Air Pollution in Urban and Suburban Areas in Kosovo

Ecology

Keywords: air pollution, Kosovo, particulate matter, NOx, O3.

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Abstract

Air pollution in cities has a major impact on human health and constitutes one of the major environmental and public-health issues human society has to address today.Contamination of water, soil, and air in many parts of the world, but also in Kosovo, is a serious environmental problem, and a permanent risk to public health. Exposure to particulate matter (PM) has been associated with a wide range of effects on health, but effects on mortality are arguably the most important, and are also most amenable to global assessment. Degradation of the atmospheric environment is intensified during the last years in the major cities of Kosovo. The main current air pollution sources in Kosovo are: KEC that includes thermal power plants (Kosova A and Kosova B) and lignite mines in Obiliq, Industrial complex in Mitrovicë, Ferronikeli in Gllogovc, Cement factory - SharrCem in Hani i Elezit, etc. The monitoring objectives are to determine compliance with air quality limit value to detect pollutant levels of SO_2, NO_x, CO, O3, PM10, in PM_{10}, which study is focused on four different urban areas in Kosovo. Air quality is a major problem in many urban areas in the Republic of Kosovo and therefore has an impact on human health. The main serious air pollutants are: Nitrogen Oxide (NO_x), Sulfur Oxide (SO_x), Carbon Monoxide CO, Carbon Dioxide (CO_2), and different dusts (PM_{10} and $PM_{2.5}$).

Introduction

The air pollution in Kosovo due to traffic and industry is abundant especially in areas were human population is concentrated. The fast rate in economic growth is bringing more sources of air pollution, in this context the air quality monitoring system will ensure a sustainable development of the urban and industrial area, minimizing and preventing the air pollution impact on human health. Air pollutions in cities are very complex because of several factors contributing to deterioration of the air quality in cities. These factors include: (1) a large amount of emission sources (traffic, industrial, residential, natural, etc.); (2) meteorological processes (wind components, temperature, moisture content, solar radiation, etc.); (3) chemical transformations (chemical reactions, dry depositions, etc.).

Among them, air pollution is one of the most serious environmental problems in urban areas. The World Health Organization, (WHO, 2005) has estimated that urban air pollution causes the death of more than 2 million people per year in developing countries, and millions of people are found to be suffering from various respiratory illnesses related to air pollution in large cities.

Air pollution has become one of the serious environmental concerns in urban areas, especially in view of the adverse health effects that have been associated with ambient fine particles. The rates of increase in pollutant concentrations in the cities of developing countries are higher than those of developed countries (BEGUM, 2008).

A vast majority of the urban and suburban areas in the world is exposed to conditions which exceed air quality standards set by WHO. Especially, the large cities in developing countries have the highest air pollution levels. Some researches show that the emissions from Asian cities will rise and this will continue to have an impact on hemispheric background ozone level as well as global climate (Gurjar et al., 2005). In general the cities in developed countries have the concentrations of air pollutants lower than the cities in developing countries. A lot of measurements of air pollutants (such as O3, SO2, NO2, TSP and PM10) in the world have been done.

Monitoring of air pollution is one of the most important tools in AQM. It helps us to understand the status of air pollution levels and to understand the evolution of air pollution. Monitoring gives us the information on emissions sources, because monitoring could be done on roadside for evaluating the traffic emissions and in industrial park for evaluating the industrial emission sources.

Material and Method

Measurement campaigns were carried out in several area, at two different points, and four different periods in urban centre of Prishtina and Mitrovica. In this paper we have detailed of air pollution over Prishtina region in Republic of Kosovo. We have measured (PM_{10},O_3, NO_2, and $PM_{2.5}$) on number and mass concentration, as the indicators of exposure to urban air pollution in urban areas in Prishtina and Mitrovica.

The city of Prishtina, one of the largest cities in the Kosovo, with a huge concentration of people and resources, has suffered from many social and environmental problems. The area of Prishtina (572 km^2, about 600.000 inhabitants) represents one of the largest Kosovo metropolitan areas.

