THE LEVEL OF AIR POLLUTION WITH NITROGEN DIOXIDE IN THE CITY OF ZALĂU IN 2020

Köteles Nandor* Pereș Ana Cornelia* Todea Adela Olimpia*

*University of Oradea, Faculty of Environmental Protection, 26 Gen. Magheru St., 410048 Oradea,, Oradea, Romania, e-mail: kotelesnandor@yahoo.com; peresana35@yahoo.com; adela_venter@yahoo.ro

Abstract

This paper presents the level of air pollution with nitrogen dioxide for the year 2020. Air pollution is monitored by the Zalău Environmental Protection Agency through continuous measurements at the industrial type I automatic station, which is located in the municipality of Zalău, Meteorologiei St. The station is included in the National Network for Monitoring Air Quality.

Analysis of the air pollution level with nitrogen dioxide in Zalău for the year 2020 shows that the maximum permissible concentration of 100 µg/m^3 was not exceeded. Higher values were recorded in January (33,411 µg/m^3), November (19.930 µg/m^3), October (19.050 µg/m^3), February (18.838 µg/m^3), March (17.561 µg/m^3) and 15.206 µg/m^3 in December. The highest nitrogen dioxide concentration was reached on 8 January 2020, 59.87 µg/m^3.

Based on the results, it can be stated that the level of pollution with nitrogen dioxide in the municipality of Zalău is within permissible limits, the maximum permissible concentration was not exceeded.

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

INTRODUCTION

Nitrogen dioxide (NO_2) is a reddish-brown gas, with a strong and pungent odour. The main nitrogen dioxide pollution sources are internal combustion engines which burn fossil fuels and motor vehicle traffic (Măhăra, 1976; Ciulache, 2004; Moza, 2009; Köteles, Pereş, 2010). Means of transport have a significant contribution to the nitrogen dioxide emissions (Mănescu, et al., 1994; Dumiter, 2005; Gavrilescu E., 2008; Moza A. C., Köteles, 2010).

Exposure to this pollutant can result in breathing difficulties, respiratory tract irritation, and long term exposure to a small concentration can destroy pulmonary cells (Pereş et al., 2010, 2011; Köteles et al., 2016).

MATERIAL AND METHOD

For this paper we have used the nitrogen dioxide pollution data provided by the Zalău Environmental Protection Agency. Nitrogen dioxide air pollution monitoring is performed through continuous measurements at the industrial type I automatic station located in the municipality of Zalău, Meteorologiei St. (apmsj.anpm.ro).

The results were obtained using mathematical and statistical methods, then they were presented in charts to show the nitrogen dioxide variability across time.

RESULTS AND DISCUSSIONS

1. Monthly evolution of nitrogen dioxide

Analysis of nitrogen dioxide concentration monthly evolution for the year 2020 shows that the highest value was recorded in January, 33.411 µg/m^3, followed by the concentrations in November (19.930 µg/m^3), October (19.050 µg/m^3), February (18.838 µg/m^3), March (17.561 µg/m^3) and 15.206 µg/m^3 in December. These values do not exceed the maximum permissible concentration of 100 µg/m^3.

The lowest values were recorded in May, 10.137 µg/m^3, followed by June, 10.913 µg/m^3, July, 11.400 µg/m^3 and August, 11.929 µg/m^3 (Fig. 1).

