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Geographical Information Processing for Environmental Pollution-Related Security within Urban Scale environments

Title: AIR POLLUTION – HEALTH IMPACT

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Objective (general)

- Determine air pollutants in the area of Aluminum factory
- Analyse spreding of air pollutants depending to meteorological conditions
- Rekognize health threats of air pollution

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- Air pollutants consist of gaseous pollutants, odours, and SPM, (suspended particulate matter) such as dust, fumes, mist, and smoke.
- The largest sources of human-created air pollution are energy generation, transportation, and industries that use a great deal of energy sources.
- Depending on their source and interactions with other components of the air, they can have different chemical compositions and health impacts.
- Since these pollutants are generally concentrated in and around urban areas, the outdoor urban pollution levels are far higher than in the rural areas.

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Clean air is the basis for the health and lives of the entire ecosystem. Exposure to air pollutants is largely beyond the control of individuals and requires action by public authorities at the national, regional and even international levels.

World Health Organization (WHO) and World Meteorological Organization (WMO) jointly established a world system of monitoring the quality of the environment (GEMS) for the protection of the environment.

EPA (Environmental Protection Agency) as the main air pollutants marked solid particles: sulfur dioxide, carbon monoxide, nitrogen oxides, ozone and heavy metals that has defined the standards for the protection of human health and ecosystems.

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•Air pollution is a major environmental risk to health and is estimated to cause approximately 2 million premature deaths worldwide per year.

•By reducing particulate matter (PM_{10}) pollution from 70 to 20 micrograms per cubic metre, it can be cut air quality related deaths by around 15%.

•By reducing air pollution levels, countries can reduce the global burden of disease from respiratory infections, heart disease, and lung cancer.

More than half of the burden from air pollution on human health is borne by people in developing countries. In many cities, the average annual levels of PM_{10} (the main source of which is the burning of fossil fuels) exceed 70 micrograms per cubic metre. The guidelines of WHO say that, to prevent ill health, those levels should be lower than 20 micrograms per cubic metre.

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Particulate matter-Guideline values

$PM_{2.5}$

10 μg/m^3 annual mean

25 μg/m^3 24-hour mean

PM_{10}

20 μg/m^3 annual mean

50 μg/m^3 24-hour mean

PM affects more people than any other pollutant.

The major components of PM are sulfate, nitrates, ammonia, sodium chloride, carbon, mineral dust and water. It consists of a complex mixture of solid and liquid particles of organic and inorganic substances suspended in the air.

PM_{10} (particles with an aerodynamic diameter smaller than 10 μm)

$PM_{2.5}$ (aerodynamic diameter smaller than 2.5 μm). $PM_{2.5}$ are more dangerous since, when inhaled, they may reach the peripheral regions of the bronchioles, and interfere with gas exchange inside the lungs.

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Health effects

Chronic exposure to particles contributes to the risk of developing cardiovascular and respiratory diseases, as well as of lung cancer. In developing countries, exposure to pollutants from indoor combustion of solid fuels on open fires or traditional stoves increases the risk of acute lower respiratory infections and associated mortality among young children; indoor air pollution from solid fuel use is also a major risk factor for chronic obstructive pulmonary disease and lung cancer among adults. The mortality in cities with high levels of pollution exceeds that observed in relatively cleaner cities by 15–20%. Even in the EU, average life expectancy is 8.6 months lower due to exposure to $PM_{2.5}$ produced by human activities.

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Guideline values-SO_2
20 µg/m^3 24-hour mean
500 µg/m^3 10-minute mean

SO_2 is a colourless gas with a sharp odour. It is produced from the burning of fossil fuels (coal and oil) and the smelting of mineral ores that contain sulfur. The main anthropogenic source of SO_2 is the burning of sulfur-containing fossil fuels for domestic heating, power generation and motor vehicles.

Health

SO_2 can affect the respiratory system and the functions of the lungs, and causes irritation of the eyes. Inflammation of the respiratory tract causes coughing, mucus secretion, aggravation of asthma and chronic bronchitis and makes people more prone to infections of the respiratory tract. Hospital admissions for cardiac disease and mortality increase on days with higher SO_2 levels. When SO_2 combines with water, it forms sulfuric acid; this is the main component of acid rain which is a cause of deforestation.

