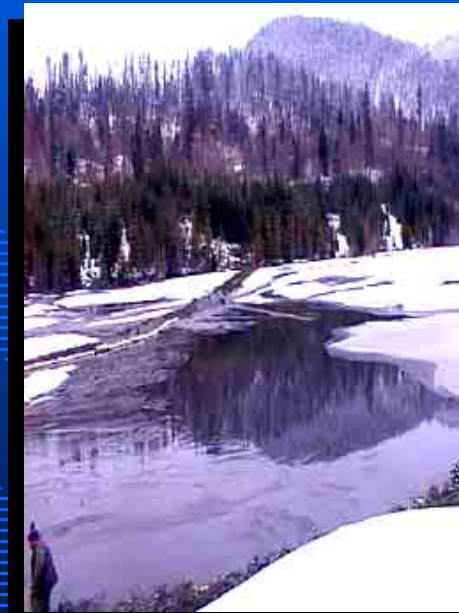


**Somes-Tisa-Danube Catchment Pollution Impact of the Toxic Spill from
Baia Mare, Romania**
*L'impact de la pollution du bassin Somes-Tisa-Danube par des boues
toxiques de Baia Mare, Roumanie*



Dr Radu Rautiu, Imperial College Consultants Ltd, October 2002

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¹University of Cluj, Romania, ²ICIA Cluj, Romania, ³Imperial College London UK

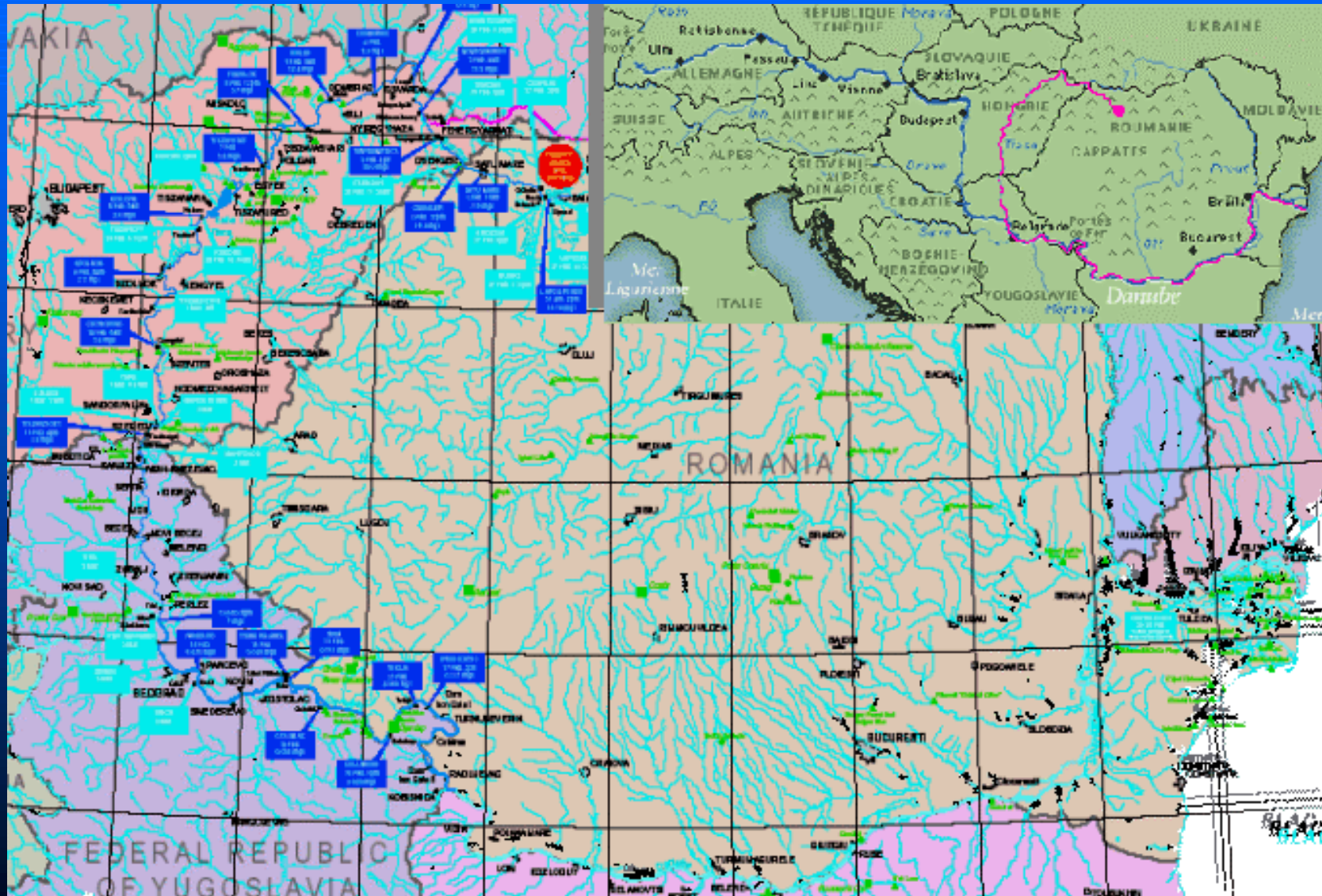
Somes-Tisa-Danube Catchment Pollution Impact of the Toxic Spill from Baia Mare, Romania

