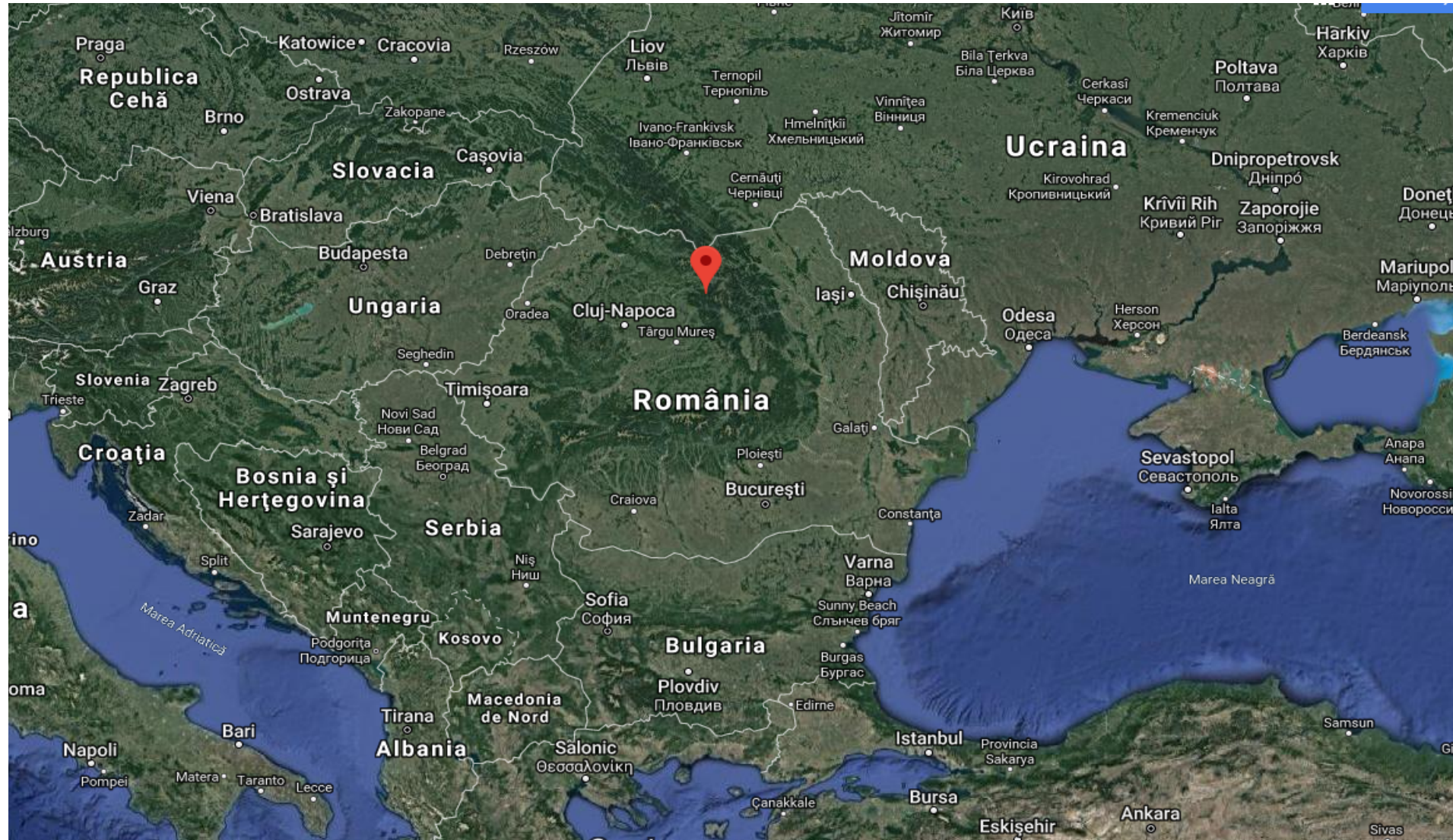
