

AIR QUALITY MONITORING FROM NO₂ POLLUTION IN PRISHTINA, DURING THE MONTHS: MARCH, APRIL AND JUNE, FOR THE YEAR 2017

Rushan Ceka¹, Granit Kastrati^{4*}, Murtezan Ismajli¹, Mile Serbinovski¹, Kemajl Bislimi², Bekim Troni³

¹South East European University, Faculty of Contemporary Sciences and Technologies,
Ilindenska 335, Tetovo Macedonia

²Department of Biology, Faculty of Mathematics and Natural Sciences, University of Prishtina,
Mother Teresa 5, Prishtina 10000, Kosovo

³University of Mitrovica "ISA Boletini" Street.Parku industrial p.n 40000 Mitovicë- Kosovo

⁴University of Peja "Haxhi Zeka", Faculty of Agribusiness, Street, UÇK 30000, Pejë-Kosovo

*Corresponding Author

ABSTRACT

The atmosphere is a dynamic natural gas system that is essential to life on planet Earth. In the atmosphere, there is Air, which is a very important element for human health and, in general, for the environment that surrounds us, and which is constantly exposed to the effects of pollution. In general, air pollution comes from human activities, but it can also be affected by natural phenomena. Some air pollutants may also have global impacts - e.g. greenhouse effect or damage of the ozone layer.

Prishtina has been exposed to urban and infrastructural development as well as environmental pollution from many spheres in recent years, one of these areas that directly affects the human factor is air pollution. The geographical position of the city of Pristina is such that it accepts pollution from the energy industry of KEK, but there is a relatively high pollution from vehicle gas emissions (Prishtina, 2013).

In this research, we will monitor the air quality from the NO₂ pollution in the municipality of Prishtina for the months: March, April and June 2017. Air quality analyzes will be taken from the measurements to be carried out in these three months, by measuring NO₂, which will be

measured for ($\mu\text{g} / \text{m}^3$), in full compliance with the Directive (Official Journal of the European Union, 2008), Law on Air Pollution Protection (No. 03/L-160).

Keywords: Air, pollution, measurement, monthly average, quality, NO_2 , station.

INTRODUCTION

Air is part of the environment that can easily be polluted by inorganic or organic pollutants. Air pollution is one of the most serious problems in the world. It has to do with the entry into the atmosphere of polluting substances that affect people's health and the environment. The atmosphere is one of the most important ways of distributing polluting substances to the environment. The distances of transport of polluting substances in the atmosphere can be several hundred to thousands of kilometers. This causes atmospheric pollution to often have a regional character and even a global character. These pollutants are emitted from various sources and some of them act with each other to form new compounds in the air. Through the atmosphere, it occurs not only the distribution of polluting fluids (e.g. organic compounds), but also of solids in the form of dust e.g. of heavy metals.

The concept of pollution involves a sense of degradation, loss of quality, removal from purity and negative environmental impacts (Godish, 2005).

Until 2010, the air quality in the city of Pristina has been evaluated visually, through respiratory senses, or through a few small measurements of the parameters that should be monitored. From 2008 to 2012, MESP, through direct investments from its budget and European Commission support, Pristina today has a relatively satisfactory system of air quality monitoring. As per the number of monitoring stations, (4 in total, 2 out of function (Pristina Municipality, 2013).

Five parameters are currently being monitored, while the EU requires measuring at least 12 parameters, including benzene, heavy metals, etc. In Pristina, through two monitoring stations, there parameters are monitored: NO_x , SO_2 , $\text{PM}10/\text{PM}2.5$, Ozone and CO (Prishtina, 2013).

Air is monitored in Kosovo (Pristina) by state institutions (HIK, NIPH, and INKOS) and by economic operators with an impact on air quality. The air quality monitoring network in Kosovo is not yet complete. An automatic air quality monitoring station is located at the HIK yard in Pristina. This apparatus analyzes the levels of: SO_2 , $\text{PM}10$, NO_2 , NO_x , CO and O_3 (Prishtina, 2013).