- **Presentation of the Baia Mare Cyanide Spill (January 2000)**
- **Baia Mare accident aftermath and implications**
- **IRCYL INCO-Copernicus project (2000-2003)**
- **Soil contamination**
- **River basin and sediment contamination**
- **Pollution impact on the ecology of the river basin**
- **Conclusions**

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INTERNATIONAL CENTER FOR
ENVIRONMENTAL AND CLIMATE RESEARCH

Baia Mare & Baia Borsa Spills



after UNEP Report , March 2000

Transgold/Aurul Pond Dam Breach

02 02 2000

- 30 January 2000, 11pm Aurul notifies local EPA and shuts down activity, starts to close breach
- 31 January 2000 Notification of local and national authorities in Romania and downstream transboundary authorities in Hungary, Serbia, Bulgaria. Treatment of spillage with hypochlorite
- 1 Feb 2000 Experts of the Dam Commission arrive
- 2 Feb 2000 Spillage stopped and decontamination started. Dead fish reported at Satu Mare.
- 8 Feb 2000 RO-HU meeting ministers of environment
- 17 Feb 2000 EU-RO-HU meeting and visit by EU Commissioner for Environment Margaret Wallström
- 25 Feb 2000 UNEP/OCHA Mission starts assessment work
- March 2000- Greenpeace Report
- March 2000- UNEP/OCHA -UNDAC Mission Report
- March 2000- INERIS Rapport
- May 2000 UNEP/ICME Draft Code of Practice Cyanide Management (revised Sep 2001 and 2002)
- Aug 2000 ICPDR- Regional Inventory of Pollution sources in the Tisa catchment
- Oct 2000 INCO Copernicus project starts (2000-2003)
- Dec 2000 EC Baia Mare Task Force Report (BMTF)
- 2001 UNEP/ICMM-APELL for Mining

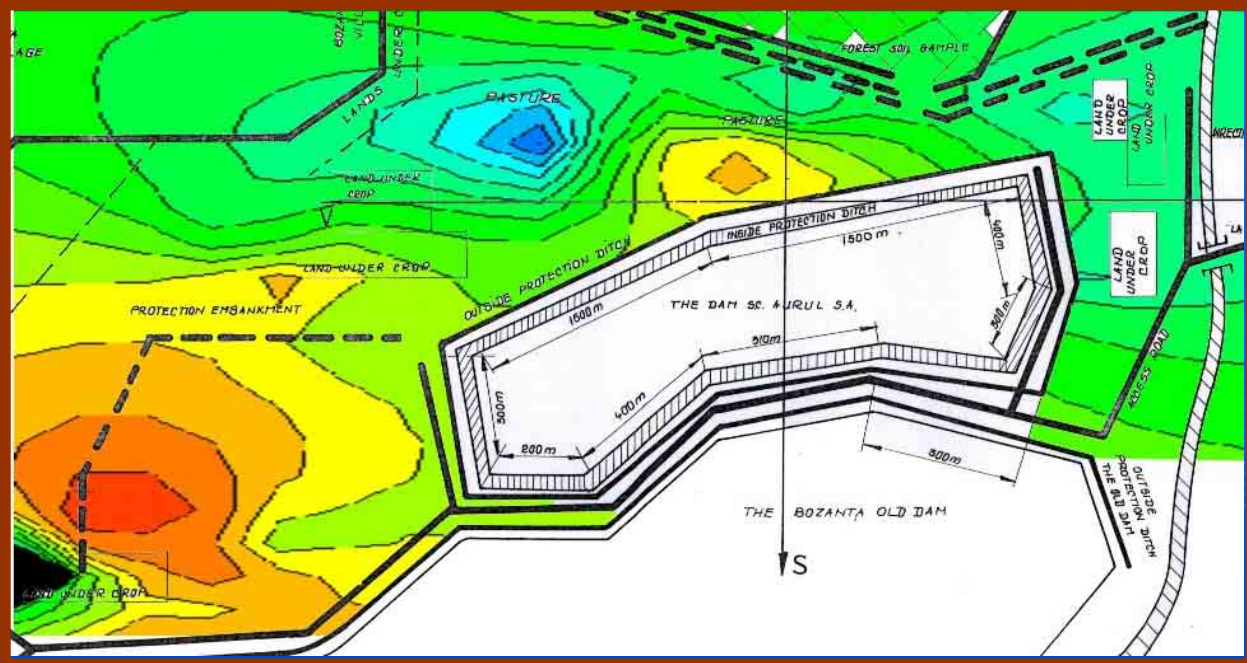
Breach in second dam
of the starting
embankment

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Baia Mare Accident Aftermath