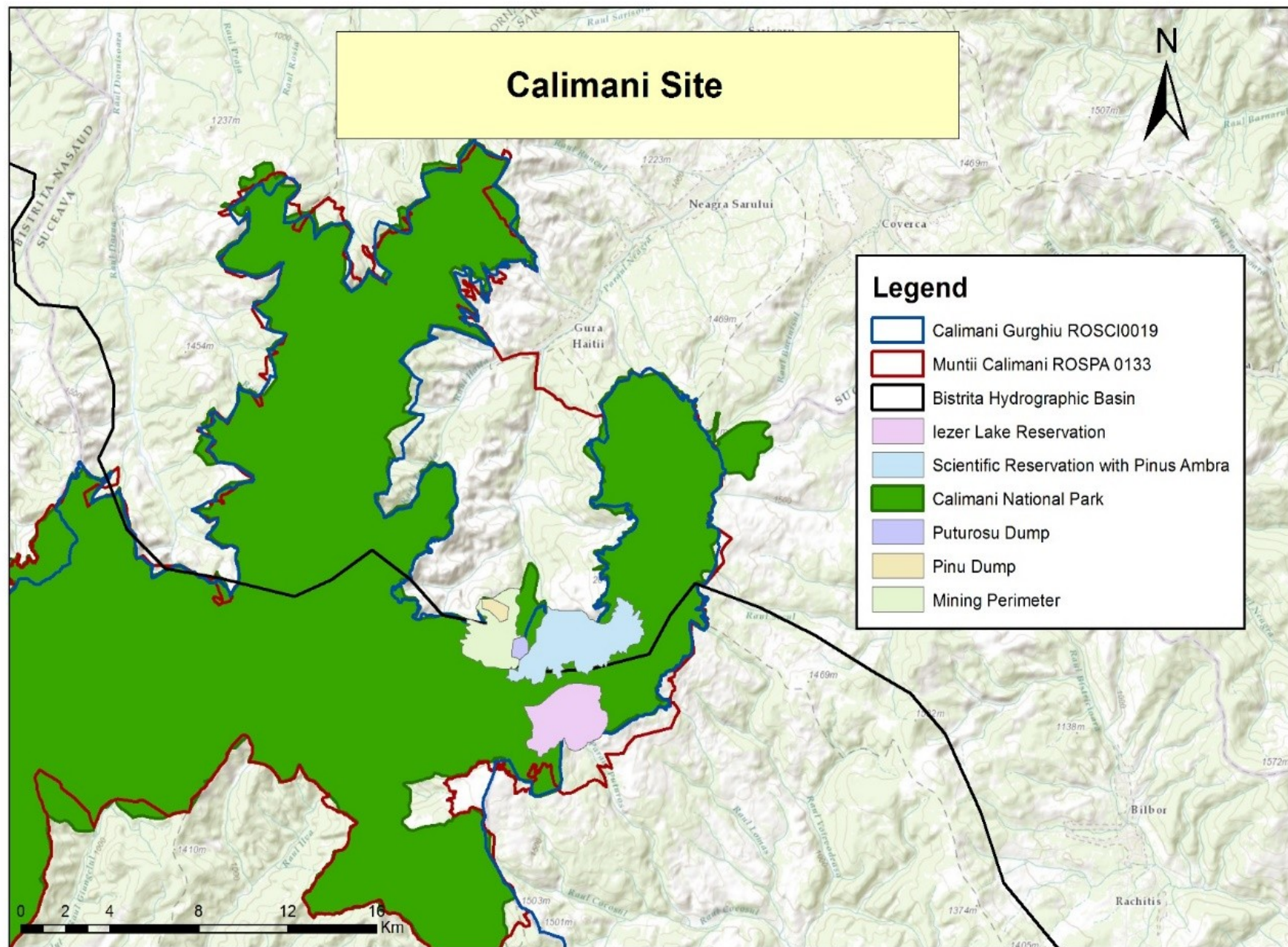


