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ENVIRONMENTAL CHANGE AND HUMAN SETTLEMENTS VULNERABILITY IN PETROSANI DEPRESSION (SOUTHERN CARPATHIANS, ROMANIA)

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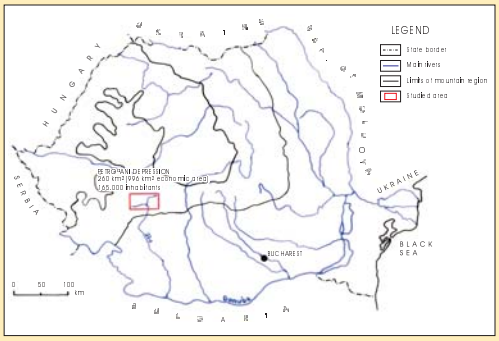


The studied area is an intramontane depression of Southern Carpathians, **one of the most important mining regions of Romania**, known as "Jiu Valley industrial region".
The pitcoal was extracted here from the nineteenth century, the mining activities generating major changes of the mountain environment and specific features of social and economic structures.

Today, **the environmental changes**, joint with **the social problems** caused by the decline of the mining industry and by the economical and political transition (monoindustrial area, with high unemployment, high criminality, low incomes and inadequate social and health assistance) enhanced human settlements vulnerability at a high level.

The most important environmental changes related to the mining activities and to intensive urbanization are due to:

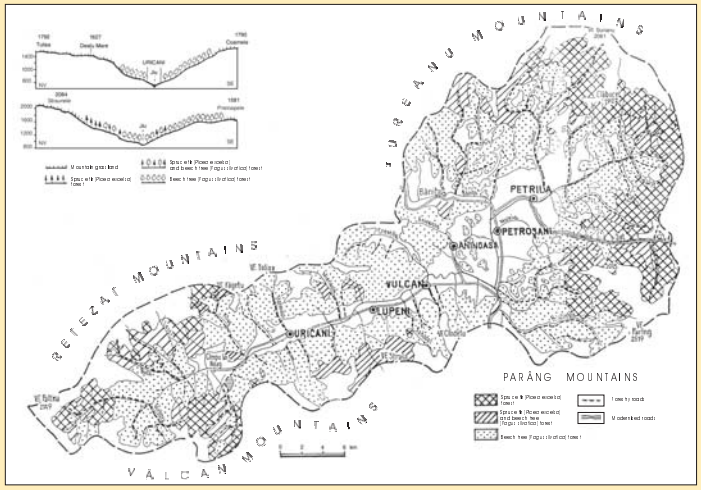
- **deforestation**
- **land use changes**
- **opening the mines (especially the quarry mining) and**
- **water, soil and atmospheric pollution**

Those actions have a major impact on the human settlements vulnerability and on human security, because they affect: the slopes stability (causing erosion and mass movements- landslides, falls etc), the availability and the quality of the water resources (especially in the

Forest occupies now 52% of the depression surface, it's restraint being caused by tree cutting (after 1870, for fuel, charcoal and constructions), overgrazing and fire. **Deforestation and afforestation** have generated **changes in the structure and composition of vegetal formations** and, also, the lowering of the tree line. e.g. in the western part of the depression *Fagus silvatica* appears on 78% of the total forest surface, until the coniferous (*Picea excelsa, Abies alba)* have restraint their surface from 50% to 21%.

In some points (Uricani), the alpine grassland descent to 1000 m, replacing the coniferous forest. The deforestation have affected the stability of the slopes, especially on limestone, where the erosion was controlled by afforestation with lilac (*Siringa vulgaris)* e.g. Taia Valley, Bolii Cave, Valomir Valley Pilugu Valley.

