THE LEVEL OF AIR POLLUTION WITH NITROGEN DIOXIDE IN THE CITY OF SATU-MARE BETWEEN 2016 AND 2018

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Abstract

This paper presents the study conducted on the level of air pollution with nitrogen dioxide in the city of Satu Mare between 2016 and 2018. The degree of air pollution with nitrogen dioxide is monitored by the Satu Mare Environmental Protection Agency at its four sampling points placed strategically in different parts of Satu Mare. The sampling points are located as follows: in the central area of the city, at the venue of the Satu Mare Environmental Protection Agency (APM Satu Mare), the next one is in Şoimoşeni St (the industrial area found in the north of the city), the third is in the industrial area around Magnoliei St, while the fourth is at the junction of Burdea St and Careiului Rd.

The values recorded at the four monitoring points show that the evolution of the nitrogen dioxide average concentrations, as well as the evolution of the multiannual monthly average concentrations have not exceeded the maximum permissible concentration of 100 µg/m³. However, the daily analysis of the level of pollution with nitrogen dioxide shows that between 2016 and 2018 the maximum permissible concentration (100 µg/m³) was exceeded 33 times, at two monitoring points, Magnoliei St and Careiului Rd respectively, the highest concentration recorded being 171.47 µg/m³.

Key words: maximum permissible concentration, monitoring, nitrogen dioxide, sampling points

INTRODUCTION

Nitrogen dioxide (NO_2) is a reddish-brown gas, with a strong and pungent odour, being considered an important source of smog. The main pollution sources with nitrogen dioxide are car engines, power plants and the burning of fossil fuels (Mănescu et al, 1994; Ciulache, 2004; Pereş et al., 2011; Köteles, Pereş, 2010). Nitrogen dioxide can be taken by air far away.

A long exposure to this pollutant can cause an increase in the incidence of asthma, an increase in death cases due to pulmonary diseases.

The nitrogen dioxide concentrations have been studied over the years by several researchers, including: Măhăra,1976; Moza, 2009; Moza, Köteles, 2010; Köteles, 2011; Pereş, Köteles, 2010; Pereş, 2011; Dumiter, 2005.

MATERIAL AND METHOD

The data on the level of pollution with nitrogen dioxide were provided by the Satu Mare Environmental Protection Agency. In the area of the city

of Satu Mare there are four monitoring points, located strategically in its important areas.

The first sampling point can be found in the central area, at the venue of the Satu Mare Environmental Protection Agency, the next one in the norther part of the city, in Şoimoşeni St, the third point is in the industrial area around Magnoliei St and the fourth one at the junction of Burdea St and Careiului Rd (apmsm.anpm.ro).

RESULTS AND DISCUSSIONS

Annual evolution of nitrogen dioxide

The results obtained after processing the data show that between 2016 and 2018 the highest values of nitrogen dioxide were recorded at the Careiului Rd and Magnoliei St monitoring points, 53.44 µg/m^3 (2016) and 48.98 (2016) µg/m^3 respectively. At the sampling point in Careiului Rd the concentration was higher again in 2018, 43.47 µg/m^3. The maximum permissible concentration of 100 µg/m^3 was not exceeded.

At the monitoring points at the venue of the APM Satu Mare and in Şoimoşeni St the nitrogen dioxide concentrations were lower, between 15.18 - 30.48 µg/m^3 (see Figure 1).