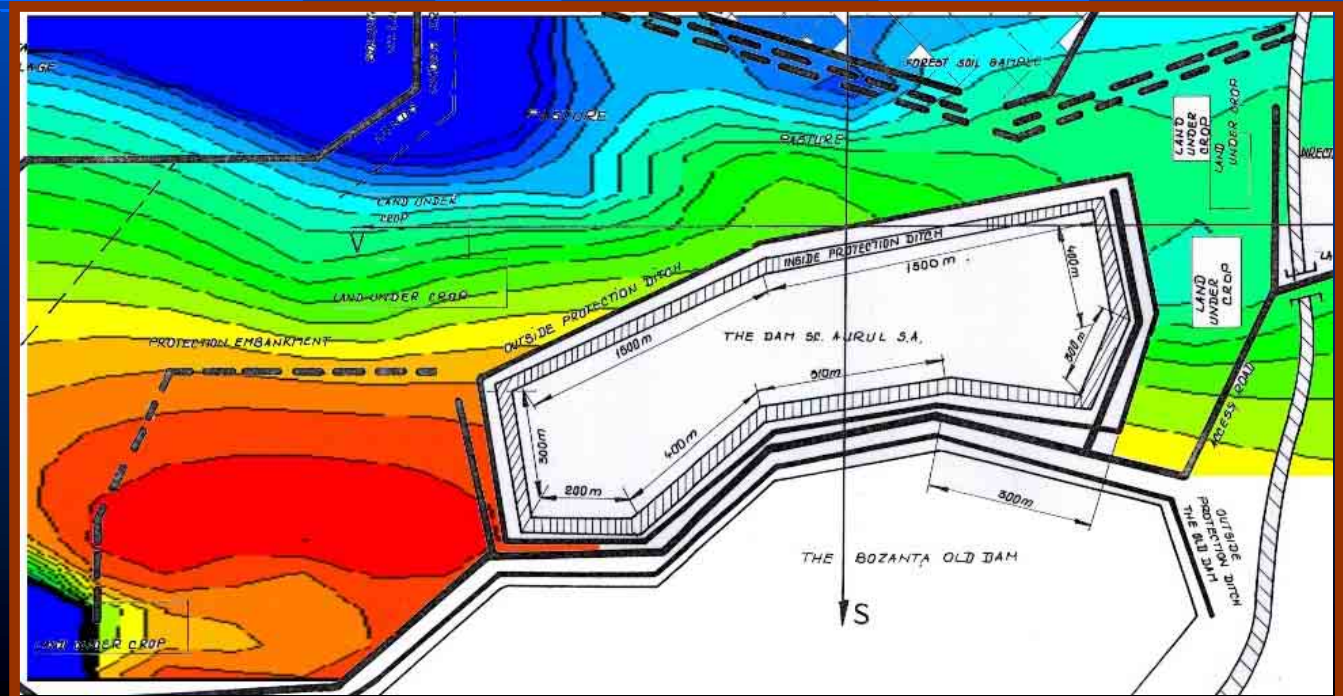
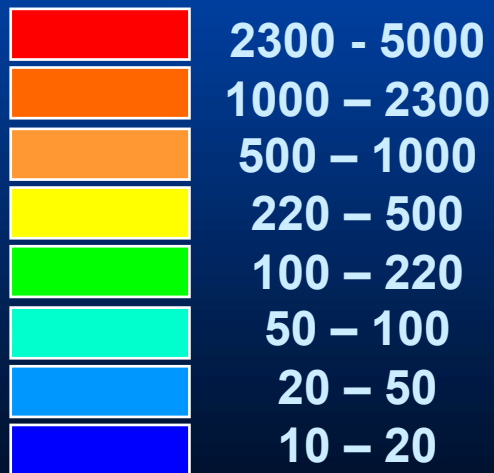
- For the period 2000-2001
- Short-term acute CN pollution and long-term heavy metal contamination (Pb, Cu also Zn, Cd, Mn) of sediments
- cca 1240 t. dead fish and imbalanced ecosystems in the catchment
- cca 50 ha. contaminated land and 8 contaminated wells
- Re-thinking of disaster management plans, and mining and mining-related operations such as tailings processing
- International litigations
- For 2002 and onwards
- Long-term soil and sediment contamination with complex cyanides and heavy metals
- Preliminary studies shown that the ecosystem of Somes-Tisa-Danube catchment is slowly recovering but still incomplete (with fauna from upstream or unaffected tributaries)
- Fish and aquatic plants are shown to have accumulated large amounts of Pb and Cu and less Zn and P
- A new emergency plan drafted by EPA and the local authorities