REMANENT POLLUTION IN THE AREA OF THE FORMER SULPHUR EXPLOITATION SITE IN THE CALIMANI MOUNTAINS, SUCEAVA COUNTY

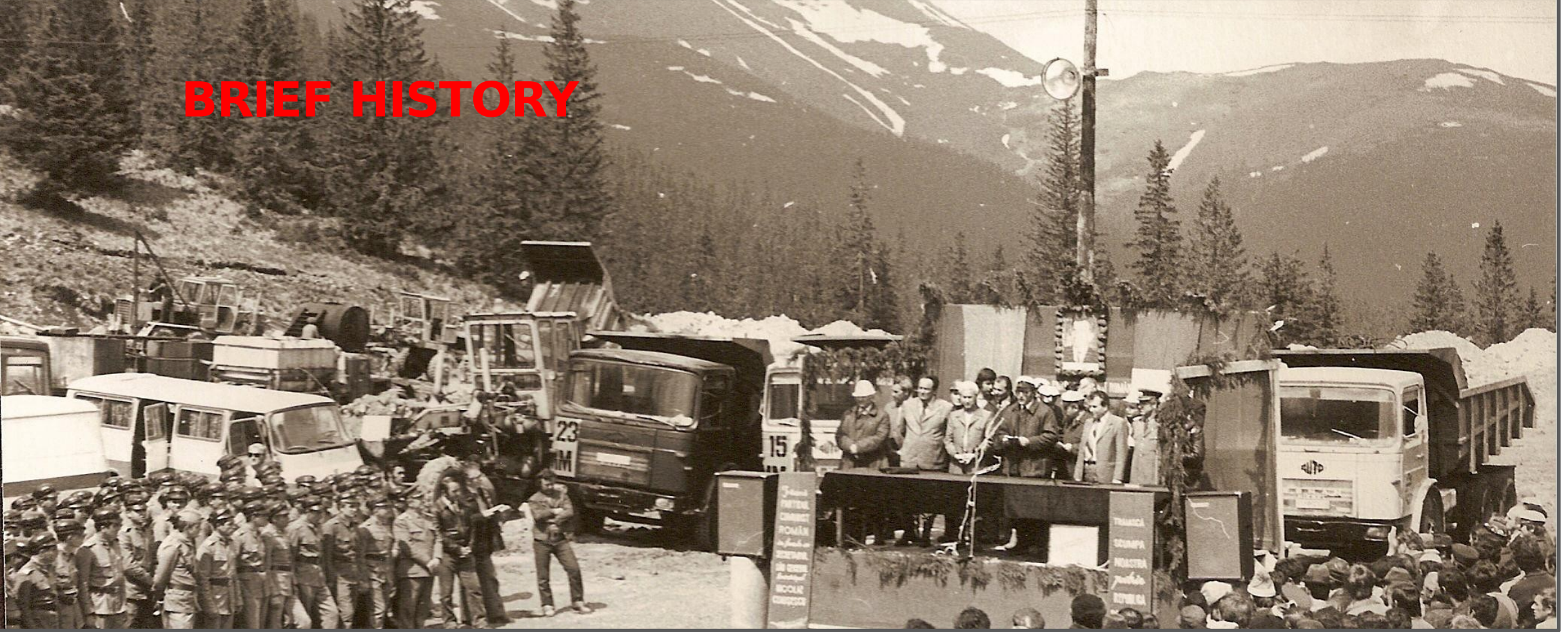
PHD.ENG. IONCE ANCA,
ARDELEANU NONA NICOLETA, IONCE RUXANDRA

THE PLACEMENT OF THE CĂLIMANI QUARRY





BRIEF HISTORY



The massif Calimani offers the only exploitable *sulfur deposit* in Romania. These native sulfur reserves were officially approved by the Romanian state in 1966. The exploitation of the sulfur deposits commenced in 1970 in the mining perimeter Negoiiul Românesc- Pietricelu- Călimani, accompanied by subsequent preparation works in a specialized unit. The sulfur rock deposits have been confirmed and evaluated by 1971 for subterranean exploitation, although a quarry was eventually opened by excavating the top of Negoiiul Românesc (between the altitudes of 1420 and 1740 m).

THE EVALUATION OF THE ENVIRONMENTAL QUALITY IN THE CĂLIMANI MINING AREA. METHODOLOGY

The technological difficulties, the unfavourable economic outcome and the poor quality of the final product, combined with the disastrous influence on the environment have lead to the only reasonable solution: the definitive cessation of all activities of the Mining Exploitation Călimani in 1997.