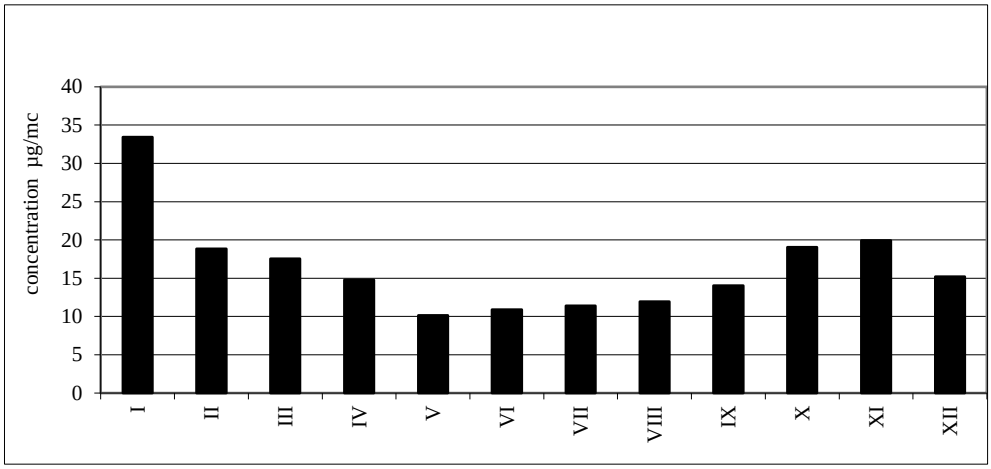

Fig. 1. Nitrogen dioxide monthly evolution at the Zalău Environmental Protection Agency sampling point in 2020

2. Evolution of maximum daily averages at the sampling point

Analysis of the daily nitrogen dioxide pollution level data in the municipality of Zalău shows that the maximum concentration of nitrogen dioxide was recorded on 8 January 2020 (59.87 µg/m^3). This value does not exceed the maximum permissible concentration of 100 µg/m^3.

Higher values were recorded on 18 February 2020 (43.30 µg/m^3), followed on 24 October 2020 by a value of 35.04 µg/m^3, then the value on 19 April, 31.39 µg/m^3, and on 23 December, 29.31 µg/m^3.

Lower concentrations were recorded on 30 July, 15.84 µg/m^3, on 10 June, 17.42 µg/m^3, and 18 August, 18.42 µg/mc (Fig. 2).

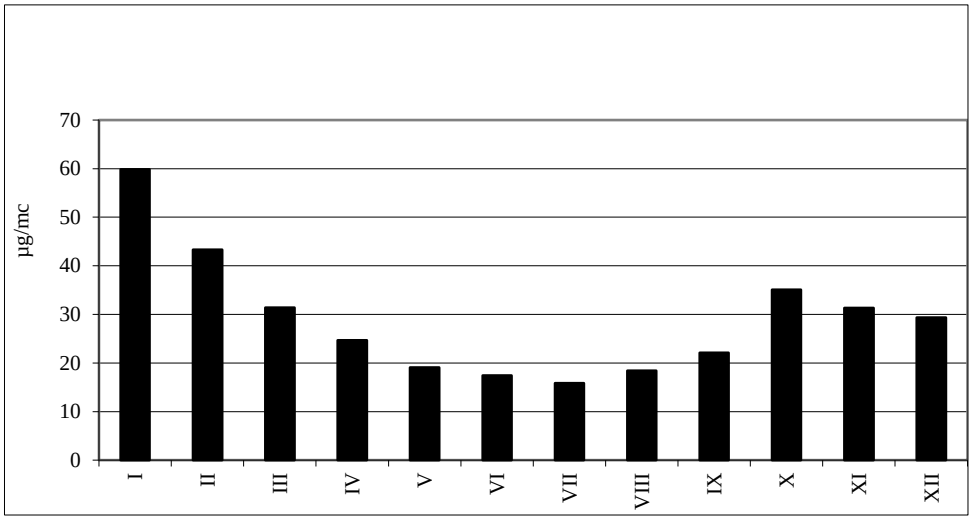

Fig. 2. Monthly maximum values recorded at the Zalău Environmental Protection Agency sampling point in 2020

CONCLUSIONS

The study conducted on the evolution of nitrogen dioxide in the municipality of Zalău for the year 2020 reveals that the maximum permissible concentration of 100 µg/m^3 was not exceeded.

The highest concentration, 59.87 µg/m^3, was recorded on 8 January 2020. Another higher value was recorded on 18 February 2020, that is, 43.30 µg/m^3.

The monthly evolution of the nitrogen dioxide pollution level in 2020 shows that the highest concentration of nitrogen dioxide was recorded in January, 33.411 µg/m^3, followed by that of November, 19.930 µg/m^3, then October, 19.050 µg/m^3, and February, 18.838 µg/m^3, but these values do not exceed the maximum permissible concentration.

