ASPECTS ON AIR POLLUTION WITH NITROGEN DIOXIDE IN THE CITY AREA ORADEA

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Abstract

They create their own individual cities, the state of environment, especially since their surface is higher.Nitrogen dioxide is used most frequently in environmental measurements that is generated by fuel combustion in engines, furnaces, etc., is one of the compounds involved in oxidant smog.
The main sources of pollution in Oradea with NO_2 are: CET I, which produces electricity and heat, means of transport that favors a greater concentration on busy streets and other industrial sources and domestic activities. The purpose of this paper is to analyze the spatial-temporal variations of nitrogen dioxide in the area of Oradea, in the present study we attempted an analysis of its evolution and the factors that require or cause. Development was highlighted as nitrogen dioxide in the three monitoring points, for the period 1994 - 2009, and its influence on temperature.

Key words: pollutant, nitrogen dioxide, the maximum permissible concentration.

INTRODUCTION

Air Quality Control is the concept that defines the observation and measurement of quantity, quality and repeating the concentration of one or more constituents in the air. Data from network monitoring and control system allows rapid identification of polluted areas and making strategic and tactical measures to combat pollution and prevent its rise. Air quality monitoring network should be chosen so as to seek the cumulative effect of industry, traffic, housing and commercial space heating. Action for air quality monitoring is useful in that it provides direct information with regard to the situation at a time in an important segment of the urban environment. Nitrogen pollutants are nitrogen oxides (nitrous oxide - N_2O, nitric oxide - NO, nitrogen dioxide - NO_2, nitrogen tetroxide - N_2O_4, nitrogen pentoxide - N_2O_5), ammonia (NH_3), hydrogen cyanide (HCN).

Movement of heavy vehicles is the main cause of air pollution by nitrogen dioxide, plus burning coal, fuel oil, natural gas and wood, particularly in the energy industry, but also in domestic and industrial waste incineration.

It is estimated that the main sources of NOx pollution are transport, holding 59% of emissions of oxides of nitrogen. The highest concentrations occur in wet months and lowest during the warm season. Stagnation of this pollutant in ambient air is favored by cool air and lack of rain.

MATERIAL AND METHODS

For analysis of nitrogen dioxide in Oradea city area were used data from the Environmental Protection Agency Bihor.

In Oradea air quality monitoring is carried out by measurements of pollutants in the atmosphere of long-term and 24 hours.

For this study we used a series of classic research models and a range of models and modern methods. The main methods used in this study are: the method of analysis, deductive method, comparative method, statistical methods - mathematics and graphs.

Using statistical methods - mathematical been processed data from the Environmental Protection Agency. Results obtained by mathematical and statistical methods were then transposed graph to clearly show the temporal variability of atmospheric pollutants.

Maximum allowable concentration for 24 hours in Romania for NO_2 is 0.100 mg/m^3 and 0.300 mg/m^3/30 minute set by STAS 12574/1987.

This pollutant is considered in Oradea for a period of 16 years, respectively from 1994 to 2009. Monitoring in Oradea in three points: at the headquarters of the Environment Protection Agency – Bihor branch, on Corneliu Coposu Street at the Children Hospital, and at Environment Protection Faculty. In point of monitoring the Faculty of Environment Protection observations begin in 1999, in June, from 2008 at this point there shall be monitored. Locations of monitoring was done taking into account sources of pollution concentrated in those areas.

For air quality analysis are taken into account the presence and quantity of harmful, comparing the maximum allowable concentrations.

RESULTS AND DISCUSSION

Evolution of the annual nitrogen dioxide concentration

After analyzing the annual evolution of nitrogen dioxide in Oradea, it is noted that the highest point of pollution, monitoring of the three points, is at the Environmental Protection Agency (to 0.017 mg/m^3), followed the Faculty of Environment Protection (with 0.015 mg/m^3), with the lowest amount of pollution with NO_2 being at Children Hospital (0.014 mg/m^3) (see figure 1).

There were no exceedances of the maximum permissible limits, the values falling within the limits imposed by the STAS 12574/1987.

