HGI
HRVATSKI GEOLOŠKI INSTITUT - CROATIAN GEOLOGICAL SURVEY

MAEGS-15
16-20 Sept. 2007, Tallinn, Estonia

PAST MINING AND PRESENT QUARRYING IMPACTS ON THE DALMATIAN KARST ENVIRONMENT, CROATIA

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15th Meeting of the Association of European Geological Societies

Content

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- Geography and geology of Croatia
- Mineral resources of Croatia and Dalmatia
- Consequences of bauxite mining and impact on soils
- Topsoil geochemical mapping
- Impacts of quarrying on landscape
- GIS modelling
- Future prospects

Geography of Croatia

- **Area: 58,540 km^2**
- **Population: 4.8 million**

Geology of Croatia

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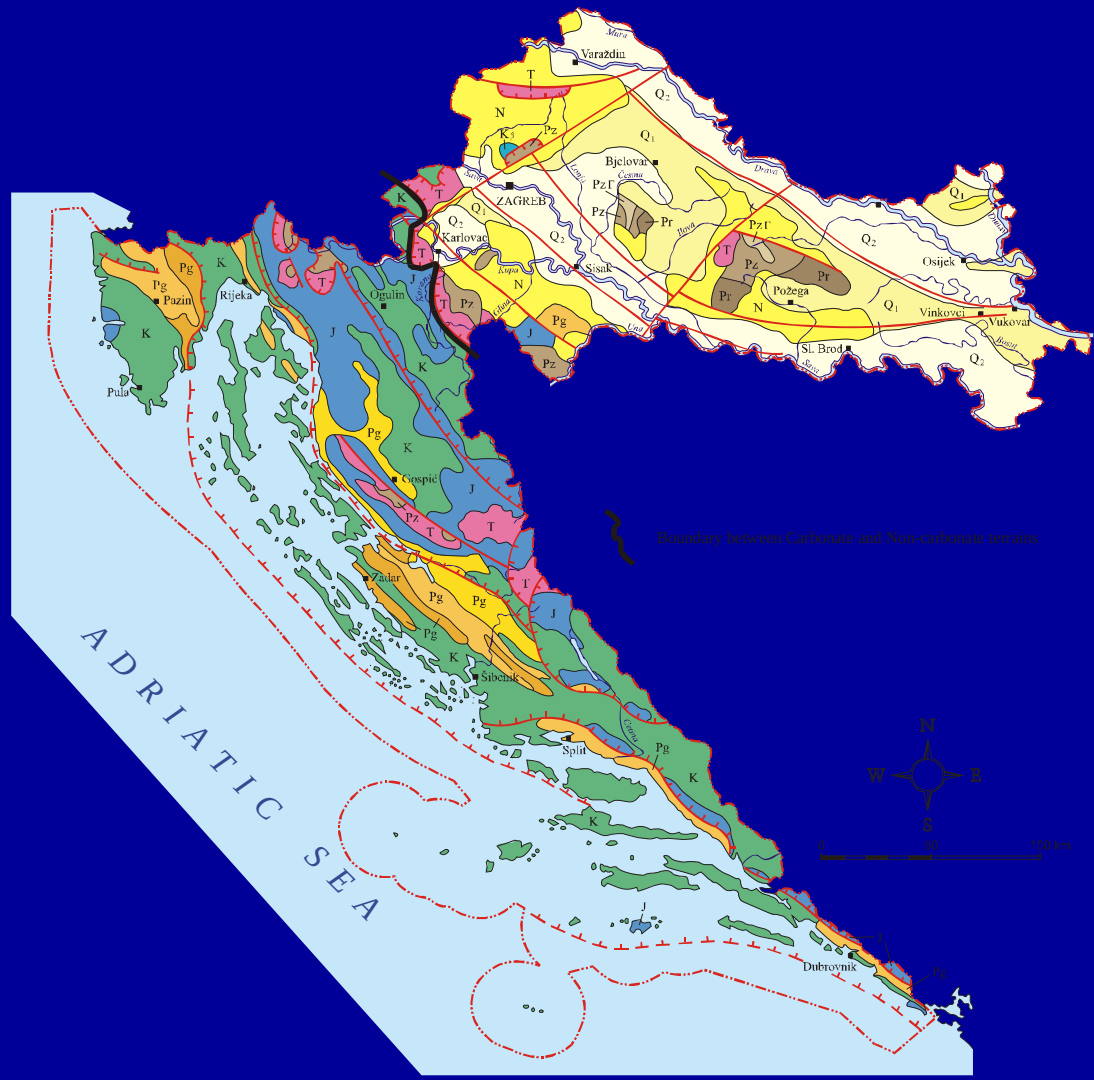
1) North and NE Croatia - **Inner Dinaride Belt**

- **90 % thick unconsolidated Quarternary sedimentary deposits**
- **10% igneous and metamorphic rocks**

2) South Croatia - **Outer (karstic) Dinarides**

- **carbonate rock (limestone and dolomite – carbonate platform environments)**



Geology of Croatia

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Dalmatian karst

Geology of Croatia

Dalmatian karst

Terra rossa

Mineral resources of Croatia

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Mineral commodity:

- **crushed stone aggregate: 253 sites**
- **dimension stone: 103 sites**
- **sand and gravel: 82 sites**
- **clay: 49 sites**
- **bauxite: 15 sites**
- **gypsum: 9 sites**
- **other non metal deposits**
- **coal in the past**

•TOTAL NUMBER OF EXPLOITATION SITES IN CROATIA: 626 (378 km²)

Quarrying in Dalmatia

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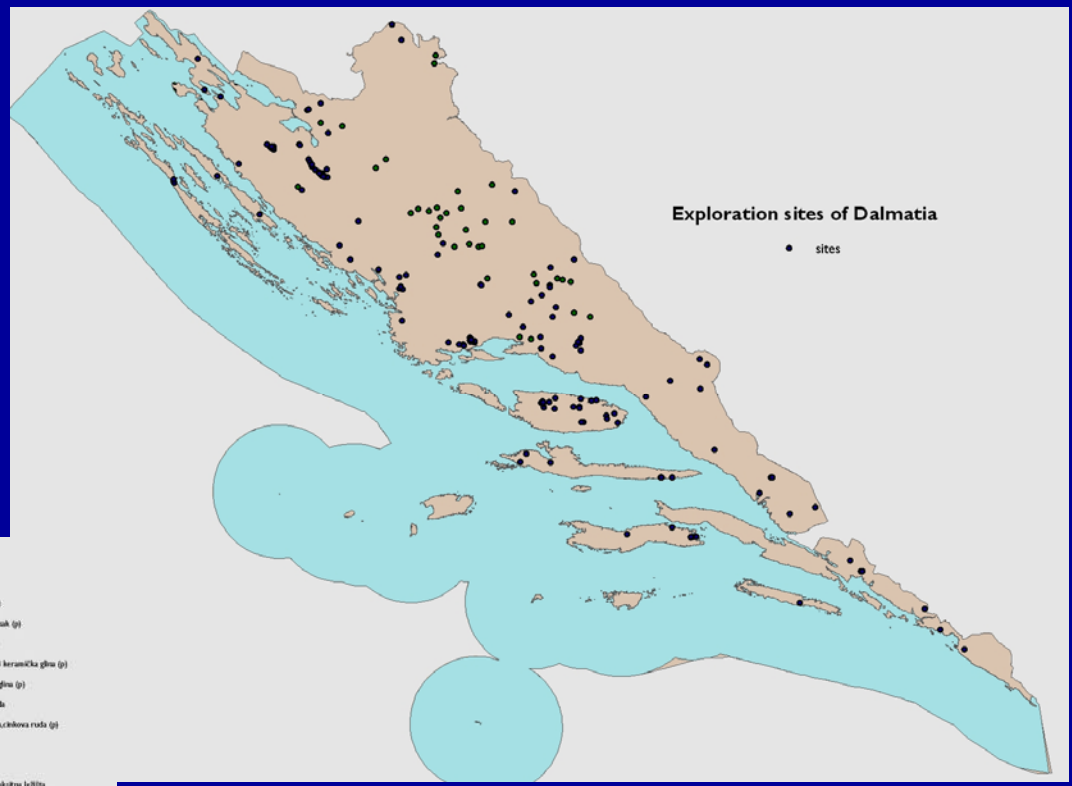
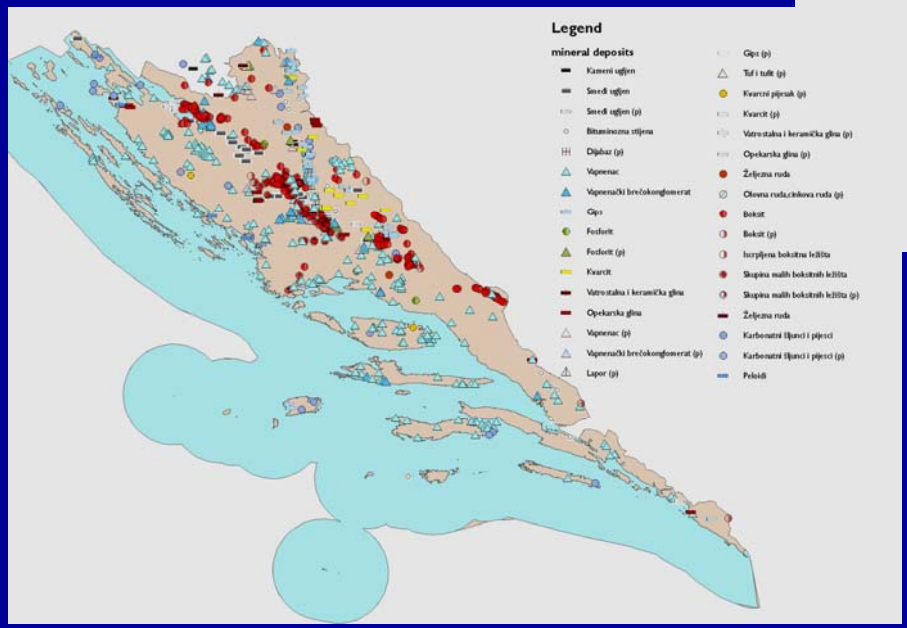
- **72 active crushed stone aggregate quarries or 25 % in Dalmatia**
- **83 active dimension stone quarries or 80 % in Dalmatia**