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Guideline values-NO_2

40 μg/m^3 annual mean

200 μg/m^3 1-hour mean

As an air pollutant, NO_2 has several correlated activities:

- At short-term concentrations exceeding 200 μg/m^3, it is a toxic gas which causes significant inflammation of the airways.
- NO_2 is the main source of nitrate aerosols, which form an important fraction of $PM_{2.5}$ and, in the presence of ultraviolet light, of ozone.
-The major sources of anthropogenic emissions of NO_2 are combustion processes (heating, power generation, and engines in vehicles and ships).

Health effects

Epidemiological studies have shown that symptoms of bronchitis in asthmatic children increase in association with long-term exposure to NO_2. Reduced lung function growth is also linked to NO_2 at concentrations measured (or observed) in cities of Europe and North America.

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Guideline values-O_3
100 µg/m^3 8-hour mean

Ozone at ground level is one of the major constituents of photochemical smog. It is formed by the reaction with sunlight (photochemical reaction) of pollutants such as nitrogen oxides (NO_x) from vehicle and industry emissions and volatile organic compounds (VOCs) emitted by vehicles, solvents and industry. The highest levels of ozone pollution occur during periods of sunny weather.

Health effects

It can cause breathing problems, trigger asthma, reduce lung function and cause lung diseases. In Europe it is currently one of the air pollutants of most concern. Several European studies have reported that the daily mortality rises by 0.3% and that for heart diseases by 0.4 %, per 10 µg/m^3 increase in ozone exposure.

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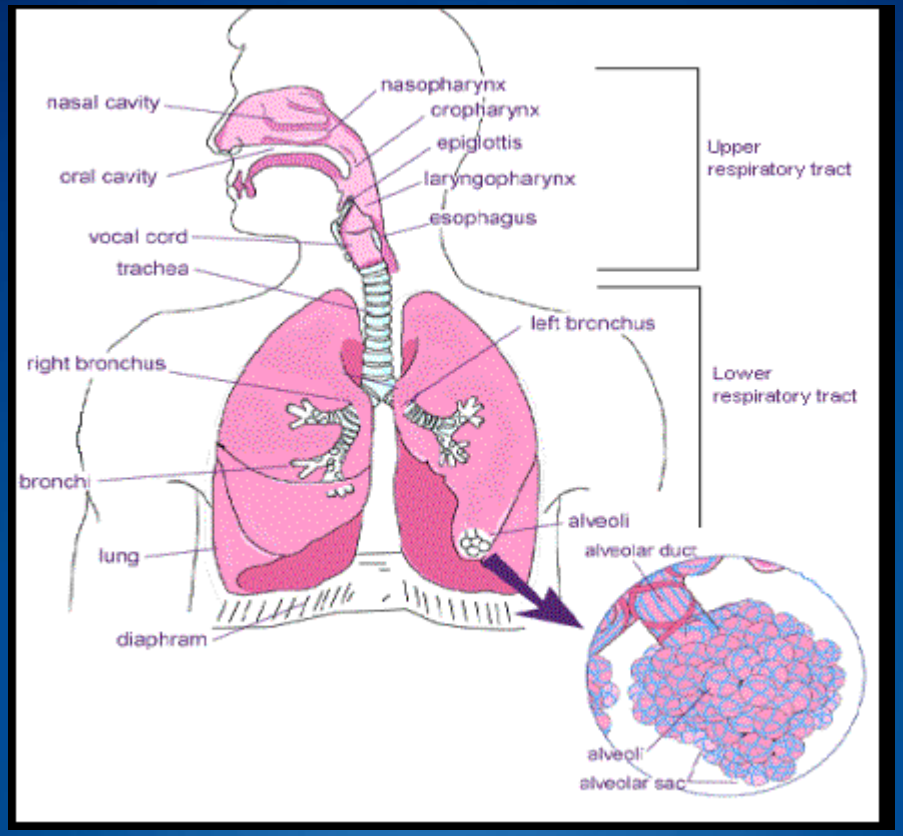

The respiratory system is sensitive to air pollution. The cardiovascular system can be affected as well.