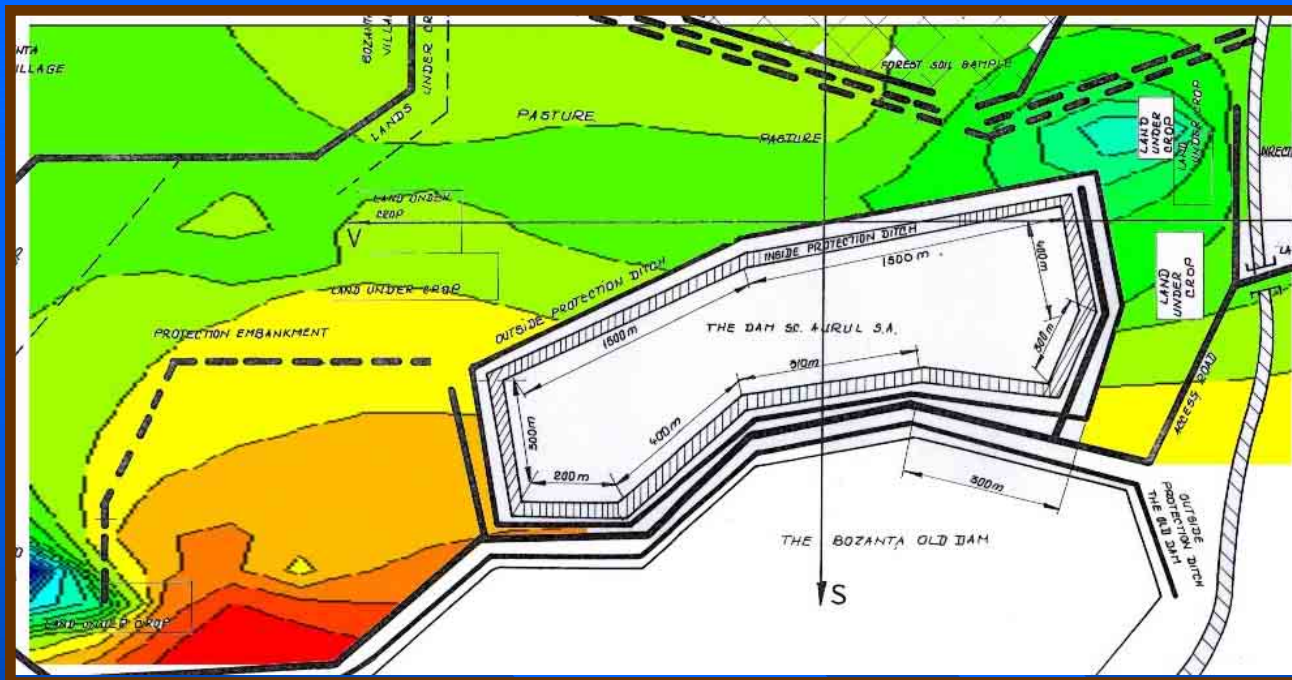


Pb in soil, 5 cm

Pb in the Area of Transgold/Aurul Dam

Pb in soil, 30 cm

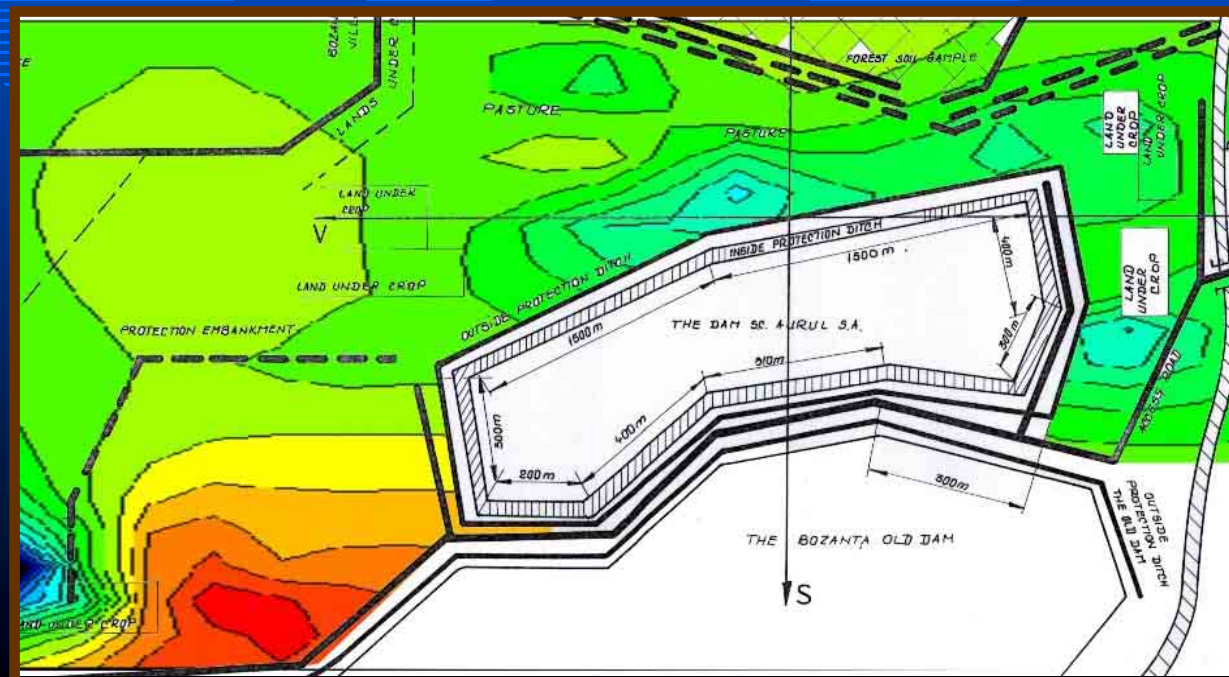