Total number of active exploitation sites: 195

Bauxites in Dalmatia

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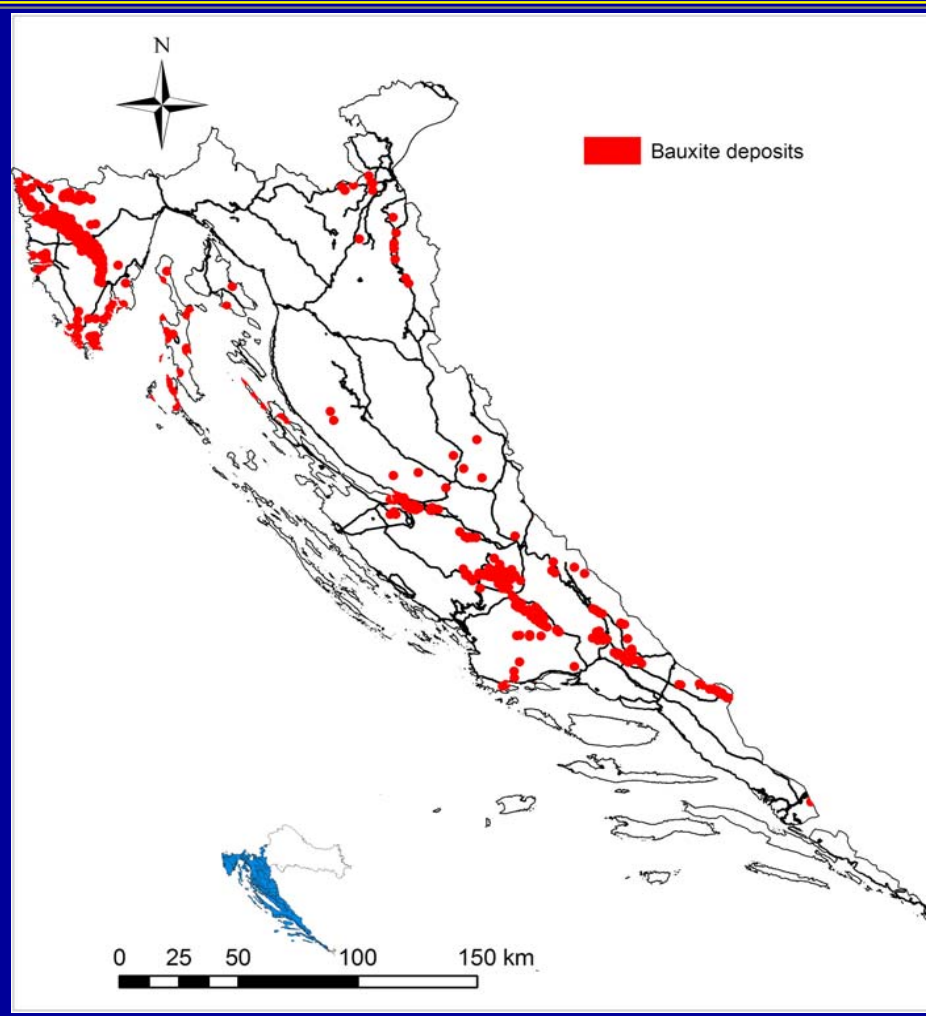
More than 1000 deposits were mined in the 20th century



Two types of environmental impacts:

1) over 800 open pits left today, many of them used as illegal waste disposal sites

Bauxites in Dalmatia

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Bauxite pits

Bauxites in Dalmatia

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Bauxite pit

Bauxites in Dalmatia

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Bauxite pit

2) dipersion of bauxite dust by wind and water , and changing the topsoil chemistry

Geochemical mapping

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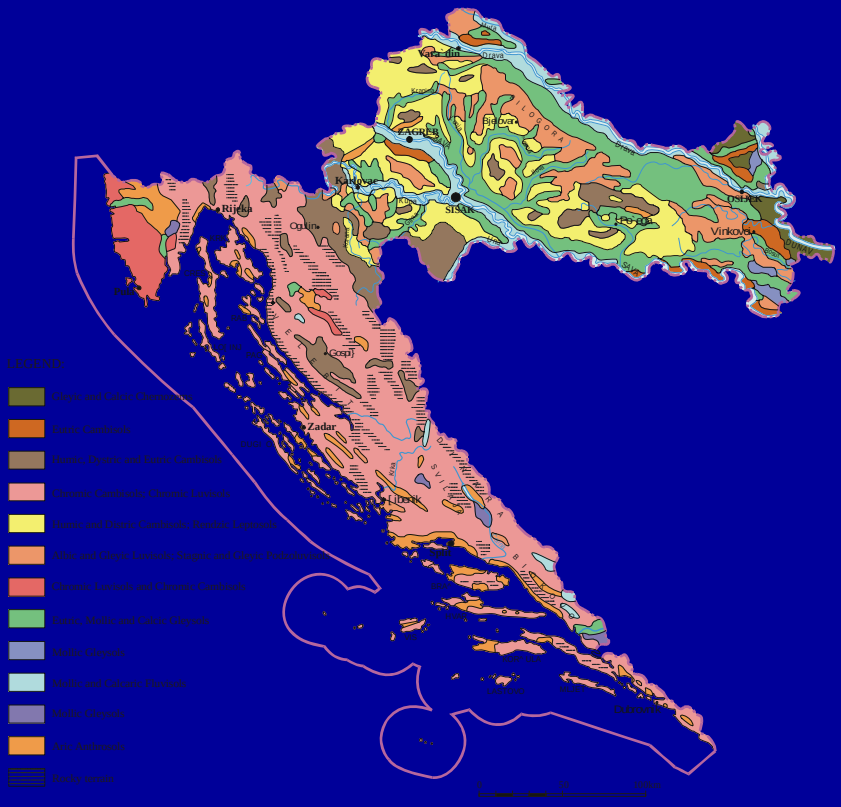
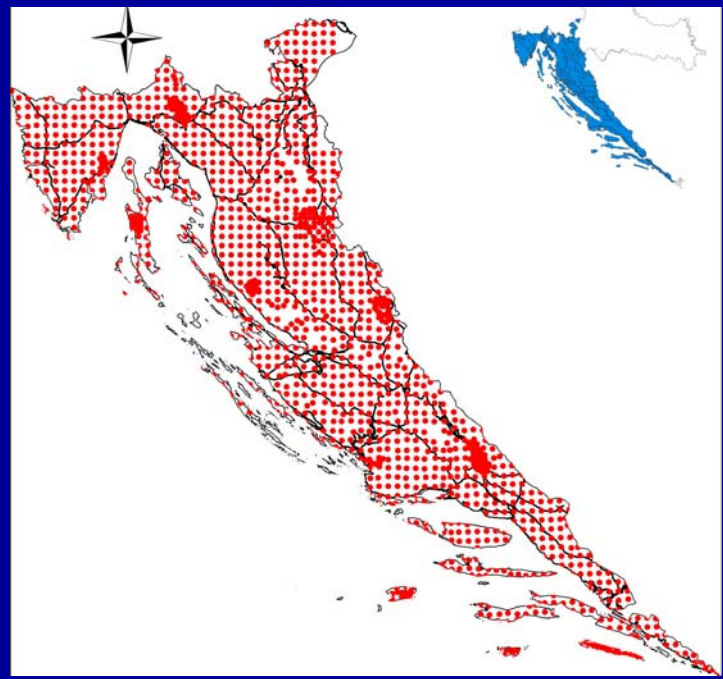
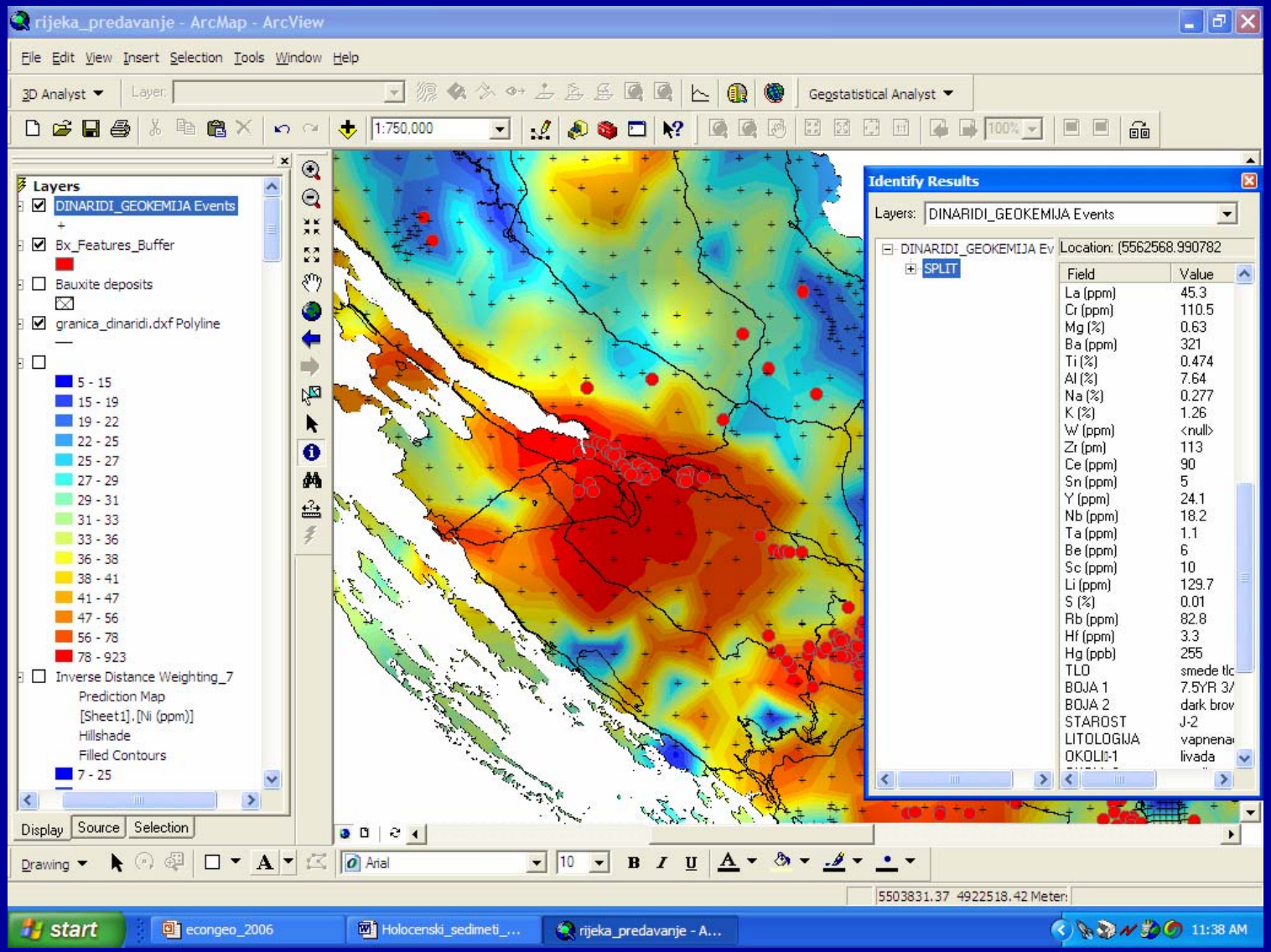


The geochemical mapping of karst topsoil is performed within the project "The basic geochemical map of the Republic of Croatia"

- 1700 sampling sites
- analysis for 35 elements
- single element maps
- GIS-database



