

ANALYSIS OF ECOLOGY SYSTEMS RESULTING FROM INDUSTRIAL DEVELOPMENT OF TUZLA CANTON

Authors:

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1. Introduction

- Tuzla Canton is located in the north-eastern part of Bosnia and Herzegovina.
- Covering the area of 2 792 km², (5.46 % of the territory of Bosnia and Herzegovina)
- Includes completely or partly territories of 14 municipalities: Banovići, Brčko, Čelić, Dobož-Istok, Gračanica, Gradačac, Kladanj, Kalesija, Lukavac, Sapna, Srebrenik, Teočak, Tuzla and Živinice.
- The population is approx. **611 000 inhabitants** (15.00 % of the total population of BiH)
- Highest population density, **219 inhabitants per km²** which is **twice as much as the average** in BiH.

Tuzla Canton has significant reserves of: coal (brown coal and lignite), stone salt, technical-construction stones, quartz sand, magnesit, limestone and wood. On the basis of above materials, important mining, energy and industrial-processing corporations were developed.

According to their influence on the environment, following industrial capacities should be observed:

- thermo-power plants,
- coal mines (brown coal and lignite),
- chemical-industrial companies,
- wood-industrial companies,
- production of construction materials and nonmetals, industry of textile, footwear, rubber etc.

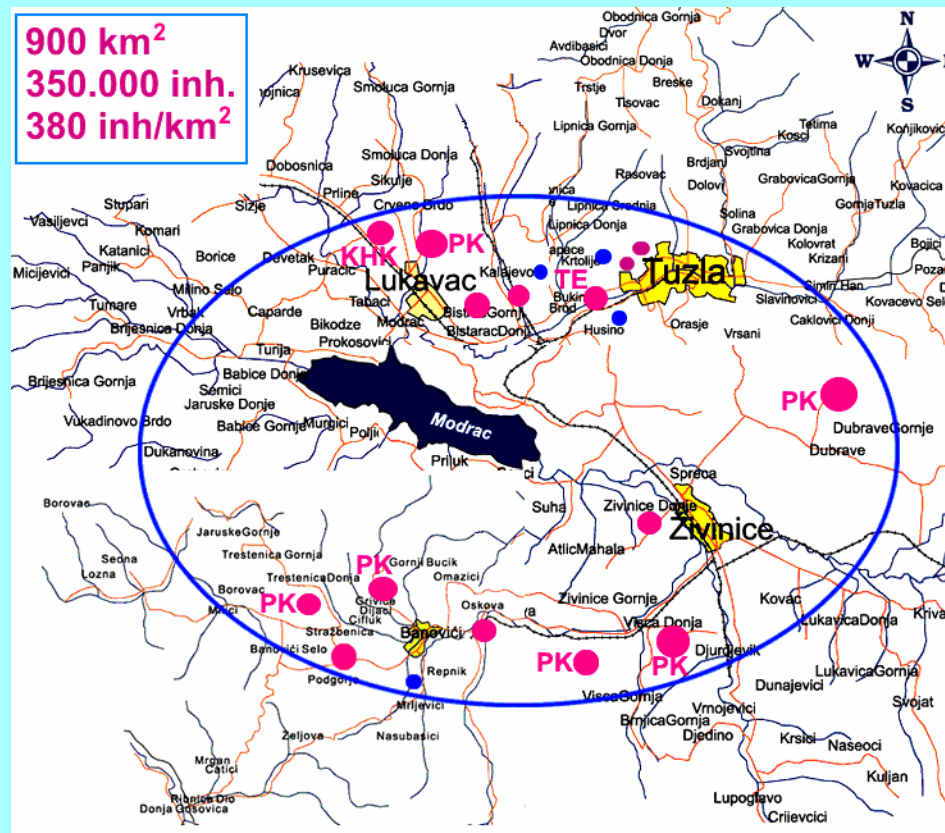


Fig. 1 Overview of main air, water and soil polluters in the **central part** of Tuzla Canton

- From the end of 50's till beginning of 70's of the last century, numerous industrial compounds were built in the central area of Tuzla Canton, within a **diameter of 30km** (municipalities of Tuzla, Živinice, Lukavac and Banovići) where approx. **350 000** inhabitants live.