Cu in soil, 5 cm

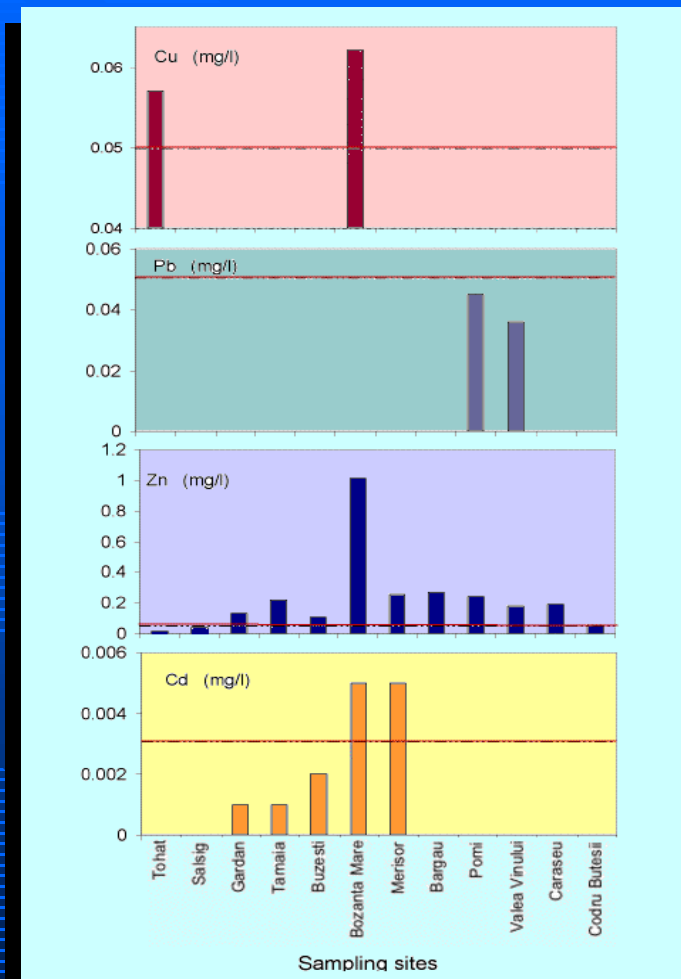
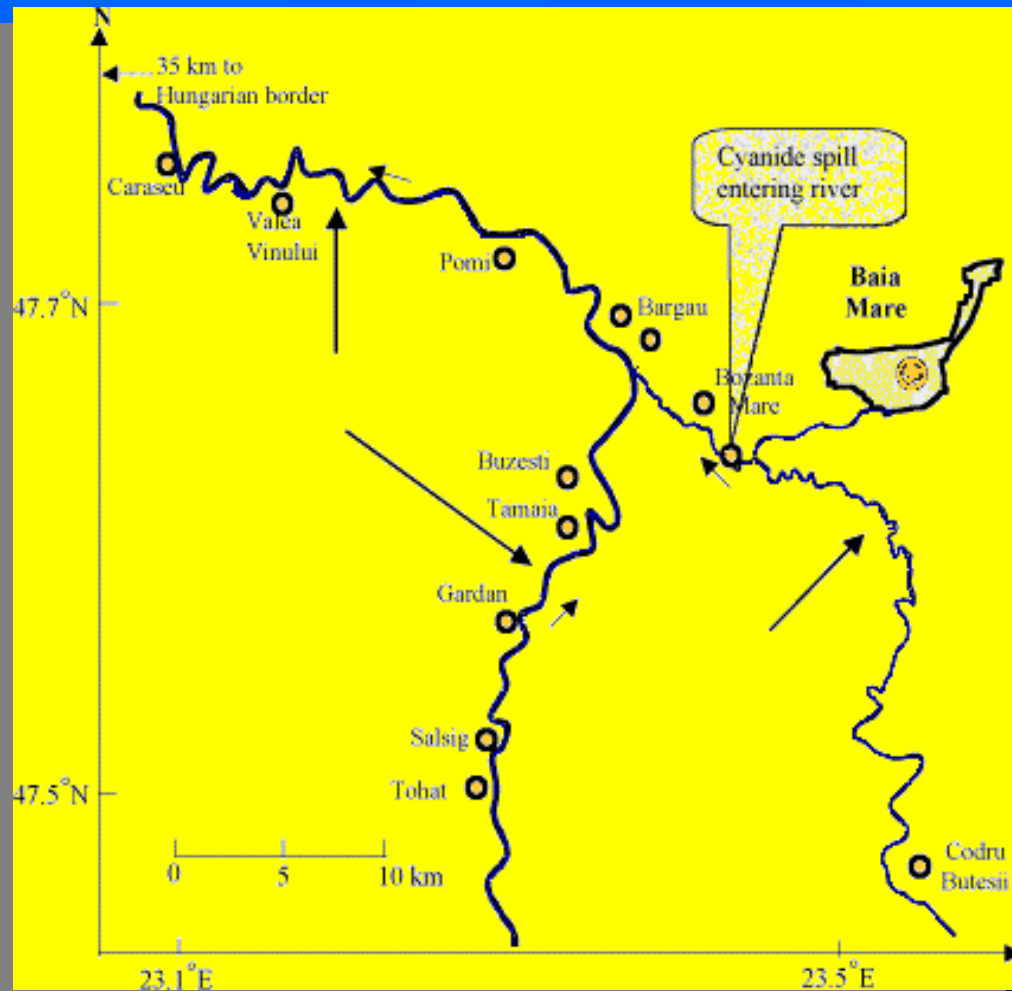
Cu in the Area of Transgold/Aurul Dam