The first automatic station for air quality monitoring, is placed at KHMI location. This station is equipped with automatic analysers of sulphur dioxide (SO_2), nitrogen oxides (NO_x), carbon monoxide (CO), ozone (O_3), particulate matters PM10/PM2.5 as well as with sensors of meteorological parameters.
The second KHMI station is placed at the yard of new Government's building, ex-Rilindja, This station is equipped with a three-channel optic analyser (Grim Model 180), which is configured to measure particulate matters.

Results and Discussion

Impact on the environment of Industrial park in Mitrovica

Industrial park in Mitrovica is consisted of former Battery Industry, Zinc Metallurgy, and Chemical Industry. Within the chemical metallurgical processing of these industries, in addition to finalizing the products, they have created hazardous waste for the environment. These wastes are dumped in the vicinity of the park, thus created the industrial waste landfill, which is in a common space.
The industrial waste landfill has an area of 34.62 hectares. Total mass of these industrial waste is estimated to be about 1 520 000 tonnes. The landfill consists of four types of industrial wastes, pyrites and pyrotine, phosphogypsum, jarosite and the so-called residue of neutral process of lye-ing the fried zinc, also known as the EMKO residue. Location of the landfill is inadequate, and with increased concern for its impact on the environment, in particular because the surrounding area is the area with settlements, and near the river.
Air in Mitrovica is polluted mainly from: Particulate Matter – PM10, PM2.5 (Dust), Gases – NO2, SO2, CO, O3. NO2 in Mitrovica comes 52% from transport, 28% from fuel for power production, and 11% from industry Mitrovica has a lower annual average of NO2 emission as compared to the annual average limit allowed.

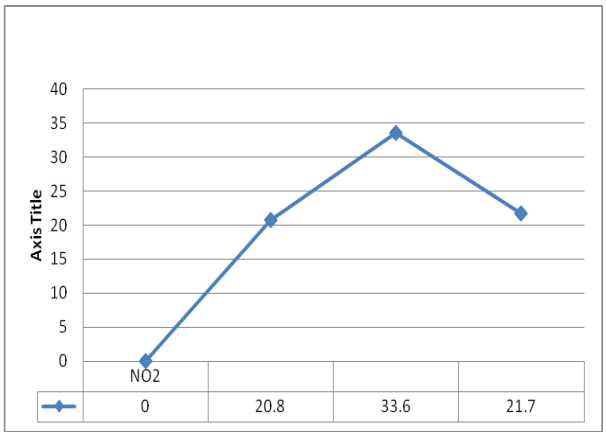

Figure 1. Pollution air NO_2 in Mitrovica

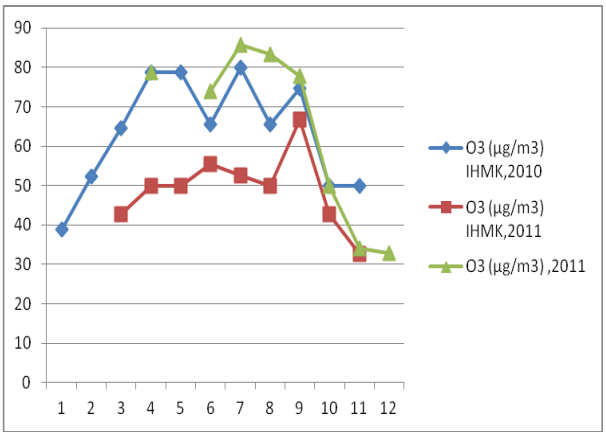

Figure 2. Pollution air O_3 in Mitrovica

Assessment of pollution from particulate matter (PM)

The particulate matters generated by natural and anthropogenic processes, which in diffusive form are dispersed in the air and soil, fall under the influence of gravity, or together with atmospheric precipitation.
The environmental impact of particulate matters depends on their size. Particles smaller than 10 micrometers, usually are of round shape, and under the wind influence, can be transferred in long distances.
Particulate matters are categorized based on the size of the particles, such as particulate matter PM10, PM2,5 and PM1, with certain aerodynamic diameter <10µm, <2.5 µm and <1µm, and total suspended particulates (TSP).