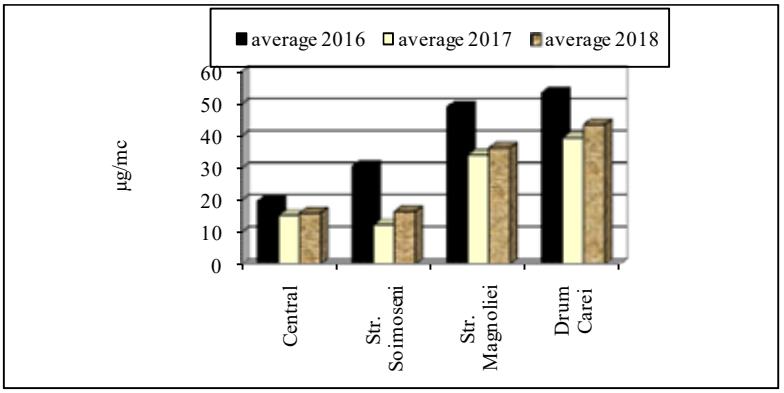

Fig. 1. Evolution of the average nitrogen dioxide concentrations in Satu Mare, 2016-2018

The analysis of the average concentration of nitrogen dioxide for the years included in the study, 2016 – 2018, shows that the highest value was recorded at the Careiului Rd monitoring point, 45.44 µg/m^3. A close concentration was obtained at the Magnoliei St monitoring point, 39.79 µg/m^3.

At the monitoring points located in the centre of the city (the venue of APM Satu-Mare) and in Şoimoşeni St, the nitrogen dioxide concentrations were 19.70 µg/m^3 and 16.93 µg/m^3 respectively (see Figure 2).

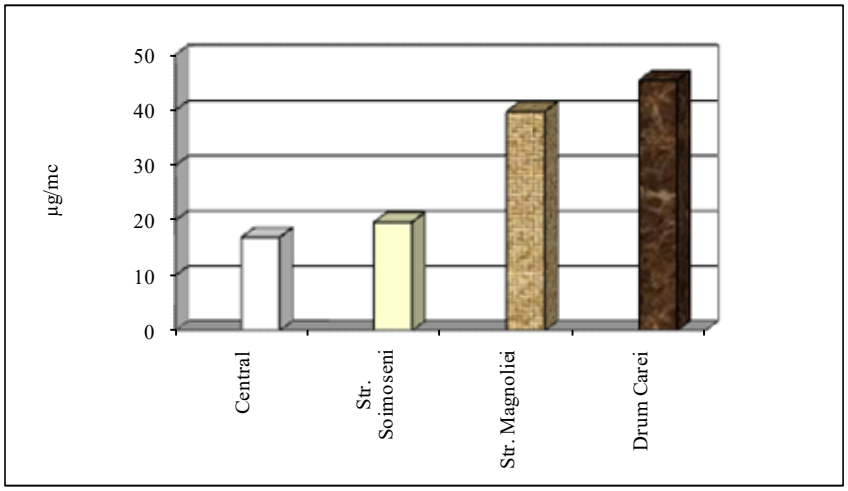

Fig. 2. Evolution of the nitrogen dioxide multiannual average concentrations at the four sampling points located in Satu Mare, 2016-2018

Monthly evolution of nitrogen dioxide

The analysis of the monthly evolution of nitrogen dioxide concentrations at the monitoring points between 2016 and 2018, shows that the highest values were recorded in 2016, as follows: in January, 61.93 µg/m^3, in March, 52.43 µg/m^3, in February, 46.49 µg/m^3 and in April, 45.95 µg/m^3, as well as in December 2018, 54.86 µg/m^3. In 2017, the highest concentrations occurred in July, 35.15 µg/m^3, in June, 34.59 µg/m^3, and in August, 33.05µg/m^3.

The lowest concentration was recorded in April 2017, 0.50 µg/m^3, followed by 13.59 µg/m^3 in July 2018. Low values were also recorded in December 2016, 20.15 µg/m^3, and in December 2017, 20.81 µg/m^3 (see Figure 3).

The results above show that at the four monitoring points the maximum permissible concentration of 100 µg/m^3 was not exceeded.