Cu in soil, 30 cm

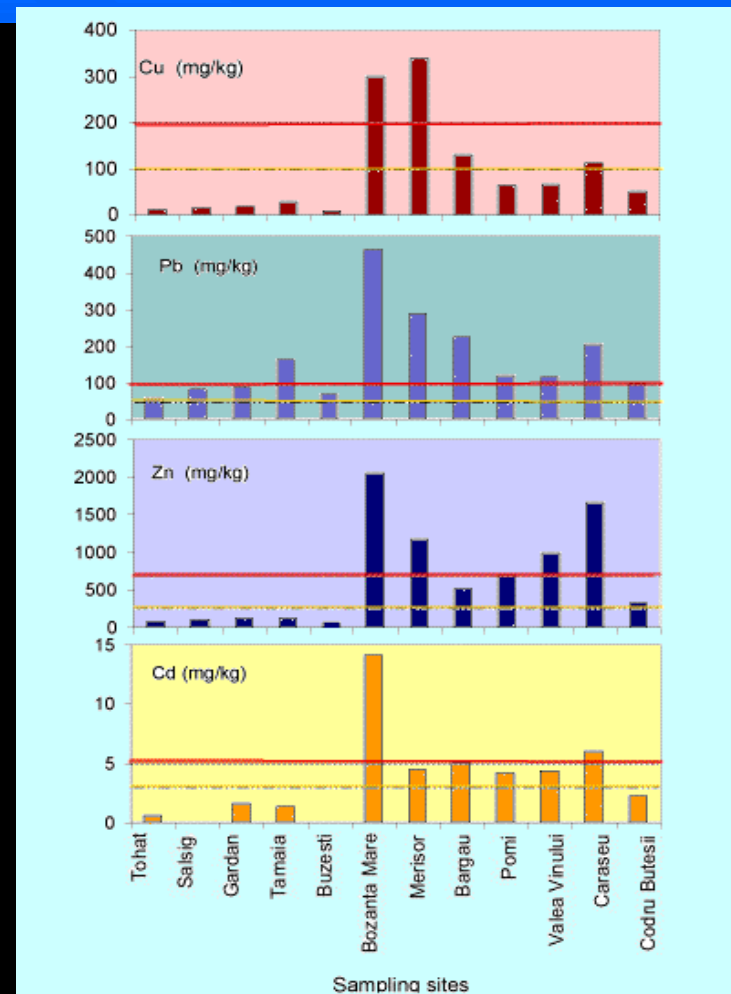
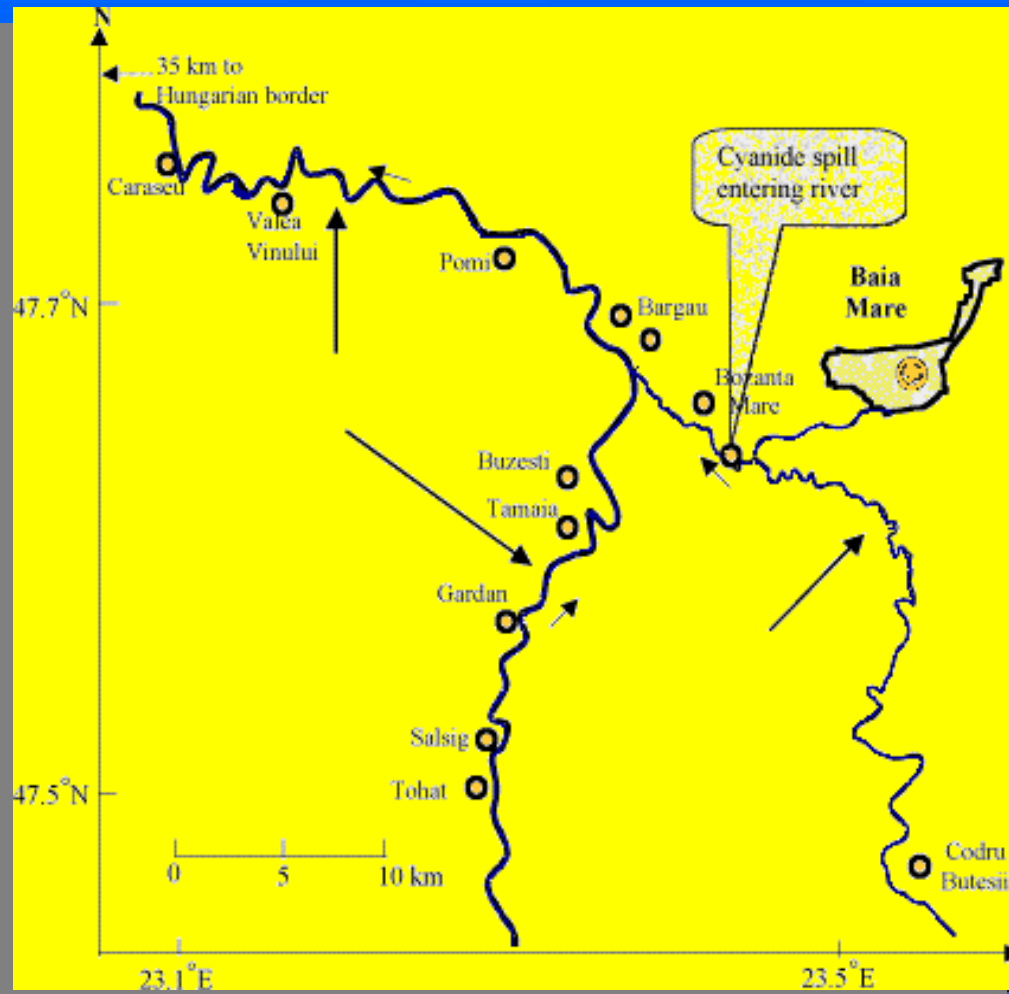


| | |
|--|------------|
| | 550 – 1000 |
| | 300 – 550 |
| | 175 – 300 |
| | 100 – 175 |
| | 55 – 100 |
| | 30 – 55 |
| | 17 – 30 |
| | 10 – 17 |