PM10 - Particulate matter with aerodynamic diameter <10µm

In the figure below are presented the annual average values for the two monitoring stations during 2010 and 2011. The figure shows that in the two monitoring stations, the annual limit value (40µg/m3) is exceeded during the monitoring period 2010 and 2011. Representative station for traffic pollution in Prishtina reaches the highest annual average value, for up to 75.74 µg/m3, which means that there is an excess of 1.9 times, more than the annual limit value (40µg/m3) according to European directives.

When comparing the data obtained between representative stations for pollution in urban, the highest concentration of PM10 pollution is evidenced in urban areas.

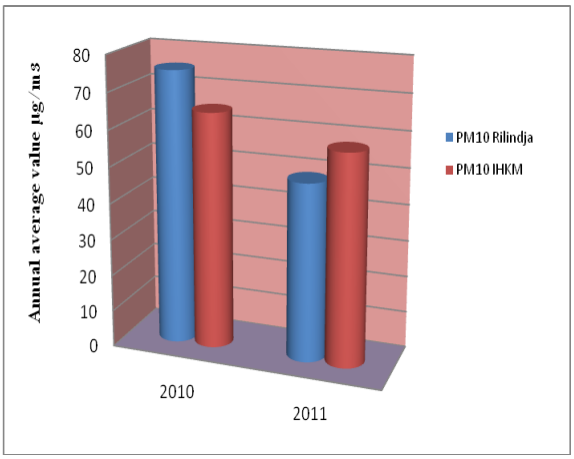

Figure 3.Annual average values of PM10 in two monitoring stations.

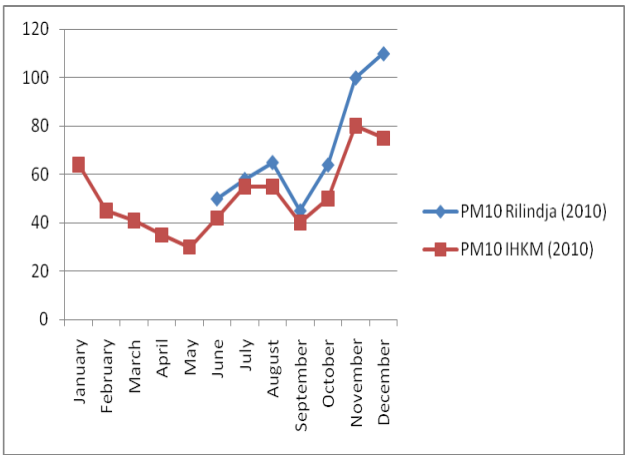

Figure 4. Monthly average values of PM10 at monitoring station (RILINDJA AND KHMI, 2010

In the figure below are presented the monthly average values of PM10, measured at monitoring stations KHMI and Rilindja in Prishtina, in 2010.

Conclusions

Air quality is a major problem in many urban areas in the Republic of Kosovo and therefore has an impact on human health. The main serious air pollutants are: Nitrogen Oxide (NO_x), Sulfur Oxide (SO_x), Carbon Monoxide CO, Carbon Dioxide (CO_2), and different dusts (PM_{10} and PM $_{2.5}$).

Contamination of water, soil, and air in many parts of the world, but also in Kosovo, is a serious environmental problem, and a permanent risk to public health. Kosovo has had great industrial potential with different destinations. Industrial park in Mitrovica is consisted of former Battery Industry, Zinc Metallurgy, and Chemical Industry.

Particulate matter (PM_{10} $PM_{2.5}$) is a type of air pollution that is generated by a variety of human activities, can travel long distances in the atmosphere and causes a wide range of diseases and a significant reduction of life. Representative station for traffic pollution in Prishtina reaches the highest annual average value, for up to 75.74 µg/m3, which means that there is an excess of 1.9 times, more than the annual limit value (40µg/m3). $PM_{2.5}$ concentration, from 38.71µg/m3 as it was in 2010, to 42.12 µg/m3 during 2011, which means that the annual limit value (25µg/m3) according to European directives.

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