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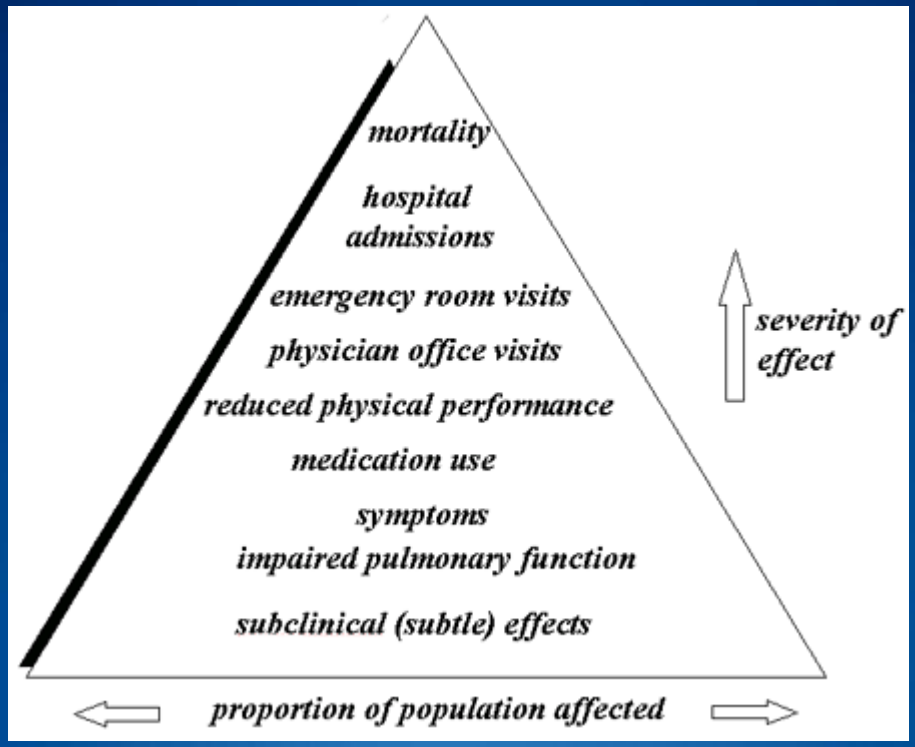

Air pollution can affect both the respiratory and cardiac systems. The health effects of air pollution can be seen as a pyramid, with the mildest but not common effects at the bottom of the pyramid, and the least common but more severe at the top of the pyramid. The pyramid demonstrates that as severity decreases the number of people affected increases.

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On the next slides we will see parts of the report of air quality in Montenegro for 2009. that included testing the air in the vicinity of KAP, especially Srpska village that can be taken as representative of the community which is under the direct influence of pollutants from KAP. (Source of data EPA Montenegro)