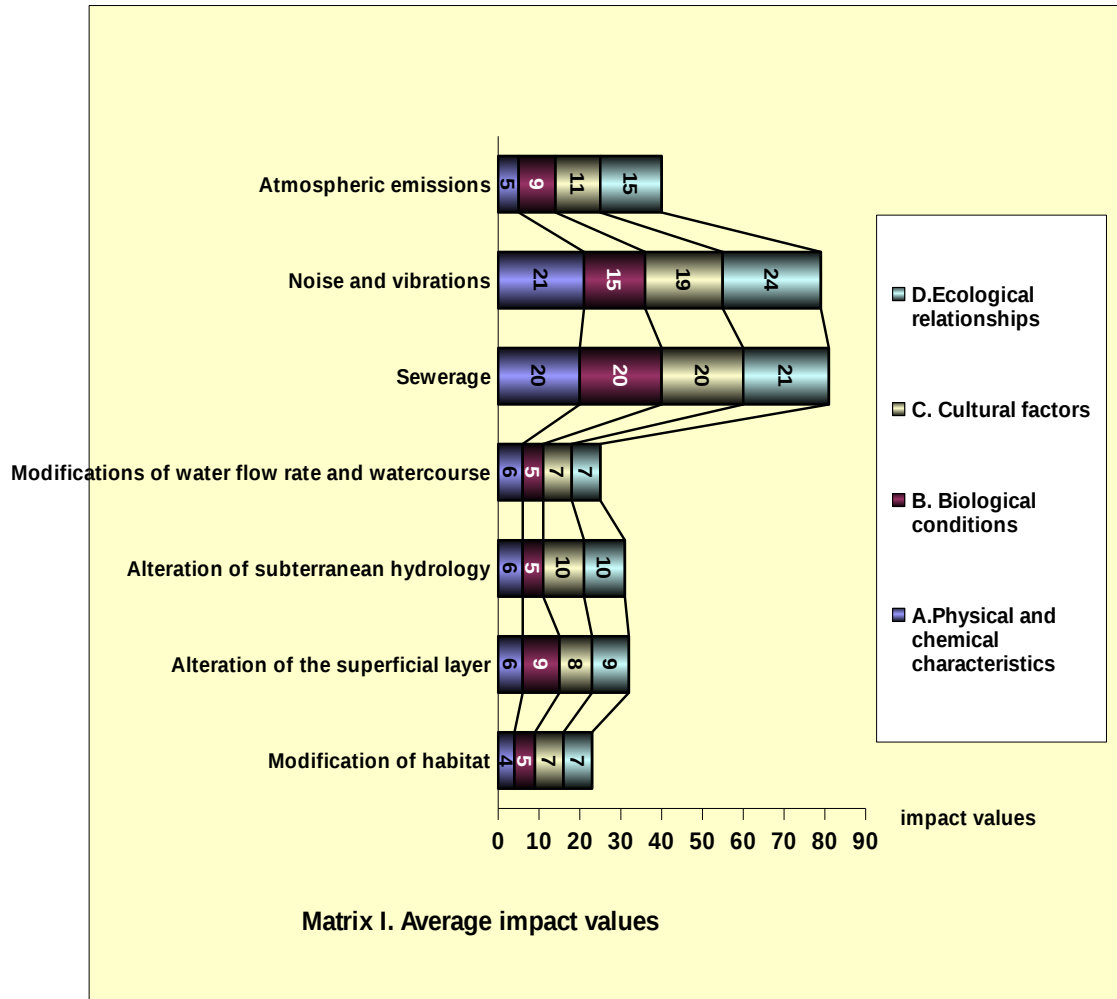
Beginning with contouring of the sulfur deposit in Călimani, followed by the subsequent sulfure exploitation in the mining perimeter, the entire project ended as a fiasco, with serious damages on the environment and surrounding human communities.

APPRECIATION GRID FOR THE AMPLITUDE OF THE MAGNITUDE AND THE IMPORTANCE OF THE IMPACT (IMPACT INDEX)

Magnitude	Grade for M	Importance	Grade for I	Impact	Impact Index M x I
Anthropized environment, reduced ecosystems	1	Very important (residential areas, natural rezervations)	1	Major- degraded environment, destroyed ecosystems	1- 5
Major pollution	2	Important	2	Significant- environment seriously affected by human activity, dangerous for all life forms	6-10
Pollution at average levels	3	Medium importance	3	Big- environment affected by human activities that create disturbances in the life of more sensitive organisms	11-15
Reduced pollution	4	Less important	4	Medium- environment affected by human activities that produce discomfort	16-20
Insignicant effects on the environment	5	Not important	5	Low- environment affected by human activities within acceptable limits	21-25

THE INTEGRATED EVALUATION OF THE IMPACT OF THE ACTIVITIES IN THE MINING EXPLOITATION CĂLIMANI DURING THE ACTIVE PERIOD

AVERAGE IMPACT VALUES FOR THE MATRIX „MODIFICATIONS IN THE REGIME”



The sulfur exploitation and preparation activities, by changing habitats, water courses and surface water quality, have impacted all environmental conditions on a significant level; however, specifically concerning the physical and chemical characteristics of the environmental factors (water, air, soil) and biological factors (flora and fauna), the impact level is major, according to current studies.