Karst topsoil database



Soils and bauxite

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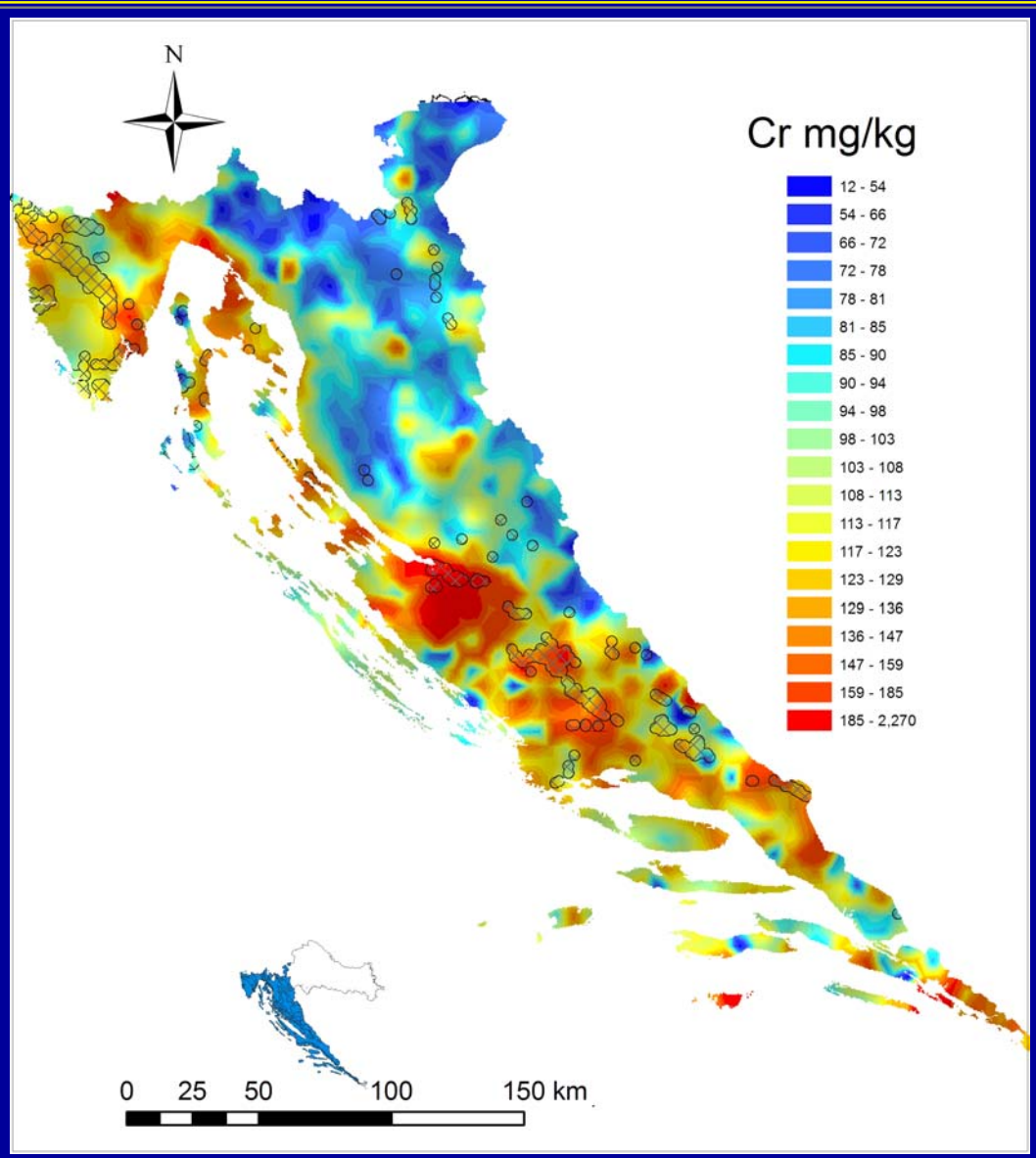
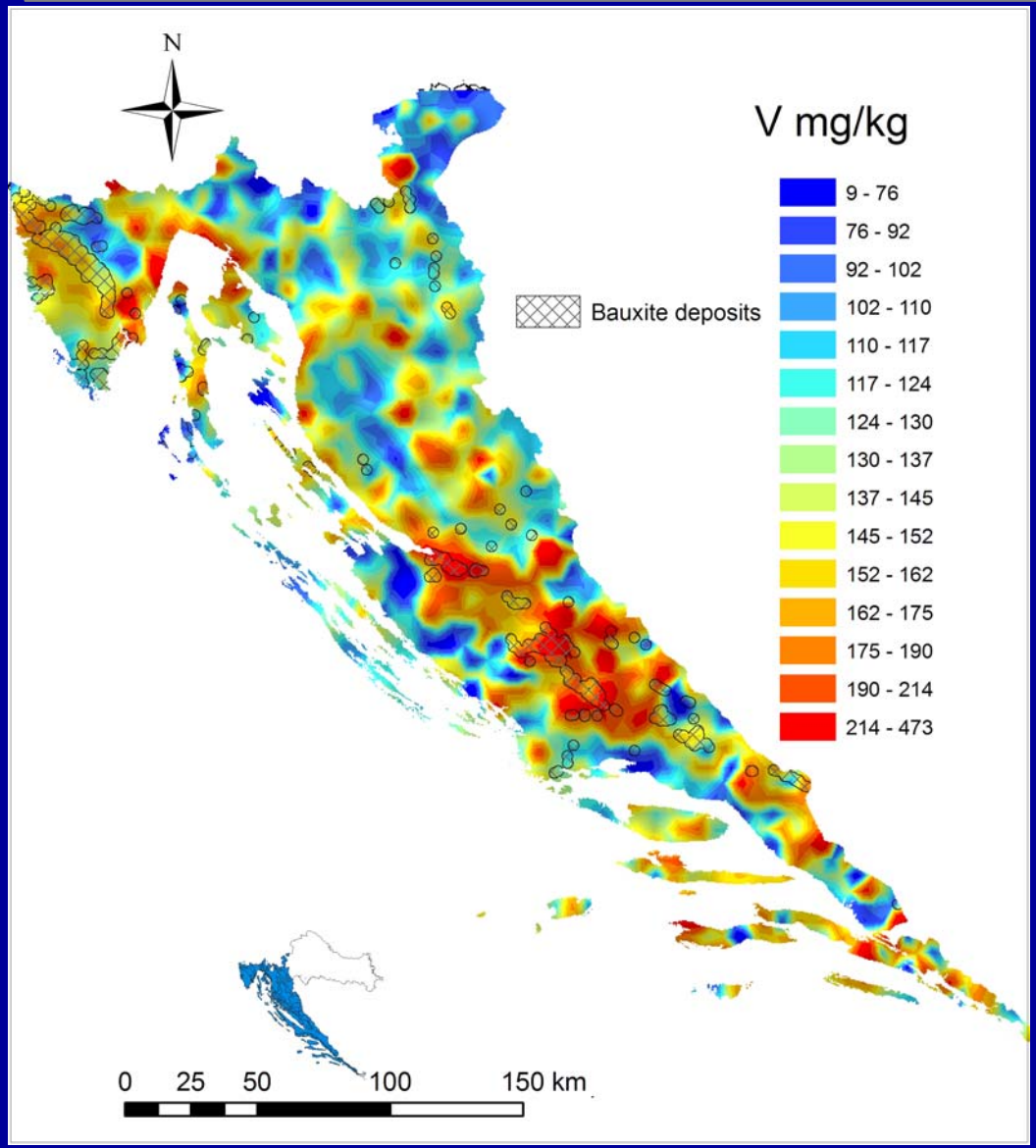
Soils from Istrian and Dalmatian region:
30 – 50% higher concentrations of Cr, V, AS, Cd, Ni and Pb

Areas of highest concentrations correspond with locations of bauxite mines



Soils and bauxite



Consequence of bauxite mining or natural geogene influence of bauxite dust in Pleistocene?