The highest concentrations of nitrogen dioxide are recorded in the cold season of the year, when the air temperature is low. From this it can be concluded that in the warm season of the year there are more active convective motions, which have an important role in air purification.

Higher air pollution values are recorded near high-traffic arterial roads, industrial waste landfills, in the area of uncontrolled waste dump sites etc.

REFERENCES

1. Ciulache S., 2004, Influenţa condiţiilor meteorologice şi climatice asupra poluării aerului, Com. Geogr. V, Editura Univ. Bucureşti.
2. Dumiter A. F., 2005, La pollution et la protection de l'atmosphere dans la ville d'Oradea, Analele Universităţii din Oradea, Seria Geografie, Tom.XV, pag. 157-164.

3. Gavrilescu E., 2008, Surse de poluare şi agenţi poluanţi ai mediului, Editura Sitech, Craiova.
4. Köteles N., Pereş A.C., 2010, Air pollution with powders in suspension (pm_{10} and $pm_{2.5}$) in Oradea city area. Analele Universităţii din Oradea, Fascicula Protecţia Mediului, Vol XV, Anul 15, Editura Universităţii din Oradea, 2010, 1224-6255, pag. 657-660.
5. Köteles N., 2011, Noţiuni practice şi teoretice de poluare şi depoluare a aerului atmosferic, Editura Universităţii din Oradea, ISBN 978-606-10-0694-6.
6. Köteles N., Domuța C., Pereş A. C., 2016, The Level of Air Pollution with Nitrogen Dioxide in the City of Satu – Mare in 2014 – 2015, Natural Resources and Development, vol. 6, eISSN 2601-5676, pag. 79 - 84
7. Măhăra Gh., 1976, Poluarea aerului şi a apelor din spaţiul Câmpiei Crişurilor şi a zonelor limitrofe, în Buletinul Societăţii de Ştiinţe Geografice din RSR, Seria IX, Vol IV (LXXIV), Bucureşti 1976, pag.170-177.
8. Mănescu S., M. Cucu, Diaconescu M., 1994, Chimia sanitară a mediului, Editura Medicală Bucureşti.
9. Moza A. C., 2009, Clima şi poluarea aerului în bazinul hidrografic Crişul Repede, Editura Universităţii din Oradea, ISBN 978-973-759-775-5, nr. pag. 286;
10. Moza A. C., Köteles N., 2010, Pollution with sedimentary powders in Crişul Repede drainage area. International Symposium „Trends in the European Agriculture Development", May 20-21, 2010, Timişoara, Banatś University of Agricultural Sciences and Veterinary Medicine Timişoara, Faculty of Agriculture and University of Novi Sad Faculty of Agriculture.
11. Pereş A. C., Köteles N., 2010, Aspects on Air Pollution With Nitrogen Dioxide in the City Area Oradea, Analele Universităţii din Oradea, Fascicula Protecţia Mediului, Vol. XV, Anul 15, Editura Universităţii din Oradea, 2010, ISSN 1224-6255, pag. 735-739.
12. Pereş A. C., 2011, Poluarea şi autopurificarea atmosferei, Editura Universităţii din Oradea, ISBN 978-606-10-0693-9.
13. Pereş A. C., Köteles N., Pârloiu C.M., 2011, The Level of Air Pollution with Depositing Dust in Bihor County. Analele Universităţii din Oradea, Fascicula Protecţia Mediului, Vol. XVII, Anul 16, Editura Universităţii din Oradea, 2011, ISSN 1224-6255, pag. 793-80
14. *** Ministerul Apelor şi Protecţiei Mediului, 2002, Normativ din 25 iunie 2002, privind stabilirea valorilor limită, a valorilor de prag şi a criteriilor şi metodelor de evaluare a dioxidului de sulf, dioxidului de azot şi a oxizilor de azot, pulberilor în suspensie (PM_{10} şi $PM_{2,5}$), plumbului, benzenului, monoxidului de carbon, şi ozonului în aerul înconjurător, Bucureşti.
15. http://apmsj.anpm.ro/
16. STAS 12574-87