 mg/l; Fe – 0.1 mg/l; carbonates – 270 – 300 mg/l; TS -55- 160 mg/l; sulfates -932.0- 1,411.0 mg/l; chlorites – 7.5 – 30.0 mg/l and others;
  - *The limit values established by Romanian normative for discharging this type of waters are: Cu- 0.10 mg/l; Pb – 0.05 mg/l; Zn – 0.5 mg/l; Mn- 1.0 mg/l; Fe – 5.0 mg/l; carbonates – 300 mg/l; TS -60 mg/l; sulfates -400.0 mg/l; chlorites – 500.0 mg/l and others;*
- Treatment methods of acid drainage used in Romania are:
  - Mixture of acid drainage with the flotation slurry ;
  - Treatment station which use the lime as a reactive.

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The land surface used in the polymetalic activity is 8,200 ha

- 46 % of the land is for operational activity;
- 54 % of the land is for the disposal of mining waste and tailing dams

The two mining companies carrying on their activity in this field posses 376 waste deposits. The waste totalize 149,5 million tones.

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Tailing dams in Romania

- The first tailing dam was built in 1961;
- There are 109 tailing dams of which 50 are operational
- The Tailing disposal site types are:
  - Valley disposal sites – 40 tailing dams;
  - Slope disposal sites – 45 tailing dams;
  - Flat disposal sites – 24 tailing dams;

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The utilized construction methods in Romania are:

- Dam construction by upstream method;
- Dam construction by downstream method;
- Dam construction by centerline method.

Tailing disposal techniques used are:

- Common deposition techniques;
- Spigot discharge ;
- Cyclone deposition.

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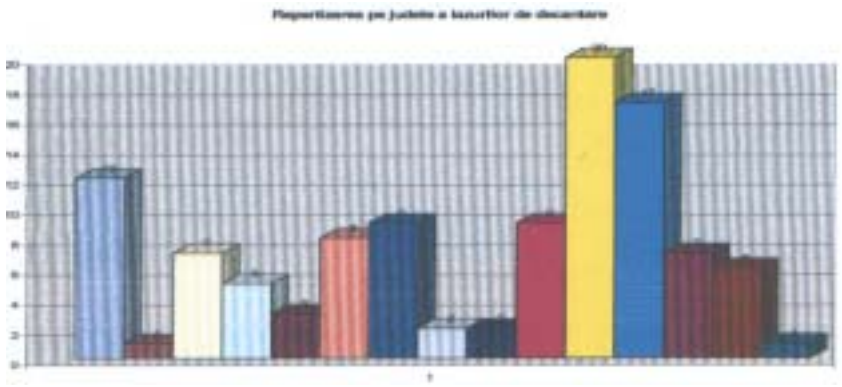
County distribution of tailing dams



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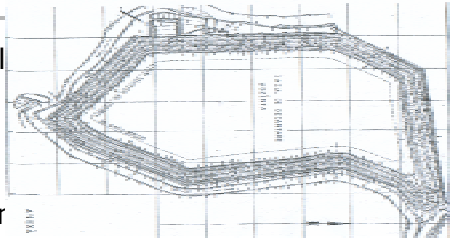
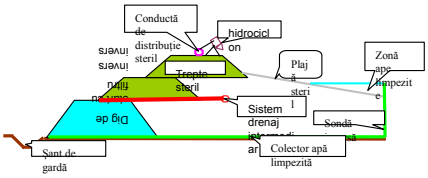
Bozanta –REMIN Baia Mare- fl
disposal

- dam construction by upstream method
- surface 120 ha;
- Disposal capacity:51 millior tones
- Tailing disposal by cyclone in the period April –Octobe and spigot (in the period October – April);
- Average height : 29 m;
- Slope of dam : 18 ^{0}
- Waste water discharge: 27(l/s;





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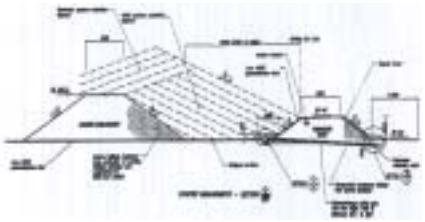
Bozanta –Transgold Baia Mare- flat disposal