Soils and bauxite

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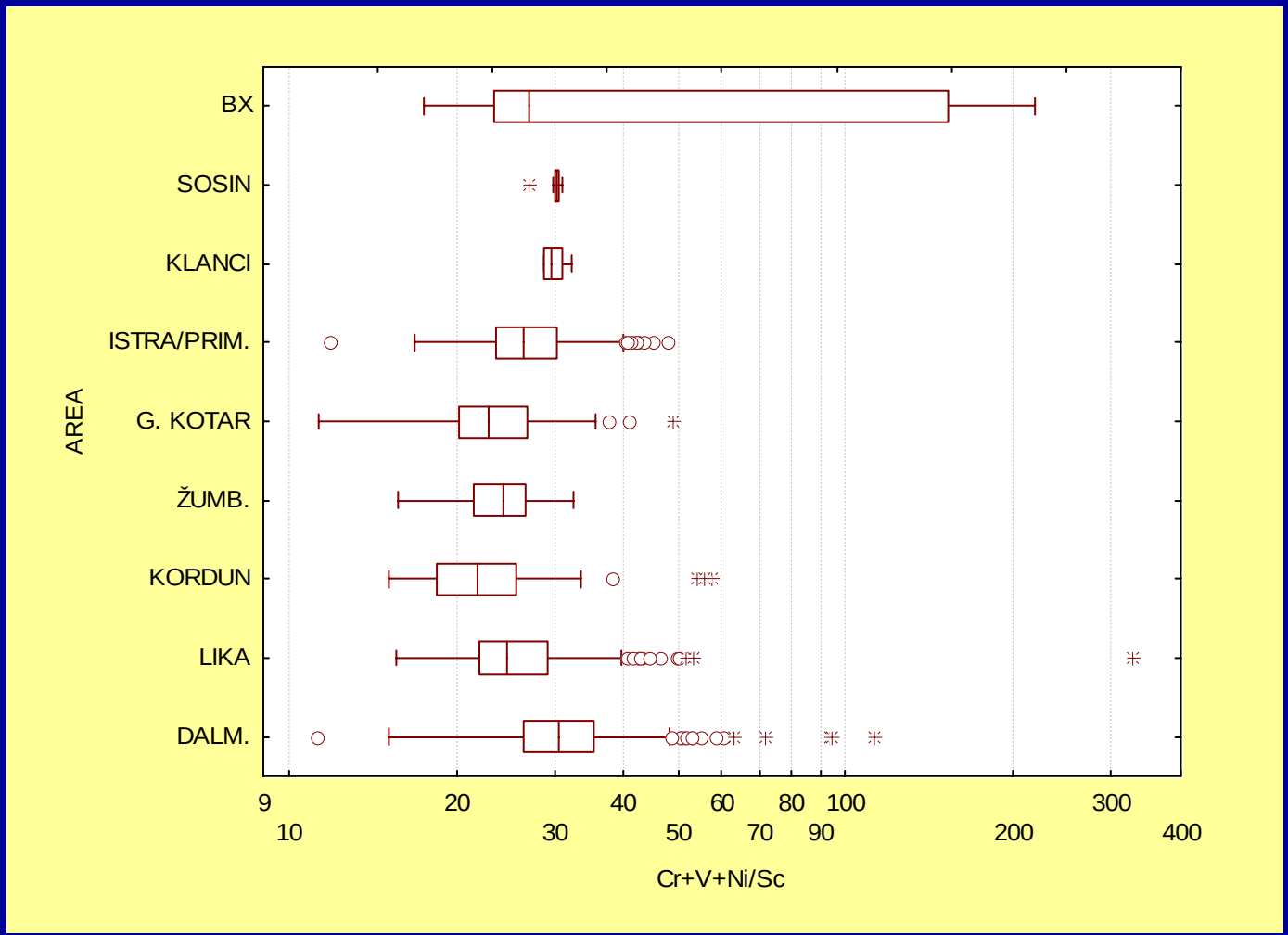
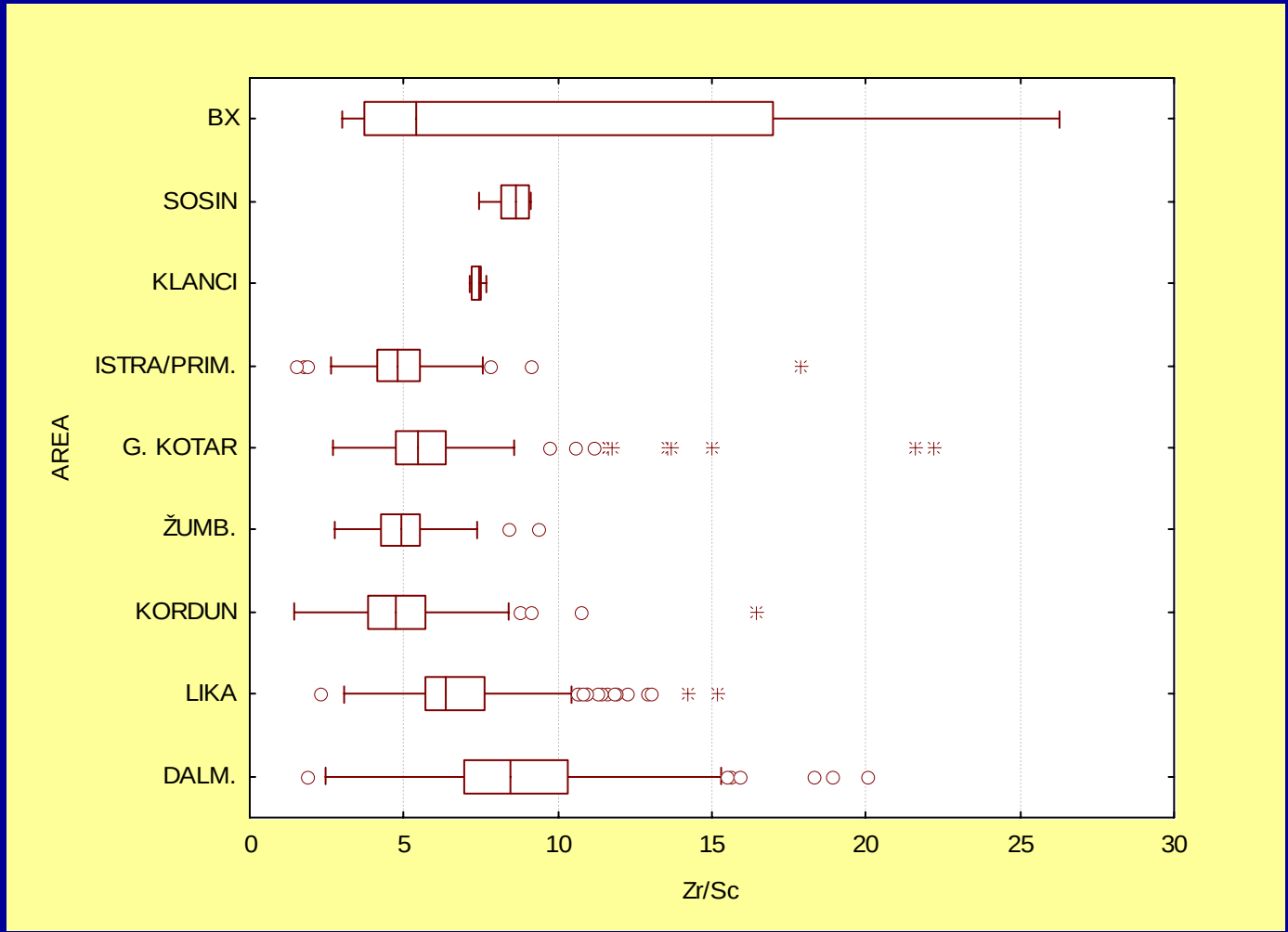