According to the Pristina Municipal Development Plan, it is estimated that in this municipality, air pollution causes 835 premature deaths, 310 new cases of chronic bronchitis, 600 hospital admissions and 11,600 urgent visits each year (Prishtina, 2013).

METHODS OF MEASUREMENTS

Measurement of NO₂ will be made by indirect methods, through adequate pipes for air pollution measurements. Measurement of air pollution by this method is done by placing two pipes in each of the places/locations where air pollution is more obvious. The pipes should be placed vertically, 5 cm away from the wall. The white cap (cover) should stand on the bottom side. During the measurements, the cap should be removed from the tube and stored in a safe place, because after the pipe removal, it is placed in it, the values are read and it is sent to the lab. Installation of pipes should be done properly, taking care not to place them in very high positions, because the higher the position, the less is the air pollution. Also, while placing the pipes, we must be careful not to place them too low, because they could be damaged.

NO₂ measurements have been made according to this schedule:

- First measurements of NO₂ have been made in March. The measurement time was from 02.03.2017 until 29.03.2017. We have focused on 10 different localities, with 10 monitoring stations, with two measuring pipes each;
- The second measurements have been made in April. The measurement time was from 13.04.2017 until 30.04.2017. We have focused on 10 different localities, with 10 monitoring stations, with two measuring pipes each, and
- Third measurements have been in June. The measurement time was from 03.06.2017 to 06.07.2017. We have focused on 5 different localities, with 5 monitoring stations, with two measurement pipes each.

After receiving the results from the monitoring stations, all the results were combined and sent for analysis. Analyses have been made at the international institute in London - Gradko Environmental.

RESULTS

NO₂ measurements were carried out on the main streets of Prishtina during the months of March, April and June. The analysis and processing of the measurements has always been calculated for $\mu\text{g}/\text{m}^3$, in full compliance with the Directive (2008/50/EC), Law on Air Pollution Protection (No. 03/L-160), and we have the following results:

Table 1: First measurements results of NO₂ results in March

Measurements time	From 02.03.2017 until 29.03.2017.										
Measurements according to monitoring stations	Sta. 1 Sta. 2 Sta. 3 Sta. 4 Sta. 5 Sta. 6 Sta. 7 Sta. 8 Sta. 9 Sta. 10										Monthly average of all monitoring stations
Measurements in $\mu\text{g}/\text{m}^3$	29.62	32.56	40.20	38.56	29.85	28.04	20.85	30.05	31.07	23.90	30.47