Figure 1. Annual mean and maximum concentrations of smoke and soot

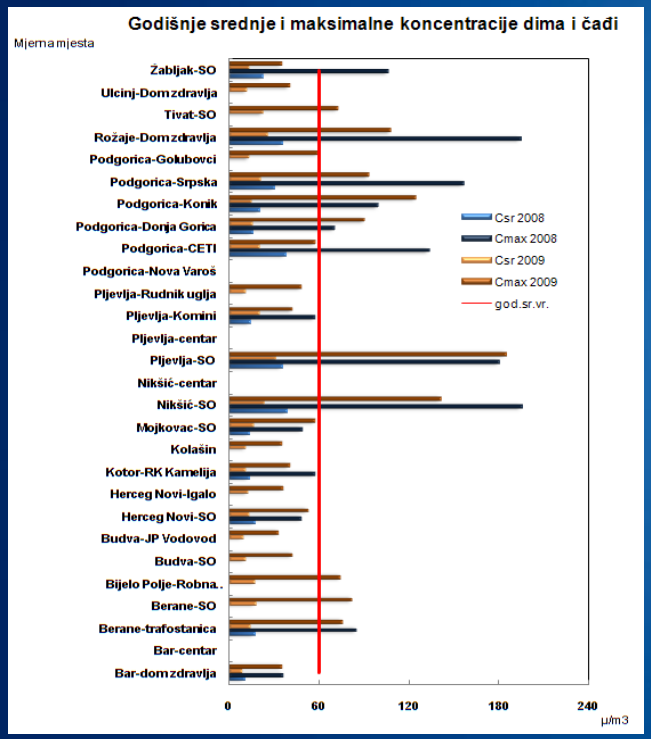

Figure 2. Annual mean and maximum concentrations TSP

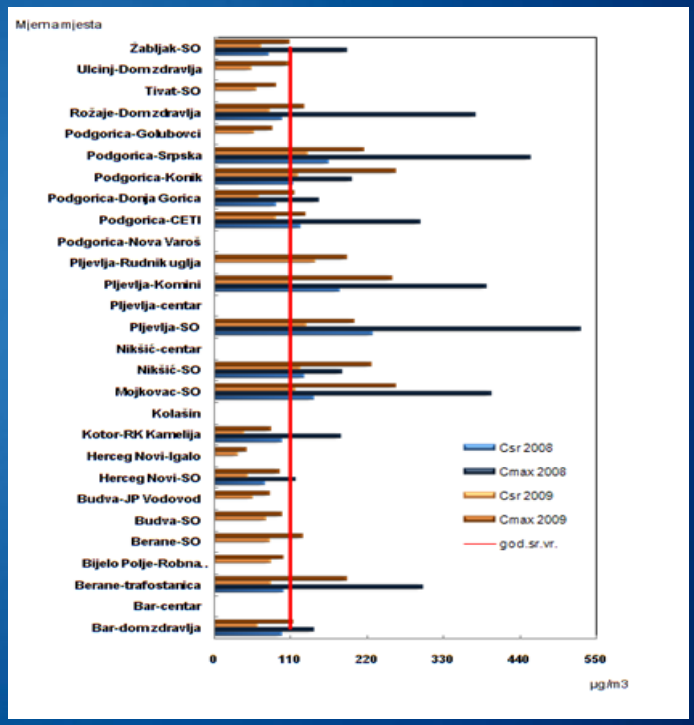

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Figure 3 .The concentration of PM10 in the air, the number exceeded