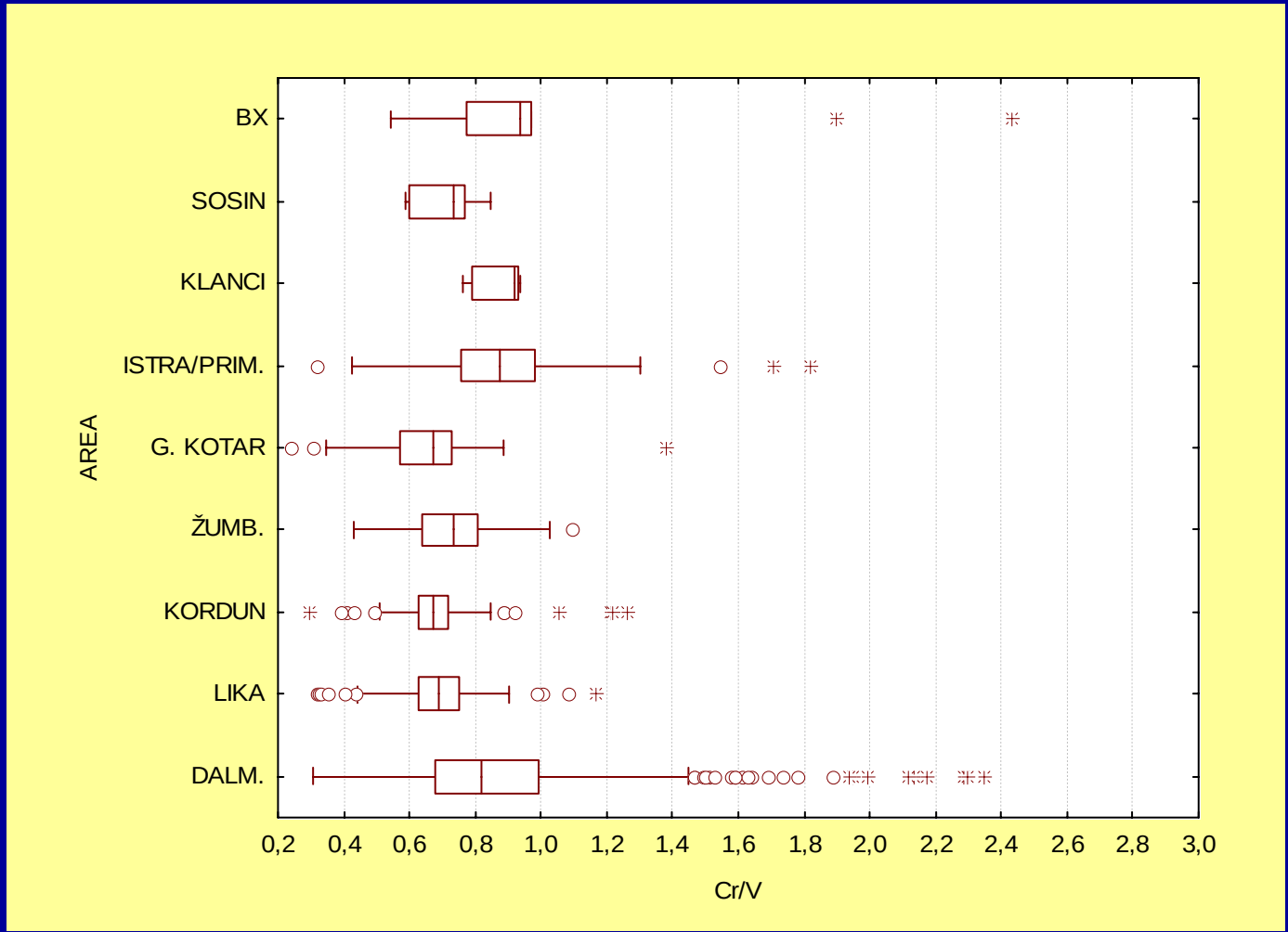
Cr+V+Ni/Sc in bauxites and soils

Soils and bauxite



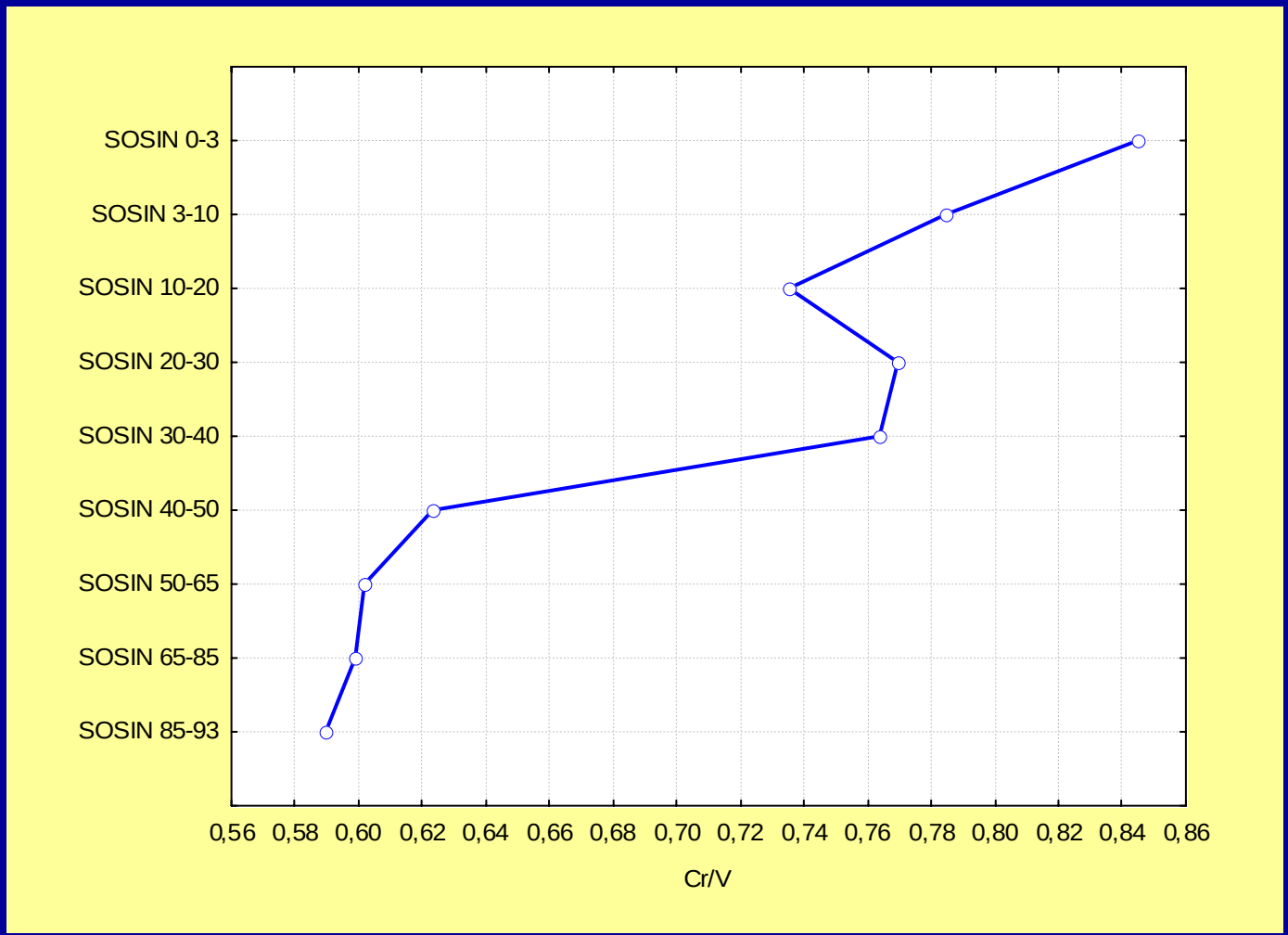
Zr/Sc in bauxites and soils

Soils and bauxite



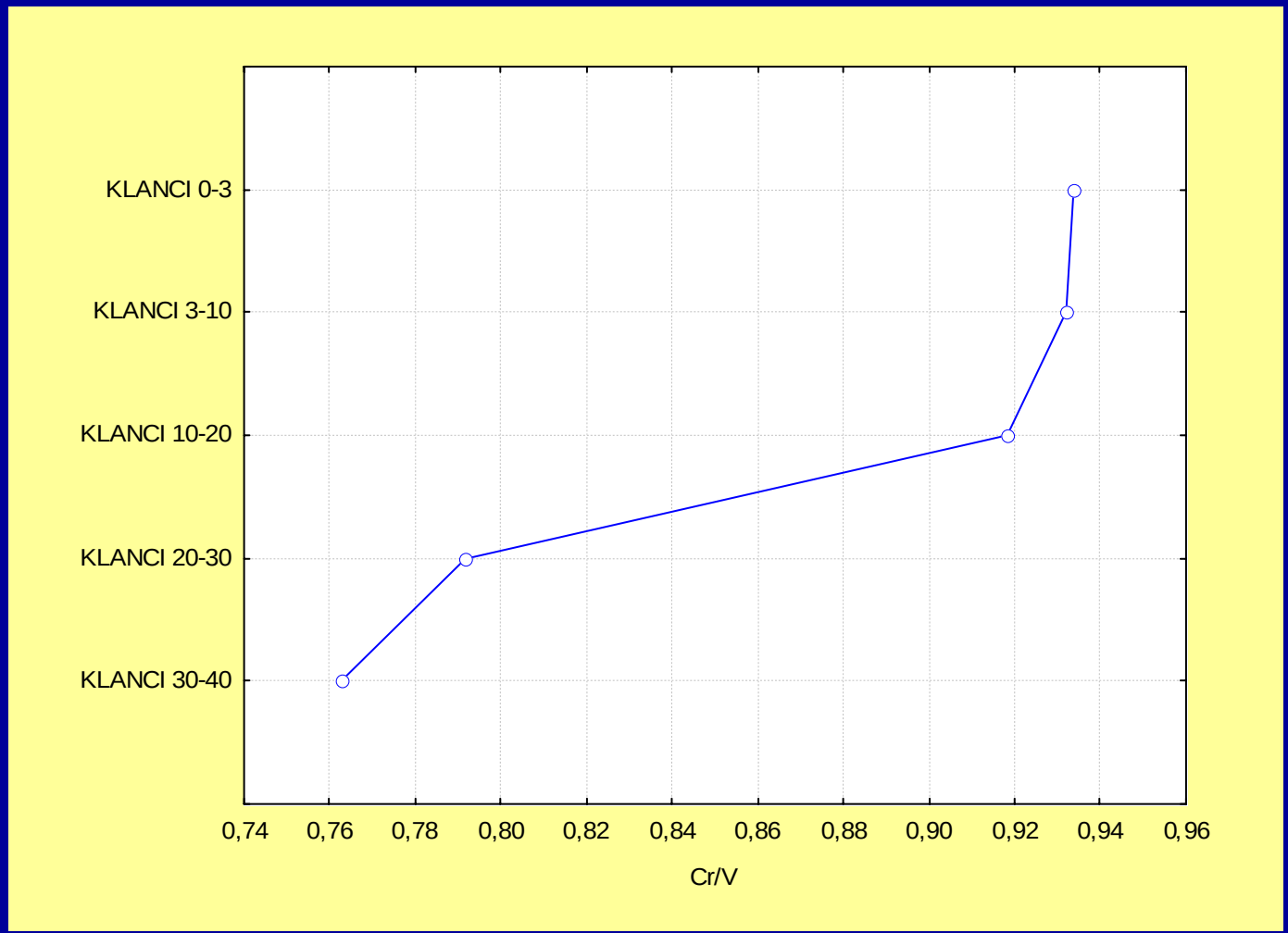
Cr/V in bauxites and soils

Soils and bauxite



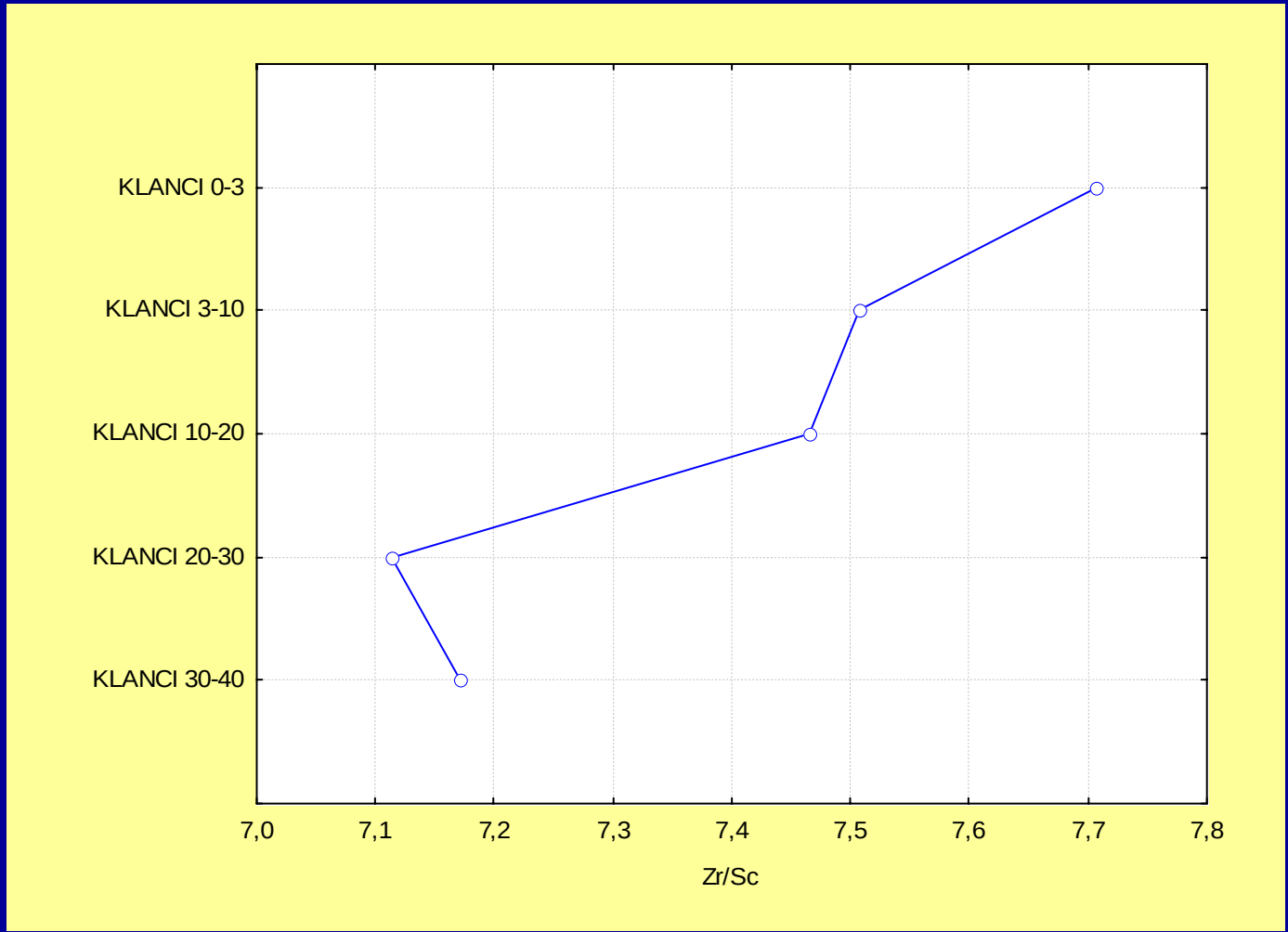
Cr/V distribution in a soil profile