In the beginning of the 60's of the 20th century, at that time **the biggest artificial lake in the south-east Europe** was built. Lake "Modrac" is situated approx. 8 km from Tuzla. The lake was used as a **source of industrial water** needed for big factories that were still being built. In the beginning of 70's there was a significant increase of „Tuzla“ Power Plant to approx. 800 MW, building of Cement Factory in Lukavac as well as chemical compound in Tuzla. All above mentioned plants use enormous amounts of industrial water, coming from lake "Modrac", in their technology processes.



Fig.2 Lake "Modrac"

Except industrial water, coal (brown and lignite) is the most important component used in all above mentioned industrial plants. In the next thirty years, operation of these plants will have an enormous influence on the environment i.e. will cause irreversible changes and pollution of water, air and soil.

2. Main characteristics of basic industrial plants with regards to environmental pollution

„TUZLA“ Power Plant has power of 800 MW, and it's the biggest in Bosnia.

- Emission of significant amounts of SO_2 , CO_2 , CO , NO_x and dust particles into air
- Depot of slag, resulted from brown coal and lignite combustion, is situated approx. 3 km from Power Plant, close to the Tuzla town center.
- Transportation of slag is hydraulic so the water used for this purpose, enriched with CaCO_3 is returned into Jala riverbed.
- The power plant has an open-type cooling system so in autumn and winter days, when atmospheric pressure is quite low, condensed drops fall onto roads and make it wet and slipper. It causes difficulties in traffic.



Fig.3 Open-type cooling towers in "Tuzla" Power Plant

Coal mines Kreka-Banovići-Đurđevik -- soil degradation

- Due to open-pit mining, significant areas of agriculture, forest and other type of lands were degraded.
- Recultivation of soil after its usage hasn't been done, and even in cases when it was done on smaller surfaces it was made in inappropriate way.
- Except mining, most other industrial plants within their operating processes, have directly or indirectly **contributed to land degradation**.
- Soil pollution and land degradation have occurred as a result of:
 - **open pit excavation off coal,**
 - disposal of various industrial waste,
 - disposal of slag and ash from coal combustion
 - underground salt exploitation,
 - surface exploitation of quartz sand,
 - pollution of water and air.



Fig. 4 Soil degradation at the open-pit coal mine Banovići (a), recultivation of soil (b)

- River Oskova is being **heavily polluted with coal dust and mud** due to an obsolete technology used on open-pit coal mines. It has caused a decrease in active volume of "Modrac" lake for about **30 %** .



Fig. 5 River Oskova after coal excavation at the coal mine Banovići

The main chemical industry capacities in Tuzla Canton

- Sodium Factory Lukavac
- KHK (coke-chemical company) Lukavac
- Cement Factory Lukavac
- Chemical factories in the Tuzla industrial zone



- emission of significant amounts of SO_2 , CO_2 , CO , NO_x and dust into air,
- slag depot, hydraulic transportation, water polluted by CaCO_3
- emission of significant amounts of hydrocarbons NH_3 , CH_x into air,
- disposal of NaHCO_3 in solid form
- emission of cement dust.

Fig. 6 Sodium Factory Lukavac, Cement Factory Lukavac, Industrial zone of Tuzla

3. Other environment polluters

Except the above mentioned polluters, great influences on air pollution also have:

- **Traffic - very intensive**
- **Small buildings' individual heating systems in the winter period.**



Fig.7 Traffic in Tuzla town center

4. Meteorology situation in the area of Tuzla municipality

In the area of Tuzla municipality there are five fixed measurement stations which are under control of government of Tuzla Canton. During the year of 2005 there were annual measurements for:

- Temperature,
- Pollutant concentr.
- Air velocity,
- Air flow direction,
- Pressure,
- Solar radiation,
- Amount of rainfall.