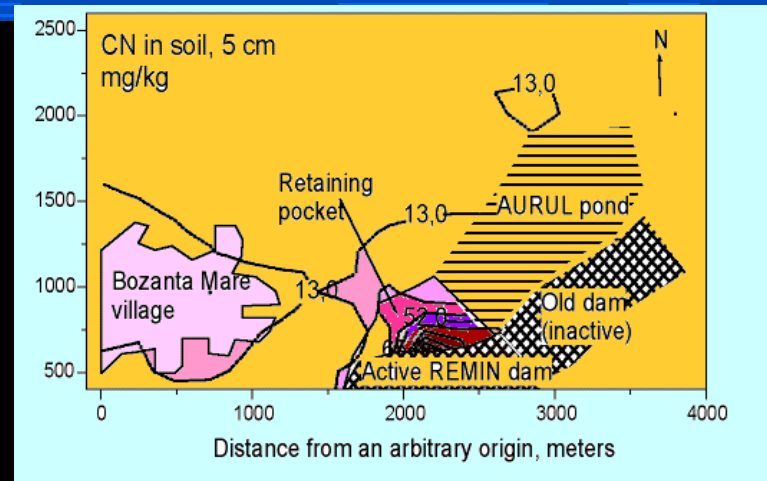
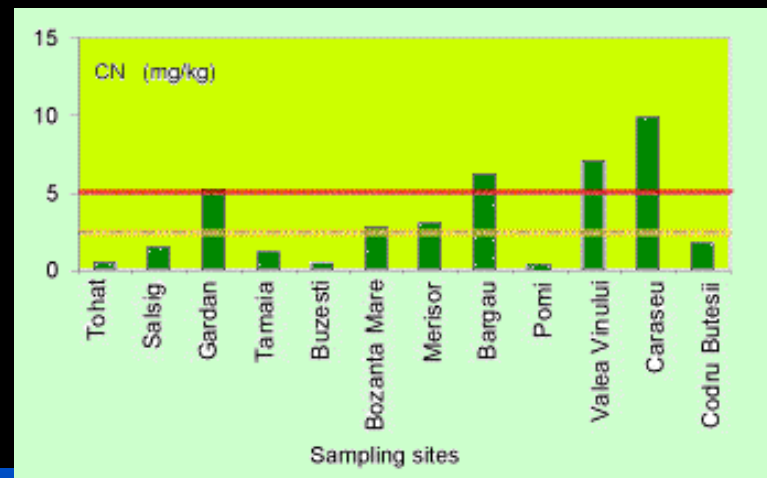
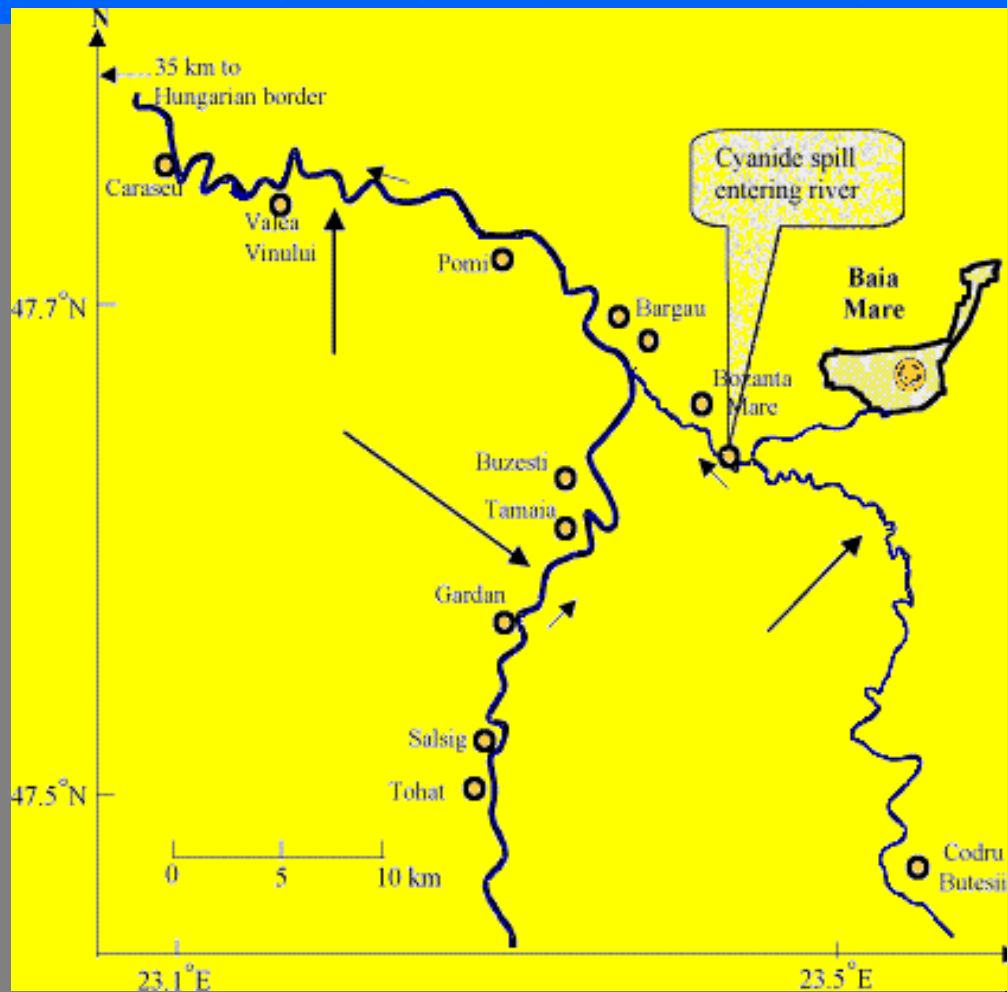
River Catchment and Sediment Contamination- Water