Soils and bauxite



Cr/V distribution in a soil profile

Soils and bauxite



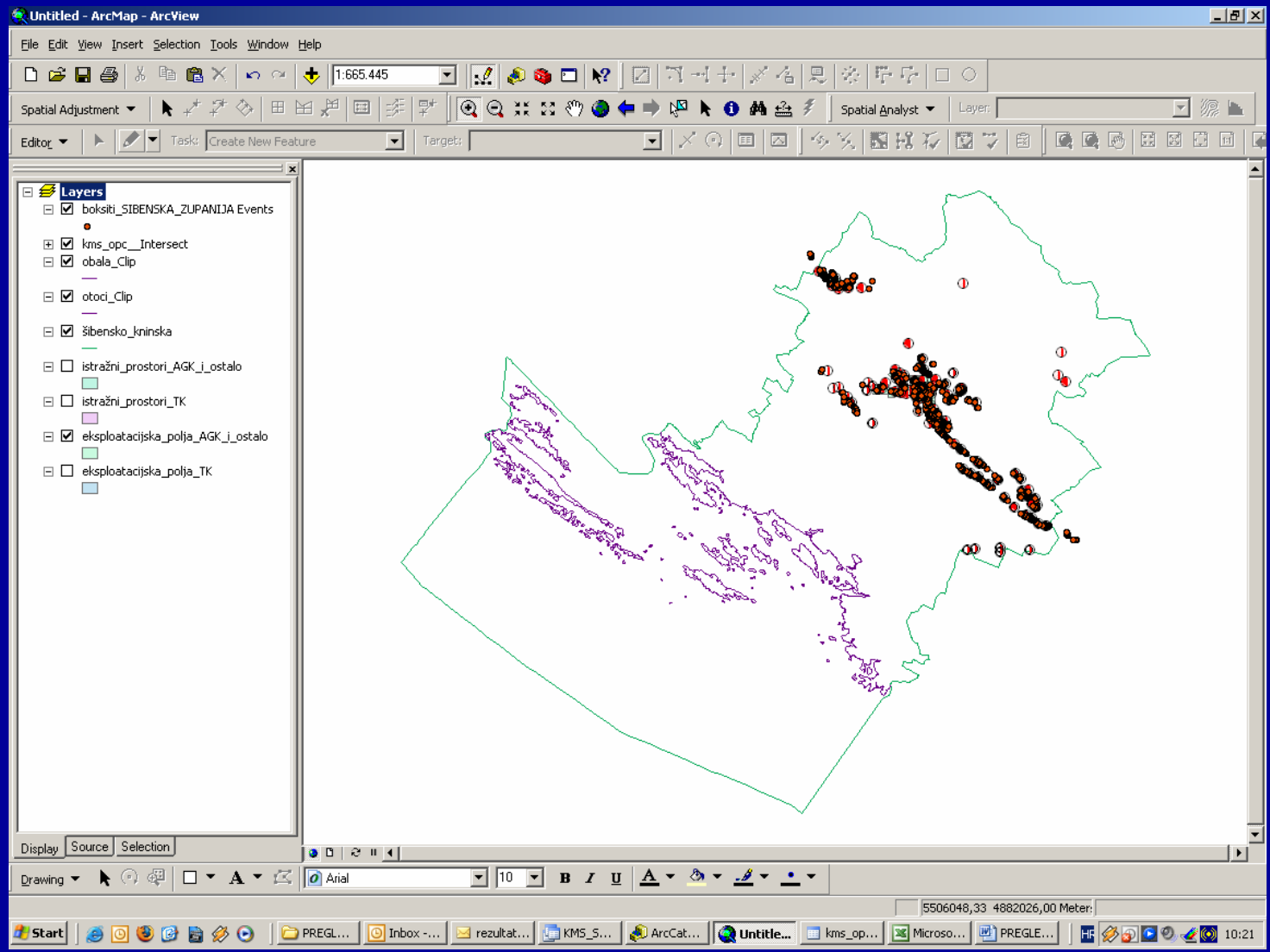
Zr/Sc distribution in a soil profile

Quarrying in Dalmatia

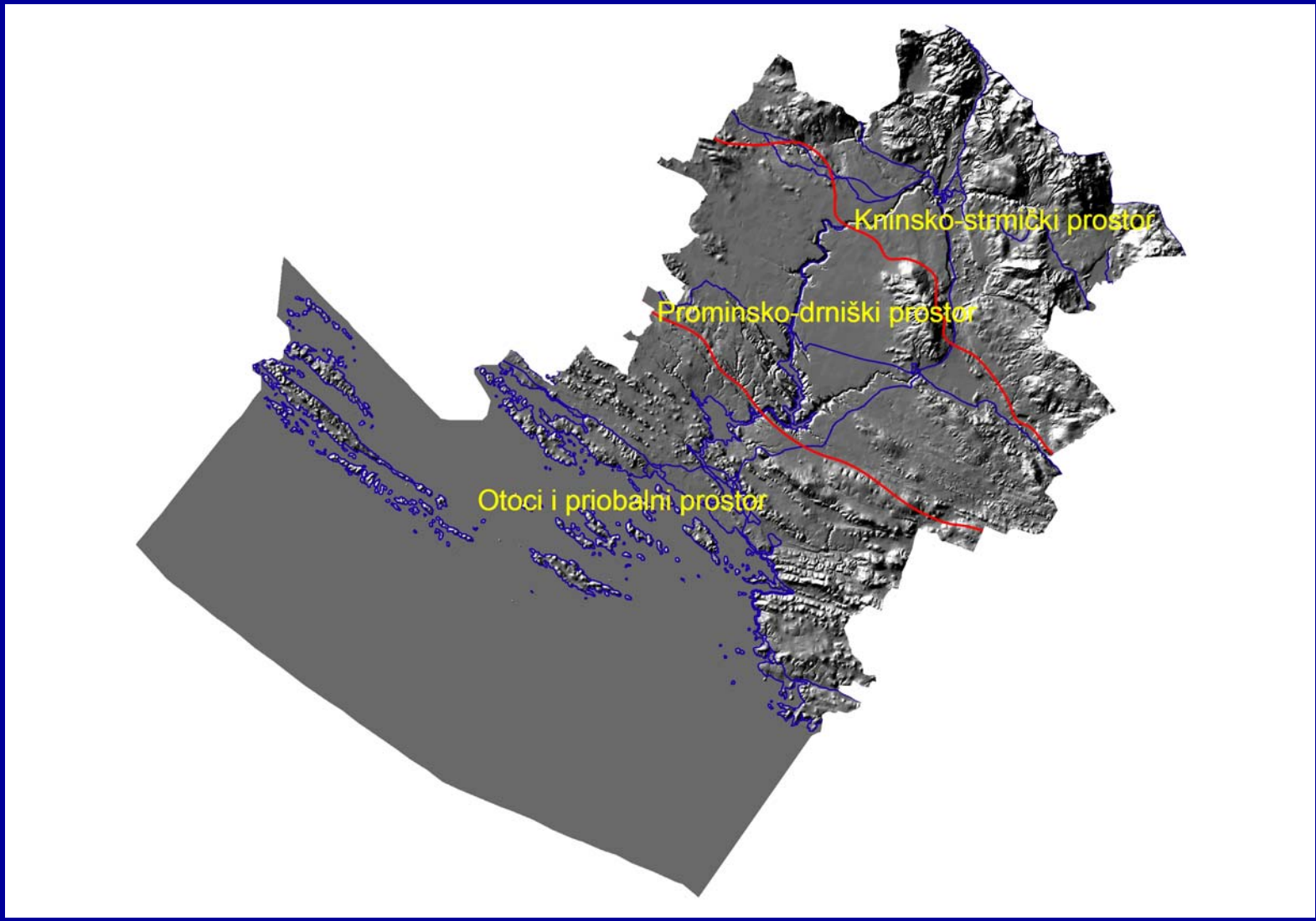
Visual impact

Illegal waste disposal

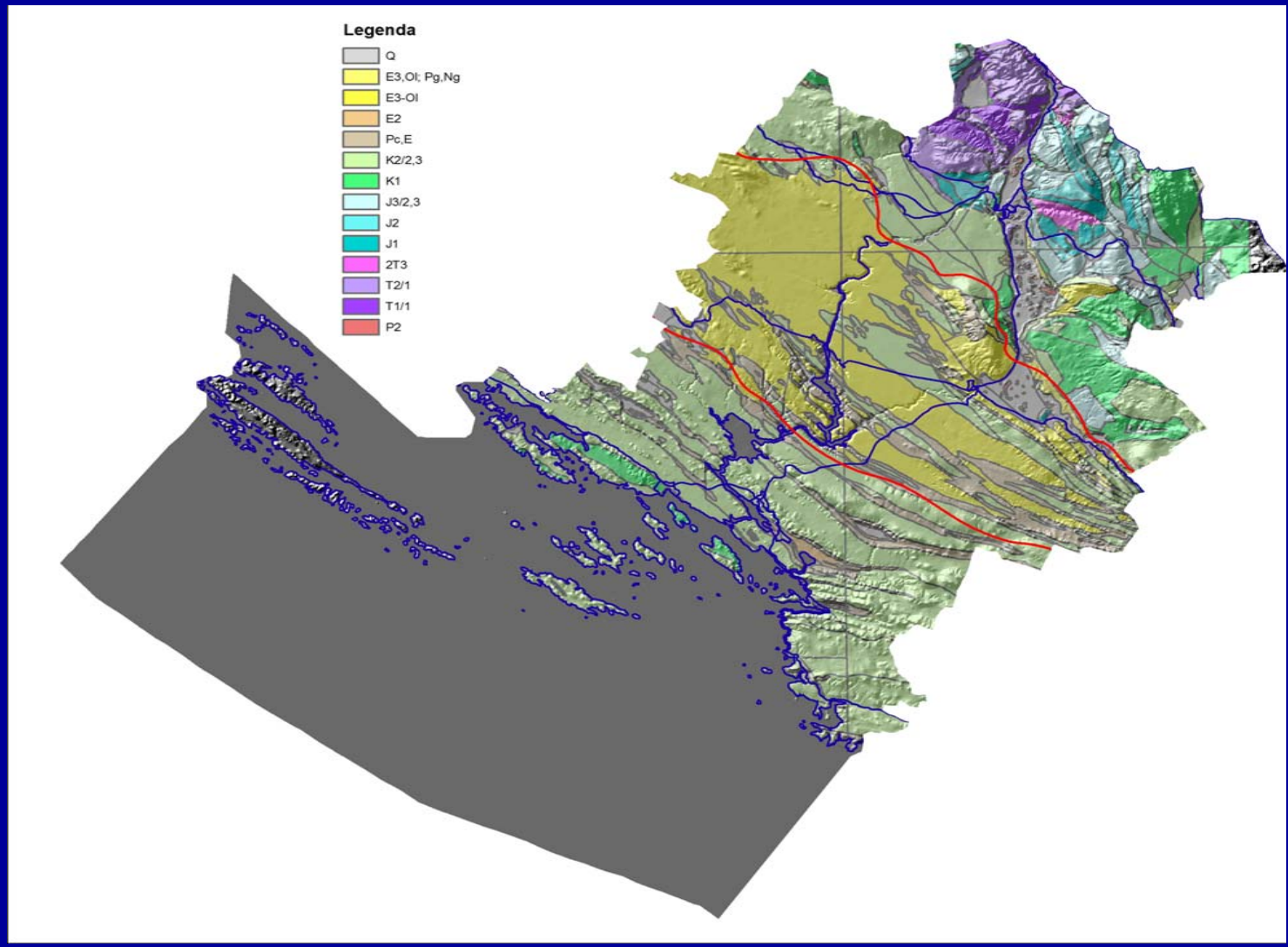
GIS – bauxite deposits in Sibenik county