- dam construction by downstream method
- surface 93 ha;
- disposal capacity:17 million tones
- tailing disposal by cyclone;
- average height : 11 m;
- decant tower : 2
- slurry discharge:1,060 m^3/h



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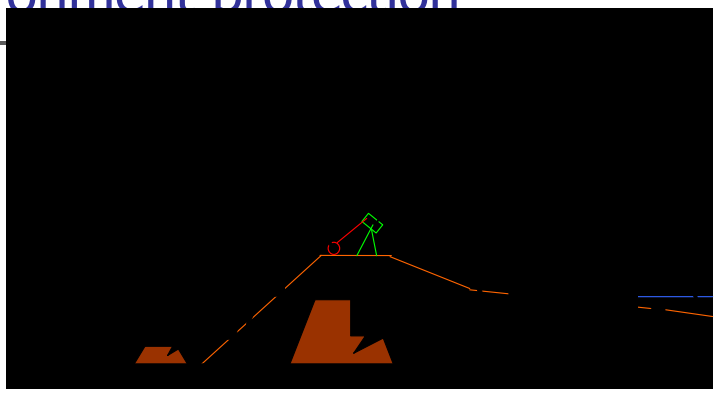

V.Glodului – valley disposal

- slope of dam : 23 $^{0;}$ - dam construction by centerline method; -tailing disposal by cyclone and spigot; average height : 46 m;
- waste water discharge: 2.500 m^3/day; - surface: 9.6 ha; -disposal capacity:6.3 million tones

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Valea Devei- valley disposal

- dam construction by upstream method;
- It started to function in the year 1972;
- surface 26 ha;
- Disposal capacity:12 million tones
- Tailing disposal by spigot;
- height : 96 m;
- Slope of dam : 20^0
- Waste water discharge: 200 m^3 /day;

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Valea Sesei – valley disposal

- Dam construction by upstream method;
- It started to function in the year 1986;
- Surface 107 ha;
- Disposal capacity:83 million tones
- Tailing disposal by spigot;
- Height : 73 m;
- Slope of dam : 33^0
- Waste water discharge:12, 300 m^3 /day;

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Valea Mealu –valley disposal

- Dam construction by downstream method;
- It started to function in the year 1984;
- Surface 22.9 ha;
- Disposal capacity:15 million tones
- Tailing disposal by cyclon;
- Height : 48 m;
- Slope of dam : 34^{0}
- Waste water discharge: 7,700 m^3 /day;

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Ribita - slope disposal

- dam construction by upstream method;
- it started to function in the year 1986;
- surface 43 ha;
- disposal capacity:18.59 million tones
- tailing disposal by spigot;
- height : 32 m;
- slope of dam : 18-22 ^{0};
- waste water discharge: 9,900 m^3 /day

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D_2 Baia Borsa- slope disposal

- dam construction by upstream method;
- it started to function in the year 1972;
- surface 7.5 ha;
- disposal capacity:7.1 million tones
- tailing disposal by spigot;
- height : 48 m;
- slope of dam : 26^0;

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Closure and rehabilitation of mining sites

- In the period of 1990-2002 more than 200 mining sites were proposed for closure;
- The costs for the closure of these mining sites are over 300 million USD;
- This closure operation is financed by the state budget and by the loan from the World Bank;
- The World Bank financed the elaboration of a Manual for the closure of the mining sites;
- This manual was approved by M.E.C., M.A.F.W.E. and N.A.M.R.;

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Conclusions:

- The mining activity has a strong impact on the environment;
- The environmental problems have been accumulated in time;
- The financial efforts for the closure of the mining sites and rehabilitation are high;
- Every year it's necessary to assure the operational costs for the treatment plant for the acid drainage from the budget ;
- The state has to assure the necessary funds for the safety of the tailing dams and waste deposits ;
- It's necessary to monitor the acid drainage and to mitigate this phenomenon.

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