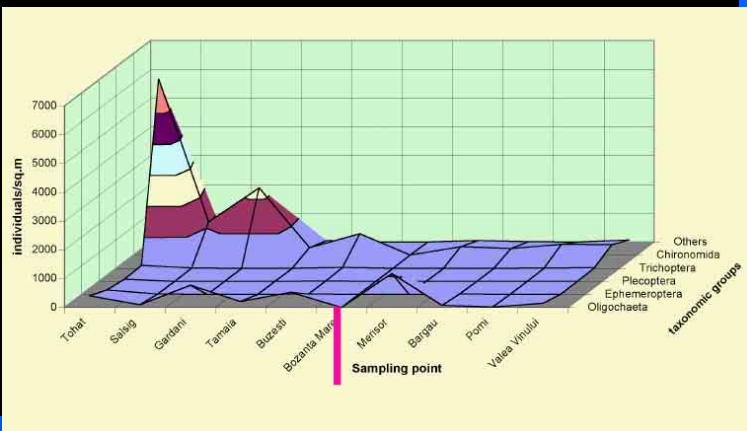
River Catchment and Sediment Contamination- Sediment



Sediment and Soil Contamination- Complex Cyanides



Pollution Impact on the Ecology of the Lapus-Somes River Basin

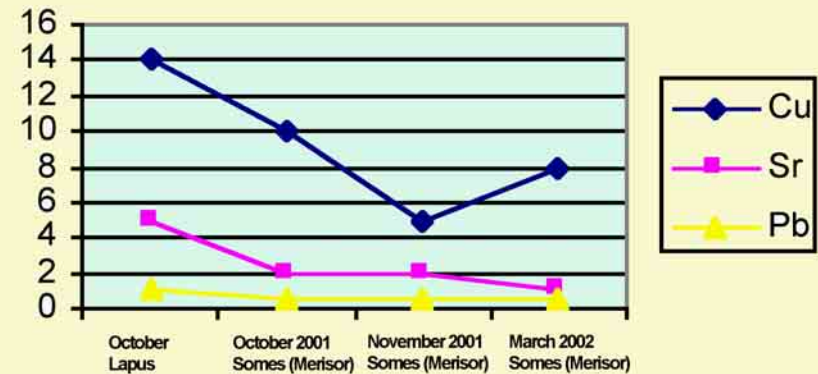


Bentic Fauna - February 2000

Phytoplankton Diversity - Lapus/Somes 2001-2002

Heavy Metals Accumulation in *Unio Crassus* Mussels 2001-2002

INCO IRCYL 2000-2003



Conclusions and Further Research

- Water quality of the river catchment Somes-Tisa within the range of normal standards (critical values found in few sites)
- The pollution mainly distributed in the suspended form : generated mainly by mining/ mineral processing activities, especially the decantation ponds that are located next to the rivers
- No cyanide was determined in the water
- The sediment situation is quite different, high values of heavy metals content, part of them as complex cyanides were recorded. The values are exceeding several times the critical limits for soil and it demonstrates the potential toxicity of the sediments. The increased content of cyanides, downstream from Bozanta Mare could be partially attributed to the cyanide spill and their persistence
- The aquatic ecosystem
 - strongly affected by the cyanide spill
 - microalgae species with narrow tolerance to changes in water quality disappeared on Somes river, downstream of the Lapus river inflow.
 - recovery process started few weeks after the accident but for a smaller number of species
 - some of the river segments were repopulated with cosmopolite species. In the river segment affected by the spill only two species from the benthic fauna persisted, in a smaller number as compared with the upper part of the river. Less than a quarter of the species reported before the accident could be identified in the summer of 2000.
 - the fish collected were only young individuals from upstream of the confluence.
 - *Unionidae* mollusks species disappeared downstream the confluence with Lapus river since their capacity to accumulate large amount of heavy metals was exceeded
- Further work is necessary downstream and trans-border into Hungary, Ukraine and Yugoslavia, also all the way to the Danube Delta to assess the long term impact on the aquatic fauna and sediment.