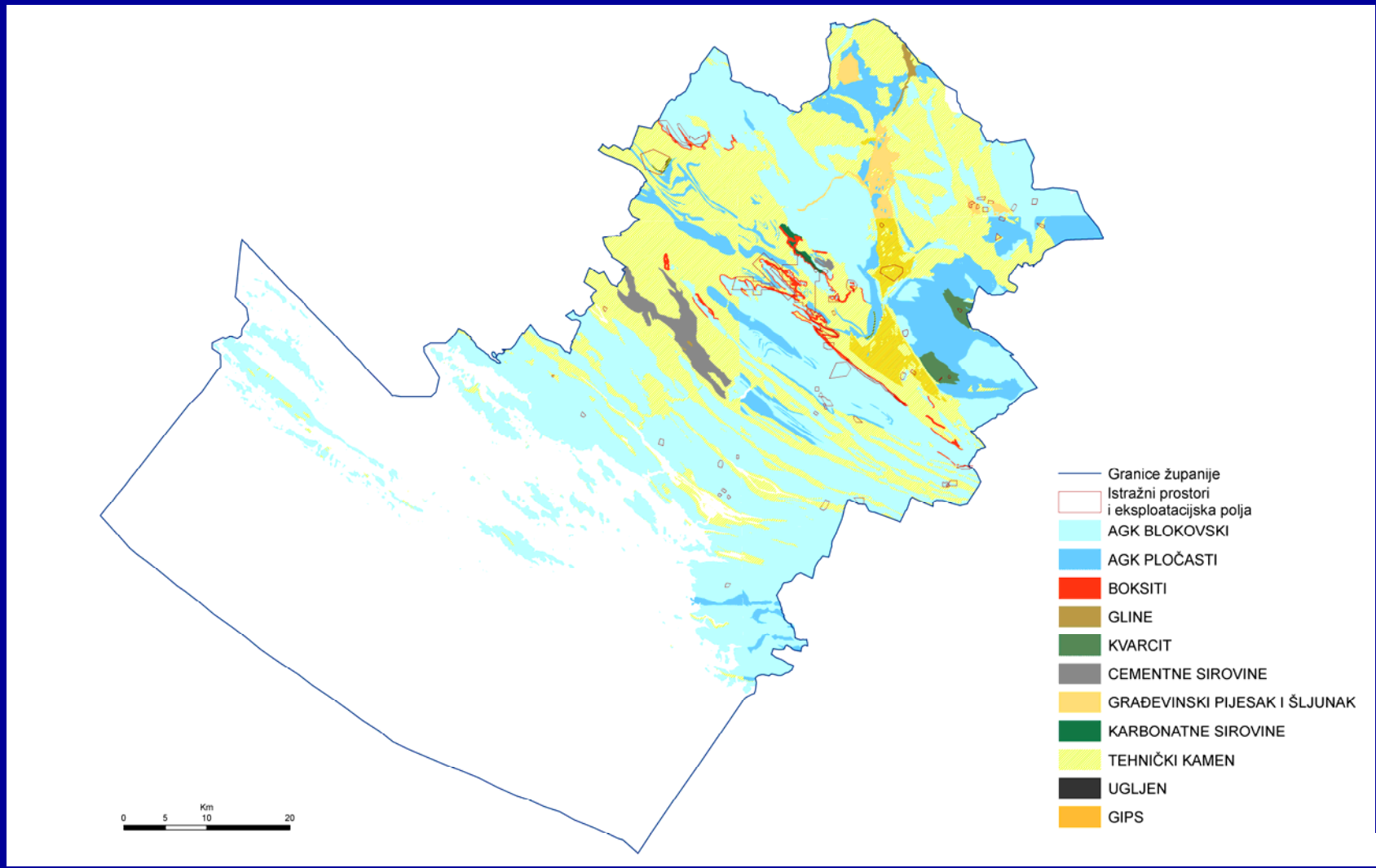
GIS - topography



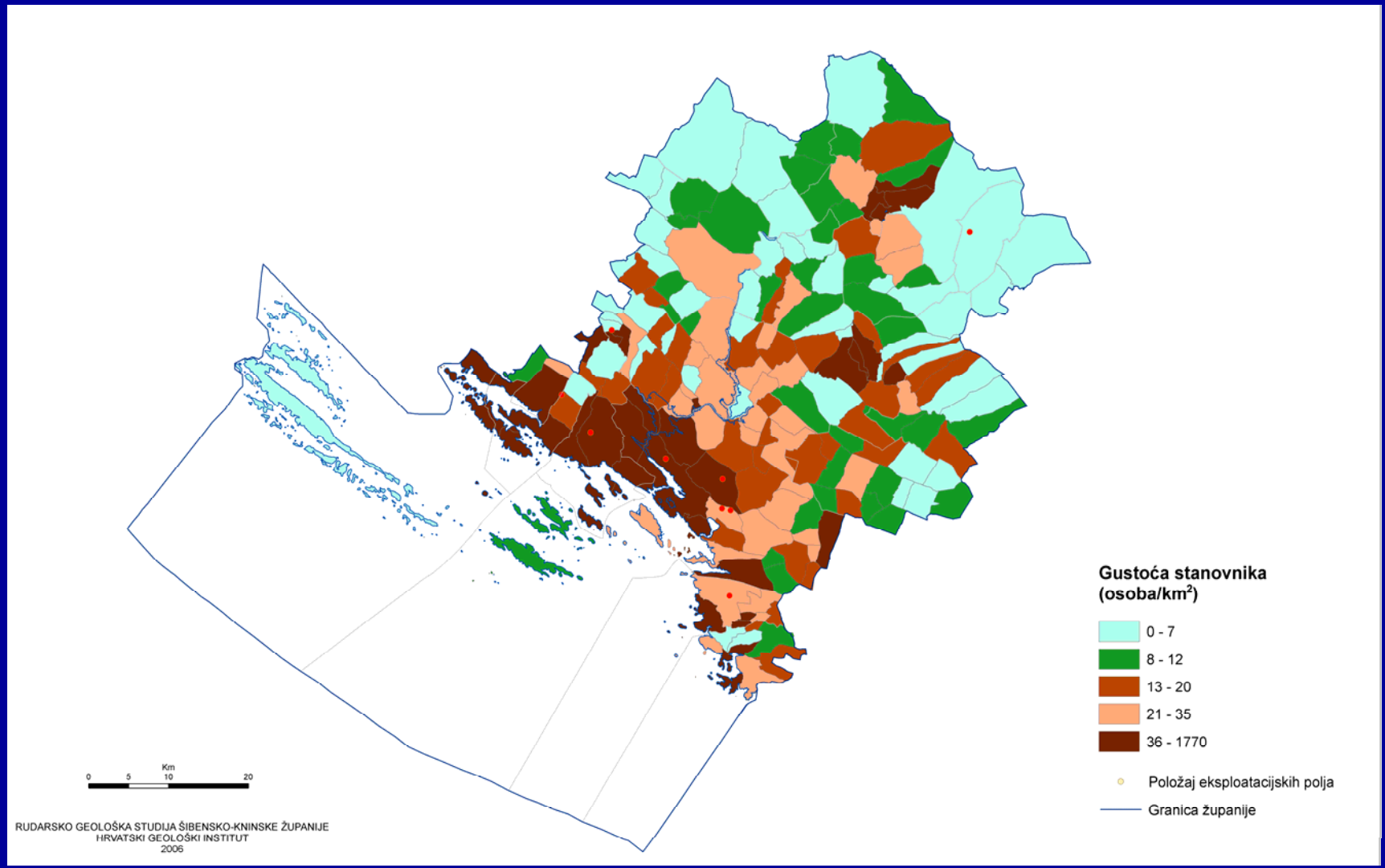
GIS – digital geological map



GIS – geological mineral potential



GIS – population density distribution



GIS – protected areas, seacoast, towns, roads

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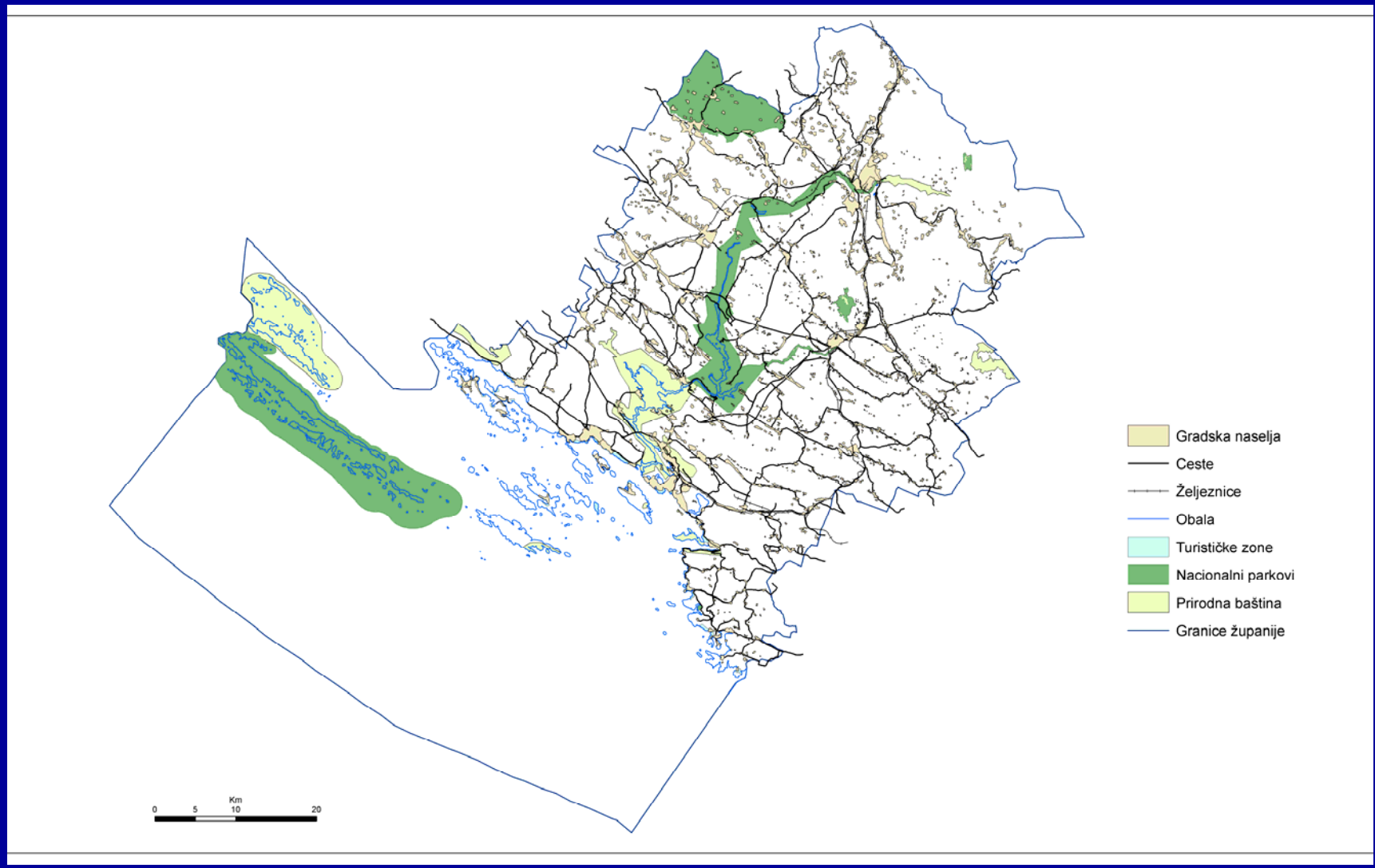