The amplitude and the importance of the modifications registered in the surface water flow rate have had a significant impact for the environmental conditions.

CALIMANI QUARRY



TAILING DEPOSIT PUTUROSU



Solid particles containing sulfur, detonation residues, quarry exploitation residues together with acid rains (resulted from the oxidation of the sulfur dioxide- released into the atmosphere from the exposed surfaces from the quarry and tailing deposits- into sulfur trioxide and, finally, in the presence of atmospheric humidity, sulfuric acid aerosols) pollute the surface of these soils. The analysis of the sterile samples taken from the contiguous areas of the tailing deposit Puturosu (EPA Suceava, 1992) revealed high values for the majority of the metals analysed (Fe, Mn, Zn, Cu) and very low pH values for the tailing deposit (pH=2,02) and the soils uphill (pH=3,05) of the area.

BUSHES WITH PINUS MUGO AND
RHODODENDRON HIRSUTUM (PRIORITY
HABITAT)

Deforestations made in order to give space to the construction of the exploitation facility, the preparation unit and all other related units, destroyed the specific habitats for the alpine and subalpine levels of the Călimani Massif over a surface of aprox. 330 ha



The negative effect of the unpurified waters is made obvious through the quality of the final receptor, the Neaga Șarului River, whose pH at its origin varies between 5,2 and 5,9 and, after taking in the acidic water (from the pump station Dumitreleu), between 2,3 and 4,5. The acidity is increased by the waters resulted from the exfiltrations from the tailing pond Dumitreleu, which, through the Dumitreleu Creek ends up in the same main emissary.

According to all documentations and scientific studies, the tailing deposits, despite the fact that they do not occupy the largest surface in the hydrographic basin Neagra, are the main source of silt transportet by the water courses; geochemically, the quality of the sediments from the Neagra Șarului River is strongly affected upstream, specifically the pH (with severe impact on the benthic organisms)

SEDIMENTS CONTAINING MINING WASTE ON THE RIVER BED OF THE NEAGRA ȘARULUI RIVER



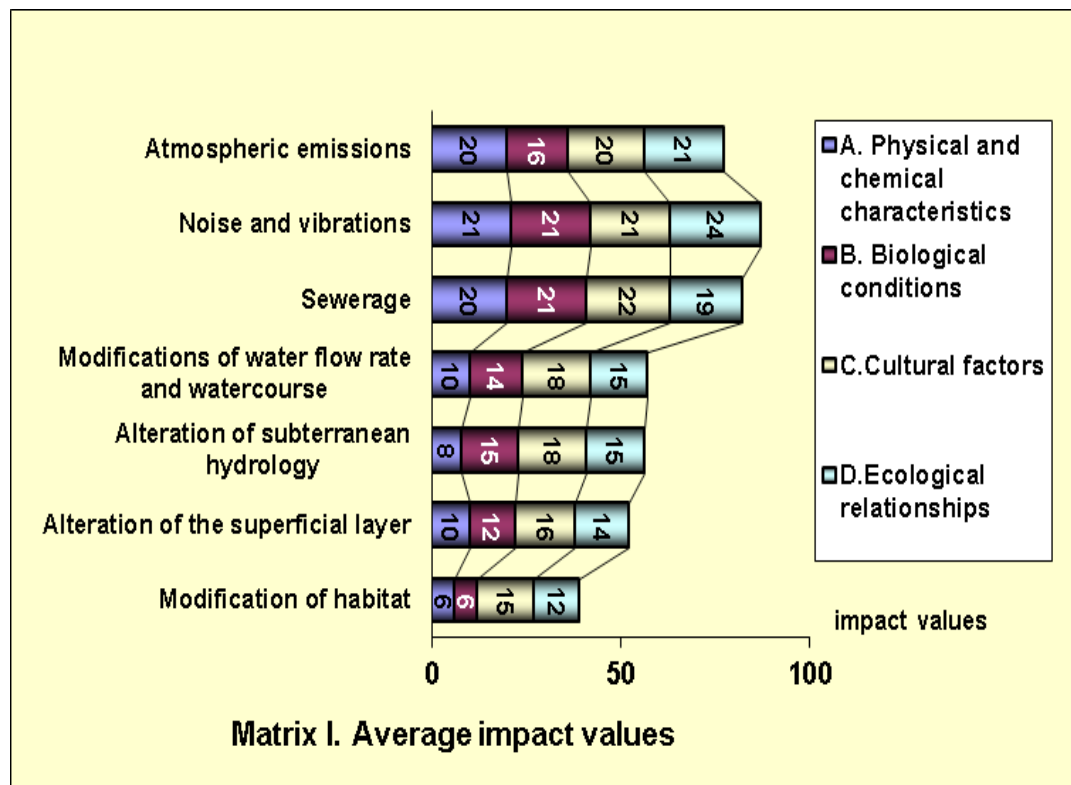
Sterile leakages along the hydrotransport pipeline from the Preparation Unit for Technical Sulfur caused by cracks resulted from mehanical and chemical weathering; the growth of vegetation is completely inhibited alongside the tracks left by the sterile material