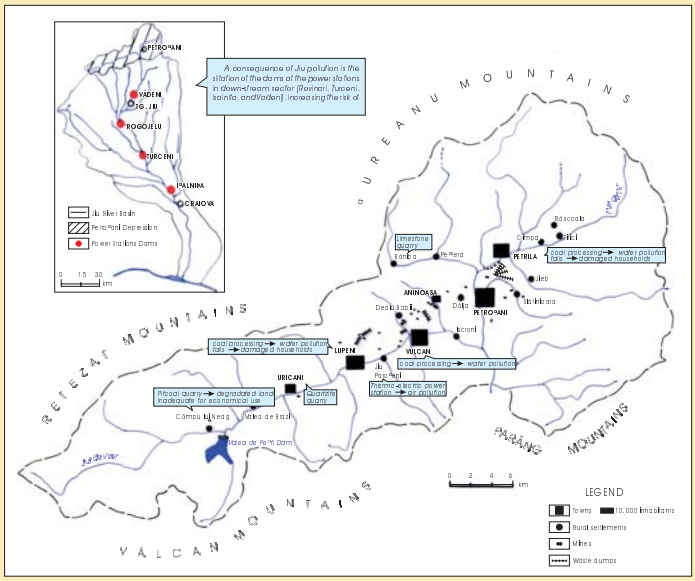
FORESTS IN PETROSANI DEPRESSION:
PRESENT DAY EXTENSION AND COMPOSITION



The mining activities have influenced the **availability and the quality of water resources**, by **pollution** and by **lowering the hydrostatic level of phreatic waters**. The Jiu River is one of the most polluted rivers of the mountain region, because of the coal processing (at Lupeni, Coroesti and Petrila) and the inefficacy of water purification stations. Yearly, 80000 m^3 suspensions (clay, dust and particles of coal) are discharged in Jiu River and the suspension concentration may increase until 17000 mg/l.

This level of solid discharge has lead to the **extinction of aquatic floristic and faunistic species** in the depression and in the Jiu Gorge sector. The river's waters are also unusable for tourism, agriculture and industry.

PETROŞANI DEPRESSION:
MINING AND RELATED ENVIRONMENTAL CHANGES



Waste dumps at Lupeni

Compaction on waste dumps at Petrila

Waste slopes affected by gully erosion. In rare cases, some species, like *Betula nana*, appear spontaneously on the slopes

Households affected by mining activities in Lupeni (Stefan quarter)

a.

b.

Another change in the natural landscape caused by the mining activities is the occurrence of small lakes in quarries (a.), among the waste dumps (b.) and in mining drifts, when they break down.

The waste dumps, quarries and mass-movements related to the mining caused **the land degradation**. There are 49 **waste dumps**, with 258 ha total surface and 37 billions m^3 barren gangue stocked. The waste dumps have until 40 m high and 25 ha surface; only 26,4% are functional, where are stocked yearly 1,8-2 billions m^3 barren gangue. The waste dumps are placed in the proximity of the settlements, being a major polluter for phreatic and surface waters, air, forest and agricultural land.

Sheet-erosion, gully-erosion, compaction and **mass-movements** affect the waste slopes. Therefor, the waste dumps must be stabilized, but the covering with vegetation is possible only after special works, because of the heterogenous character of barren gangue.

The rockfalls and cracks occur on 20 ha, causing the close of some mines, **the damage of mining equipment, households and agricultural land, injured people and even casualties**. e.g. At Lupeni (Stefan slum) many houses are affected by cracks and mass-movements and the people live in improvised shelters near the houses. The local City Hall and the National Pitcoal Company haven't take any measures for repairing those houses. The National Pitcoal Company offers a small financial compensation to the people (about 1500 €) for buying another houses.

In **Lupeni**, another quarter affected by falls and cracks was demolished. At **Petrila**, many

CONCLUSIONS: Viewing the major social and environmental problems, the Petrosani Depression ('Jiu Valley industrial region'), was declared in 1998 a **defavoured zone**, which benefits of **international projects** (PHARE-MARR program, ISPA program) aimed to reduce the human vulnerability, by ecological reconstruction and by creating new working places. An important issue of those programs is the **development of the tourism** (winter sports, eco-tourism etc.); this will be a **major challenge**, because it could generate new changes in an already fragile environment, threatening the sustainable development of the human settlements.