The Environmental Protection Agency, during the 16 years studied, the highest concentration was recorded in 2008, with a value of 0.025 mg/m^3, and the lowest in 2006, with a concentration of 0.007 mg/m^3 (see figure 1).

The Faculty of Environment Protection during the nine years the highest concentration observed was in 2000, respectively 0.020 mg/m^3, and lowest in 2004, respectively 0.011 mg/m^3.

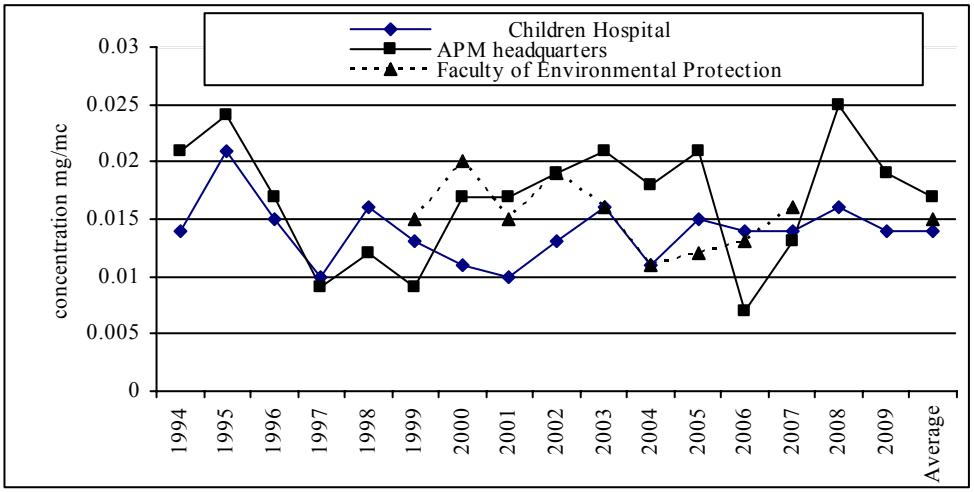

Figure 1 Evolution of annual average concentrations of NO_2 (mg/m^3) in Oradea monitoring points in the period 1994 to 2009

Children Hospital has the highest concentration in 1995 of 0.021 mg/m^3, and the lowest in 1997 and 2001, of 0.010 mg/m^3 (see figure 1).

Monthly evolution of the concentration of nitrogen dioxide

Analyzing the monthly progress of the evolution of nitrogen dioxide concentration in figure no 2 results that the highest concentration recorded in October for the Environmental Protection Agency, some with a value of 0.023 mg/m^3, followed in November with a concentration of 0.021 mg/m^3 recorded all at the same point and February produced the same amount of monitoring point from the Faculty of Environmental Protection. Values are lowest in the summer months, that the lowest value recorded in July, the C. Coposu at Children Hospital, with a concentration of 0.010 mg/m^3 (see figure 2).

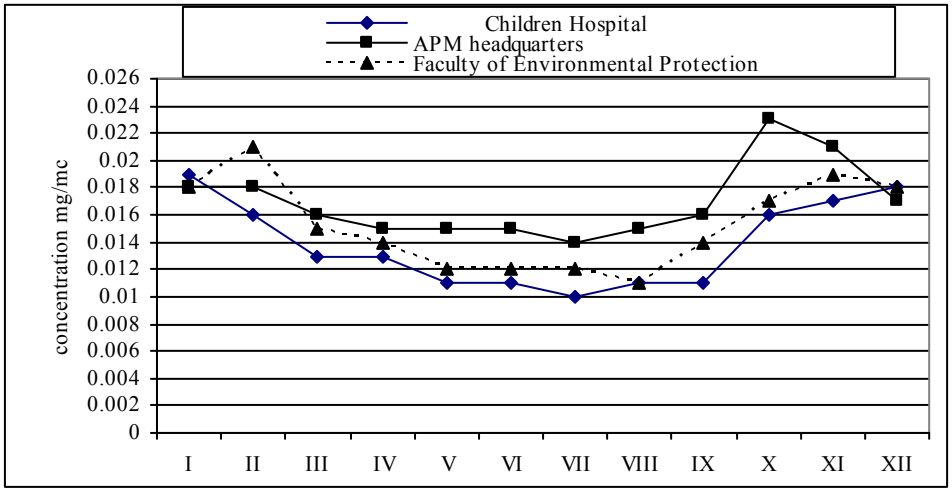

Figure 2 Evolution of monthly average concentrations of NO_2 (mg/m^3) in Oradea monitoring points in the period 1994 to 2009