GIS – areas of mineral exploitation restrictions

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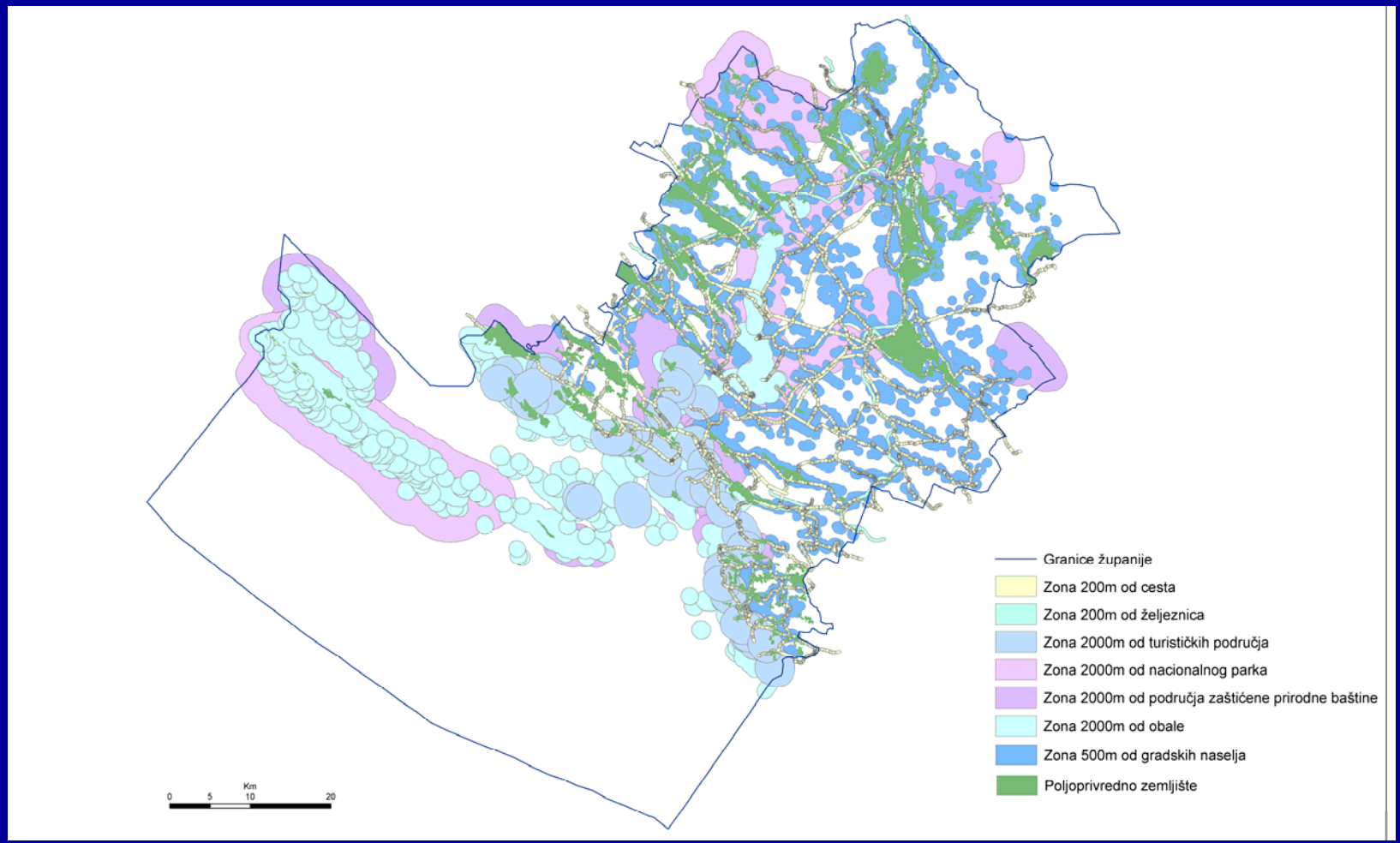
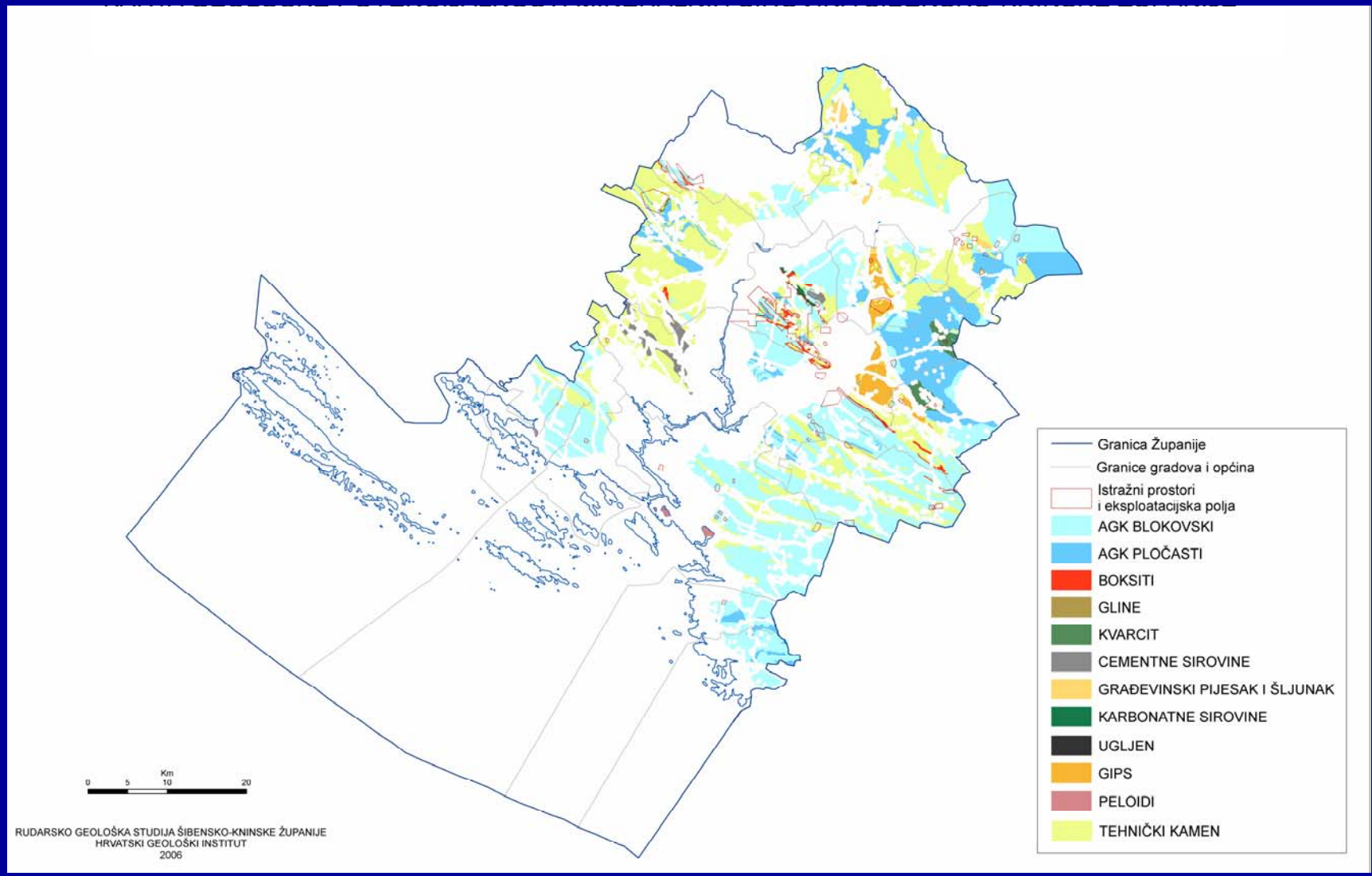
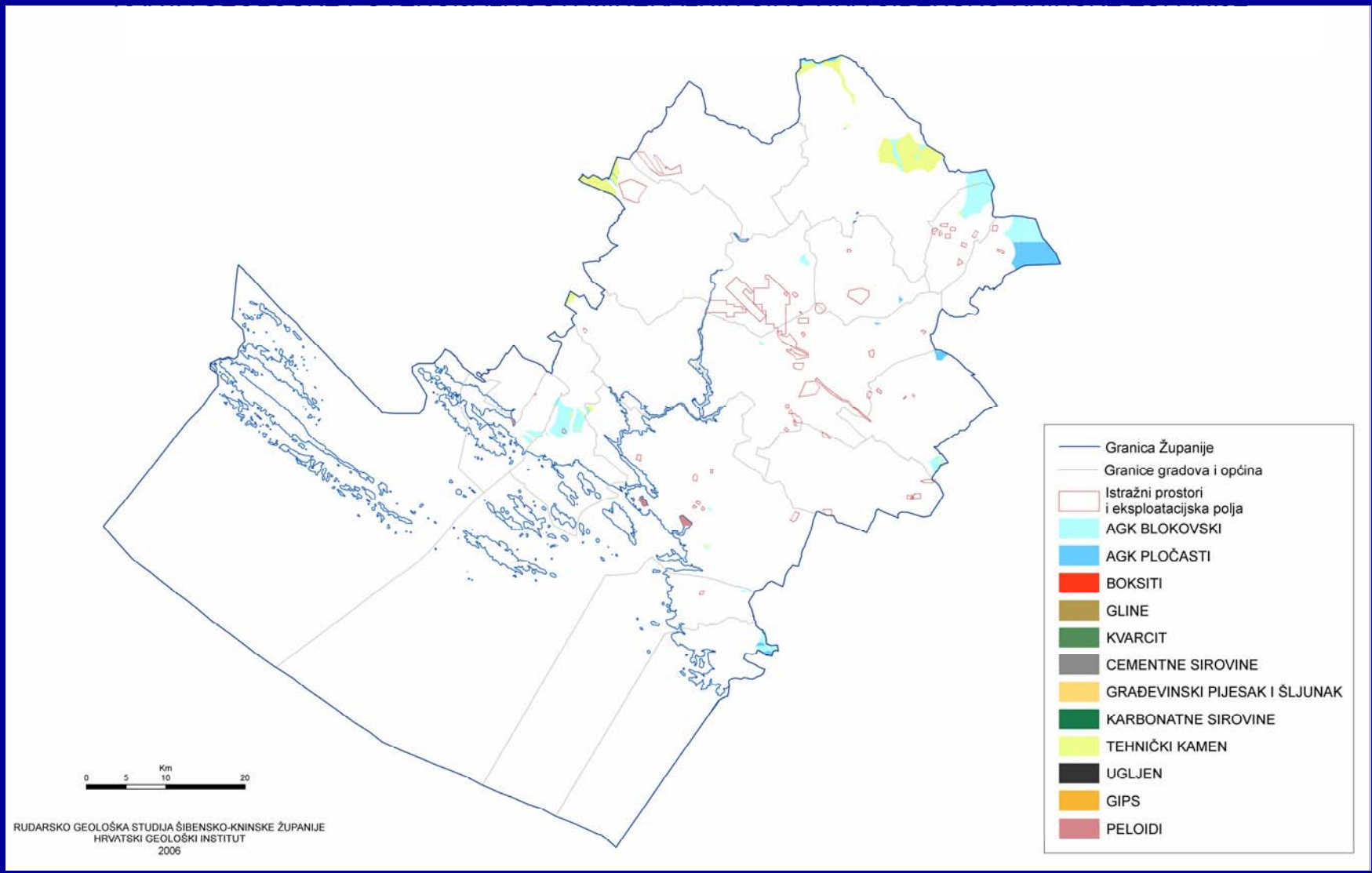
Based on distance from seacoast, towns, roads, protected areas, sports and tourist centres and agricultural areas



GIS – resultant geological mineral potential



GIS – geological potential for crushed aggregates



Future prospects

To rise awareness of various mining problems and impacts on karst, to help manage better the use of mineral resources in Dalmatia, based on identification of more suitable areas for stone production by taking in account both environmental and marketplace restrictions and to help local environmental policy makers to correctly manage the fragile karst environment and to preserve the natural landscape.


Thank you !