Fig.8 Measuring station "Skver", close to the city center

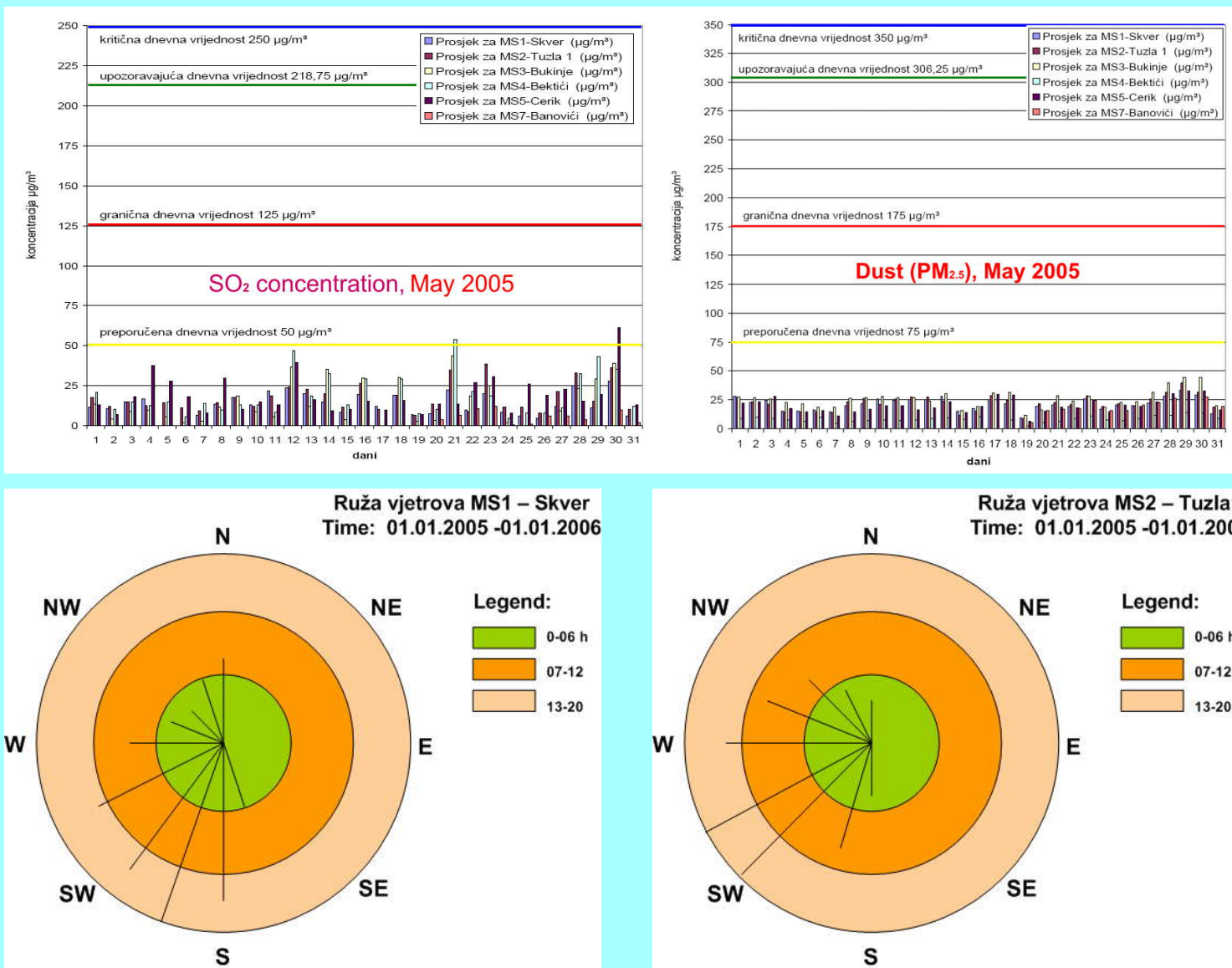


Fig. 9 Graphical overview of average daily values of SO₂ and dust, during May 2005, TUZLA (a) graphical overview of air blowing direction at the location MS1 and MS2, in the period Jan-Dec 2005 (b)

5. The main causes of pollution

- Insufficient and inappropriate legislation norms,
- Ecological culture at low level
- Dirty technologies,
- Traffic,
- Households (Živinice - individual heating systems)

6. Conclusion

When talking about the quality situation of the environment, the following conclusion might be drawn:

- The area of Tuzla Canton, in accordance with all parameters and standard procedures used for assessment of environment quality status, has been and still is one of the **most endangered areas** in Bosnia and Herzegovina.
- There is no doubt that such position was reached partly due to insufficient and inappropriate legislation for the environment protection, and especially due to lack of interest within the society for implementation of European standards in organizing and leading environmental protection activities and implementation of legal regulations.
- There is an urgent need in making a **joint strategy for the area of Tuzla Canton**, which will say how to protect environment and people as well as take into consideration all above mentioned influences and start solving all mentioned problems through a systematic approach.