The monthly evolution of nitrogen dioxide in connection with air temperature

Thermal inversion conditions, calm atmosphere and lack of precipitation allow the perimeters of the stagnation of the gas emission.

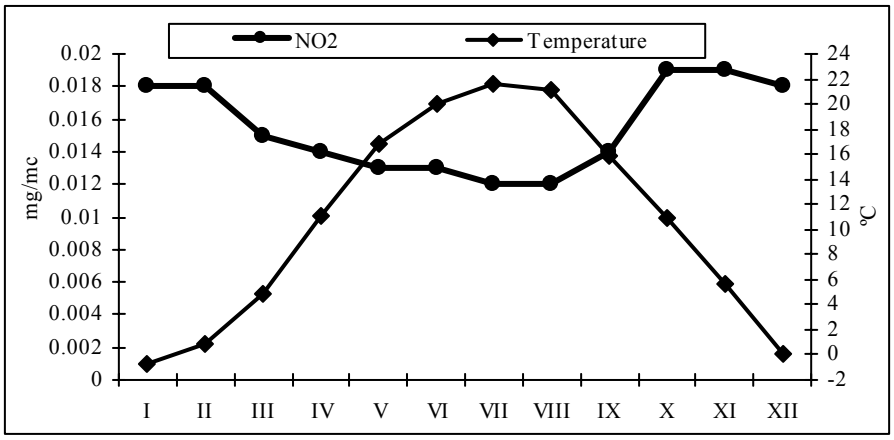

Figure 3 Variation of monthly average concentrations of NO_2 (mg/m^3) and air temperature (°C) in Oradea

The correlation between nitrogen dioxide and temperature are represented in the figure no 3 hence the walking backwards between the two. The temperature is much lower NO_2 concentration is higher and as the temperature is much higher pollutant concentration is lowered. This emphasizes the role of purifying the air temperature by convective movements during the warm season.

Highest emissions occurred in wet months and lowest during the warm season (June, July, August).

Annual emissions of carbon monoxide, nitrogen dioxide (NO_X)

The most significant quantity of nitrogen oxide emissions resulting from road traffic, followed by emissions from non-industrial combustion, combustion in manufacturing industry and emissions from waste incineration.

Table 1

Annual emissions of carbon monoxide, nitrogen dioxide (NOx) in Bihor county

Year	2001	2002	2003	2004	2005	2006	2007	2008	2009
Annual emissions NO_x (t/year)	28657.77	15794	17692.41	283.15	1540.99	2069.53	4934.127	5598.64	10094.17

Source: www.Apmbh.ro

Emissions of nitrogen oxides in the county have the highest concentration Bihor in 2001, followed by 2003 and the lowest in 2004 (see table 1). Appreciable differences in the quantities of pollutants as the annual emissions inventory was based on reports of a number of operators inconsistently. Economic reports have been considered as such.

CONCLUSIONS

Maximum permissible concentrations of nitrogen dioxide in the area of Oradea were not inadvertently exceeded only for very short periods of time. This has contributed towards the prevailing wind in the southern direction, which favors the dispersion of pollutants.

The highest concentrations of nitrogen dioxide are produced during the cold season when the lowest recorded temperature values. This emphasizes the role of purifying the air temperature by convective movements during the warm season.

Critical areas in terms of air pollution are located near high traffic roads, major intersections, industrial waste, household garbage uncontrolled landfills, livestock farms, chemical industry, but the latter have substantially reduced production activities.

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