For the matrix „accidents and risk factors” we have obtained results that indicate a high environmental impact. Before the start of the implementation of the required safety measures, the collection well behind the end dam of the tailing pond used to be clogged annually (due to seasonal torrential rains) and gradually lost its stability; moreover, precipitation water transported materials from the tailing deposits Puturosu and Pinu, tailing ponds, degraded technical sulfur from the industrial facility and petroleum products and downstream, impacting the vegetation, water quality etc.

THE INTEGRATED EVALUATION OF THE IMPACT OF THE MINING EXPLOITATION CĂLIMANI IN THE POST-CLOSURE PERIOD

AVERAGE IMPACT VALUES FOR THE MATRIX
„MODIFICATIONS IN THE REGIME”, 2018



After the cessation of the mining activities, from the surface of the mining perimeter, significant quantities of impurified rain waters pass through the contaminated surface and transport significant amounts of pollutants into the local hydrography. From its confluence with the Dumitreleu Creek (the last tributary with a significant flux of pollutants) and down to the Bistrița River, the Neagra Șarului River's hydrochemical and geochemical characteristics show important signs of improvement so that at the Gura Negrii point, downstream from the confluence with the Haita Creek, the water and sediment pH is 4 units higher than upstream, whereas the total sulfur content from the sediments represents only 5,84% of the upstream amount.

THE SLOPE OF THE PINU TAILING DUMP PINU, WHICH AFFECTS AND FRAGMENTS THE DOWNHILL HABITATS, 2018

When heavy rainfall occurs, the precipitation water washes the ground and transports significant amounts of debris from the tailing dump of the former Mining Exploitation Călimani into the Pinu Creek and, consequentially, into the entire hydrographic basin, damaging in its way the vegetation. The specific ecosystem alongside the riverbed of the Pinu Creek offers the downstream communities in Șaru Dornei valuable economic services (provision of water). Therefore, the modification of habitats, watercourses and the quality of surface waters are ongoing issues with a significant impact for the physical and chemical environmental characteristics and ecological relations.



The impact level of the tailing dumps on the physical and chemical characteristics of the surrounding environment is estimated to be at a significant level, according to our classification, and major for the biological conditions and ecological relationships.



CONCLUSIONS

The exploitation-preparation of sulfur in Călimani caused visible repercussions on the environment and, to a high degree, quantifiable effects on the natural environmental and human communities. We would therefore like to sum up the following conclusions drawn in this paper :

- The data used for the impact evaluation by means of the matrix method have been also used for calculating the global pollution index(GPI) ; if at the moment of the cessation of the mining activity and before quantifiable cessation works have been initiated, the global pollution index calculated was 3,03 (a number indicating an environment affected by human activity with disturbances to all its life forms), whereas in 2018 the value of the GPI calculated was 2.06 (not very different from the initial value, indicating in this case an environment affected by human activities with discomfort for all life forms).

- Despite the fact that in 2008 cessation and ecologization works have been commenced on the mining perimeter, these did not manage to cover all the impact areas, the mining unit being merely an enclave in the National Park Călimani. These areas continue to affect the ecological coherence and the quality of the ecosystem services, as reflected in the matrix impact evaluation- the result was a *major to significant* level of impact through**
- The diffuse pollution of surface waters caused by uncovered surfaces and tailing dumps free of vegetation exerts significant pressure on the aquatic habitats.**
- The exploration and preparation of useful mineral substances in this mountainous area have caused an intense anthropization of the landscape;**
- The exploitation caused the destruction of geological structures: the volcanic pseudokarst Luana's Caves**



THANK YOU FOR YOUR ATTENTION!