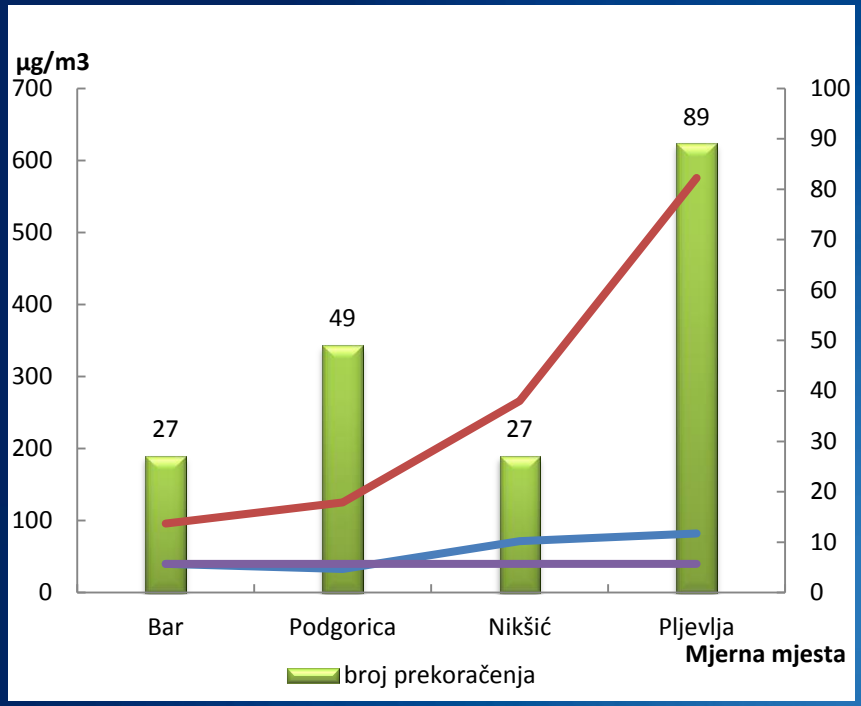

Figure 4 .Annual mean and maximum concentration of benzo-a-pyrene

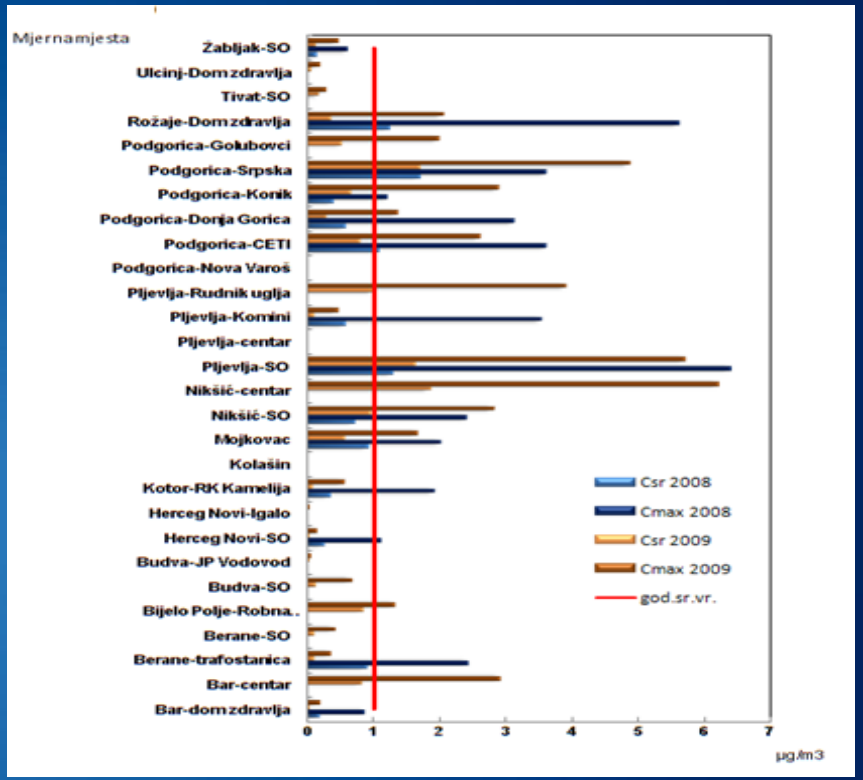

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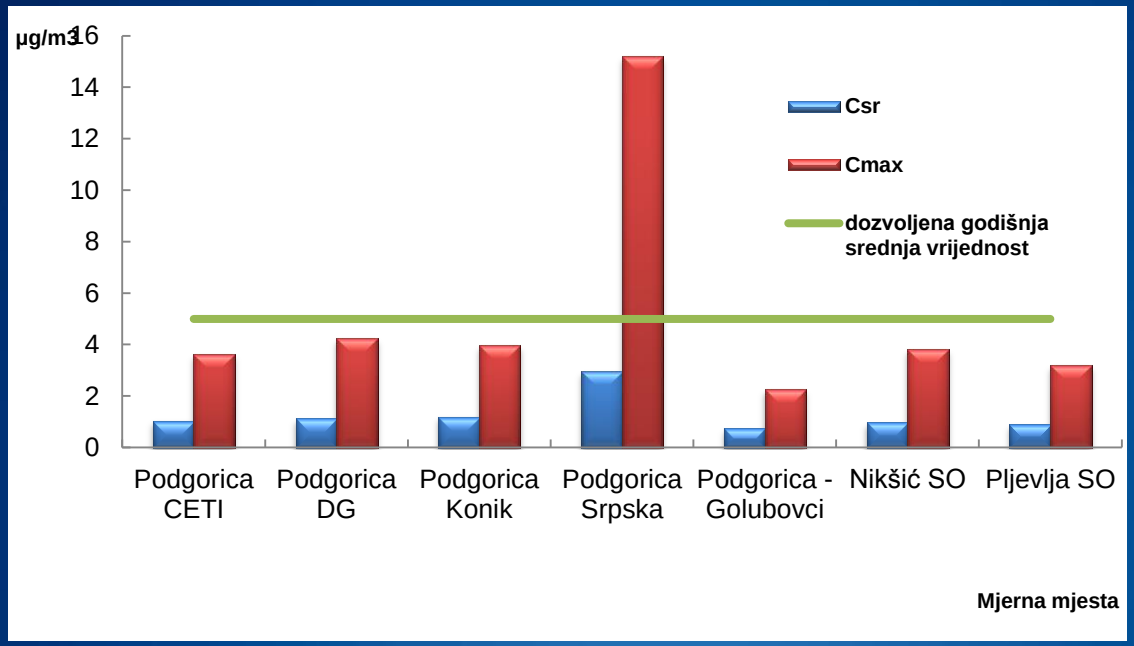
Figure 5 Annual mean and maximum concentrations of fluorides



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Thank you

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