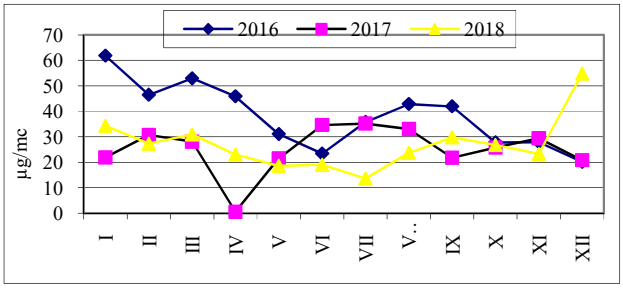

Fig. 3. Monthly pattern of the nitrogen dioxide at the 4 sampling points in Satu Mare, 2016-2018

Table1

Number of samplings, of exceedances and the highest value of nitrogen dioxide recorded in Satu Mare between 2016 and 2018

Month/ Year	Total number of samplings	Number of exceedances	The highest value recorded µg/m^3	Sampling point
I/2016	73	10	129.70	Magnoliei St
I/2017	64	0	-	-
I/2018	76	0	-	-
II/2016	78	3	122.06	Magnoliei St and Careiului Rd
II/2017	70	0	-	-
II/2018	76	0	-	-
III/2016	88	4	114.99	Careiului Rd
III/2017	85	0	-	-
III/2018	82	0	-	-
IV/2016	72	4	125.72	Careiului Rd
IV/2017	74	0	-	-
IV/2018	72	0	-	-
V/2016	72	0	-	-
V/2017	79	0	-	-
V/2018	77	0	-	-
VI/2016	74	1	105.19	Careiului Rd
VI/2017	73	0	-	-
VI/2018	74	0	-	-
VII/2016	78	0	-	-
VII/2017	82	1	104.89	Careiului Rd
VII/2018	84	0	-	-
VIII/2016	80	1	108.57	Careiului Rd
VIII/2017	77	1	105.50	Careiului Rd
VIII/2018	70	0	-	-
IX/2016	80	3	126.95	Careiului Rd
IX/2017	78	0	-	-
IX/2018	78	0	-	-
X/2016	76	2	147.29	Careiului Rd
X/2017	83	0	-	-
X/2018	88	0	-	-
XI/2016	78	0	-	-
XI/2017	83	0	-	-
XI/2018	77	0	-	-
XII/2016	76	0	-	-
XII/2017	73	0	-	-
XII/2018	67	3	171.47	Careiului Rd

The daily evolution of the level of pollution with nitrogen dioxide between 2016 and 2018 shows that out of the 925 samplings taken in 2016 the maximum permissible concentration of 100 μg/m^3 (STAS 12574-87) was exceeded 28 times, the highest value being recorded at the Careiului Rd in October, the value of 147.29 μg/m^3.

In 2017, out of the 924 samplings the maximum permissible concentration was exceeded twice, the highest value was recorded at Careiului Rd in August, 105.50 μg/m^3.

In 2018, out of the 921 samplings the maximum admissible concentration was exceeded three times, the highest value being recorded at the Careiului Rd point, 171.47 μg/m^3 (see Table 1).

CONCLUSIONS

Looking at the annual evolution of nitrogen dioxide for the years included in the study it can be concluded that the maximum permissible concentration of 100 μg/m^3 was not exceeded. The highest level was 53.44 μg/m^3, in 2016, at the Careiului Rd sampling point. In 2017, the highest concentration was 39.41 μg/m^3 (Careiului Rd), while in 2018 the highest value recorded was 43.47 μg/m^3. In the area of this sampling point the traffic is heavy and this is the reason why the level of pollution with nitrogen dioxide is higher as compared with the other monitoring points.

The monthly evolution of the level of pollution with nitrogen dioxide in the period included in the study shows that the average concentration of the four sampling points is higher in January 2016, 61.93 μg/m^3. In 2017, the highest concentration was recorded in July, 35.15 μg/m^3, while in 2018 the highest value occurred in December, 54.86 μg/m^3.

The daily pattern of nitrogen dioxide shows that during the period included in the study the highest number of exceedances was recorded at the Careiului Rd sampling point, but they were of short duration.

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