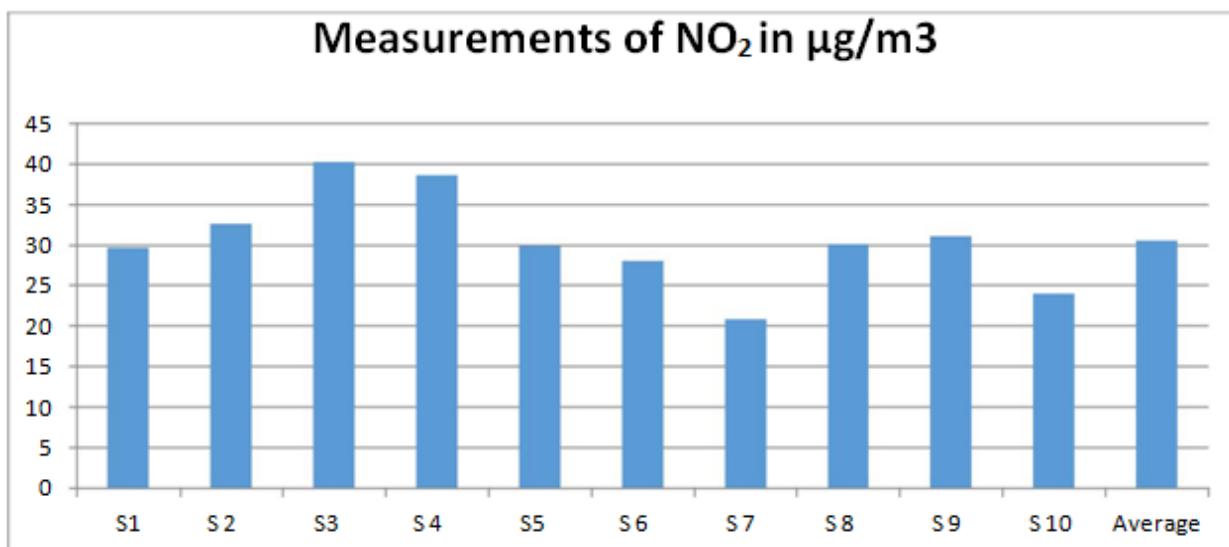


Figure 1: NO₂ Results during March

The figure shows the values of NO₂ measurements according to the results in 10 locations during March, the monthly average for each monitoring station, and the monthly average of all monitoring stations with a numerical value of 30.47, always calculated in $\mu\text{g}/\text{m}^3$. The minimum numerical value of the monthly average is recorded at monitoring station 7, whereas the maximum value is recorded at monitoring station 3.

Table 2: Second measurements results of NO₂ results in April

Measurements time	From 03.04.2017 until 30.04.2017.										Monthly average of all monitoring stations
Measurements according to monitoring stations	Sta. 1	Sta. 2	Sta. 3	Sta. 4	Sta. 5	Sta. 6	Sta. 7	Sta. 8	Sta. 9	Sta. 10	
Measurements in µg/m ³	29.04	27.89	45.46	32.83	35.10	38.90	36.17	31.40	26.63	55.37	35.88

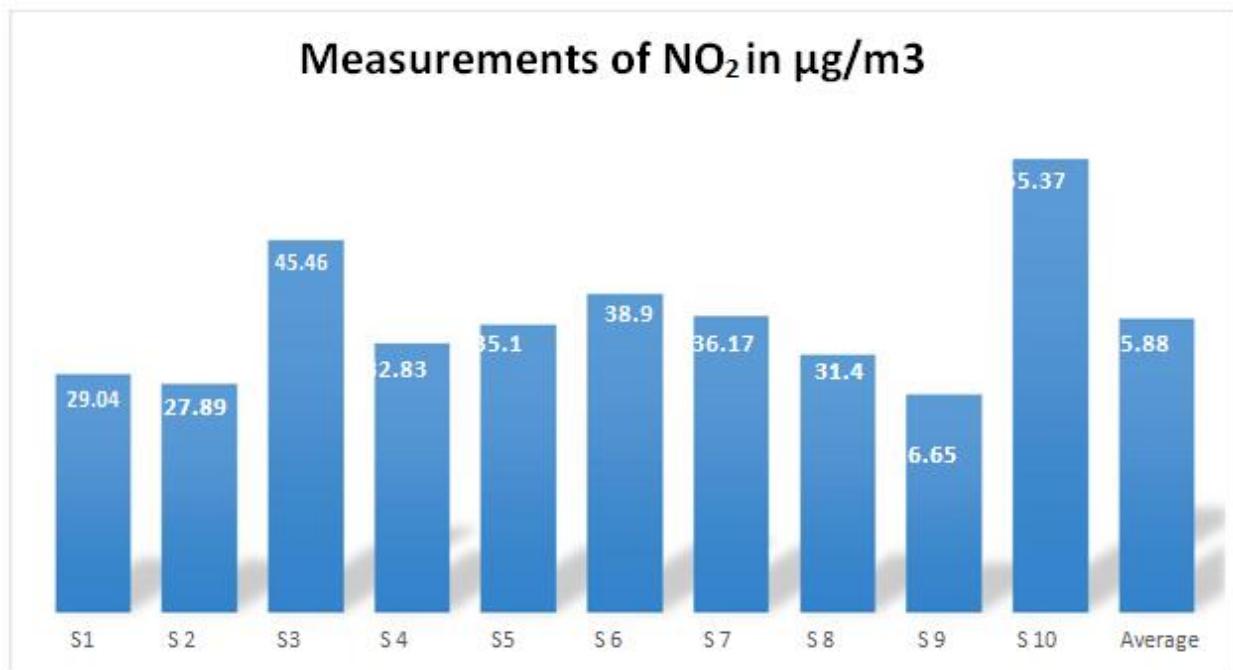


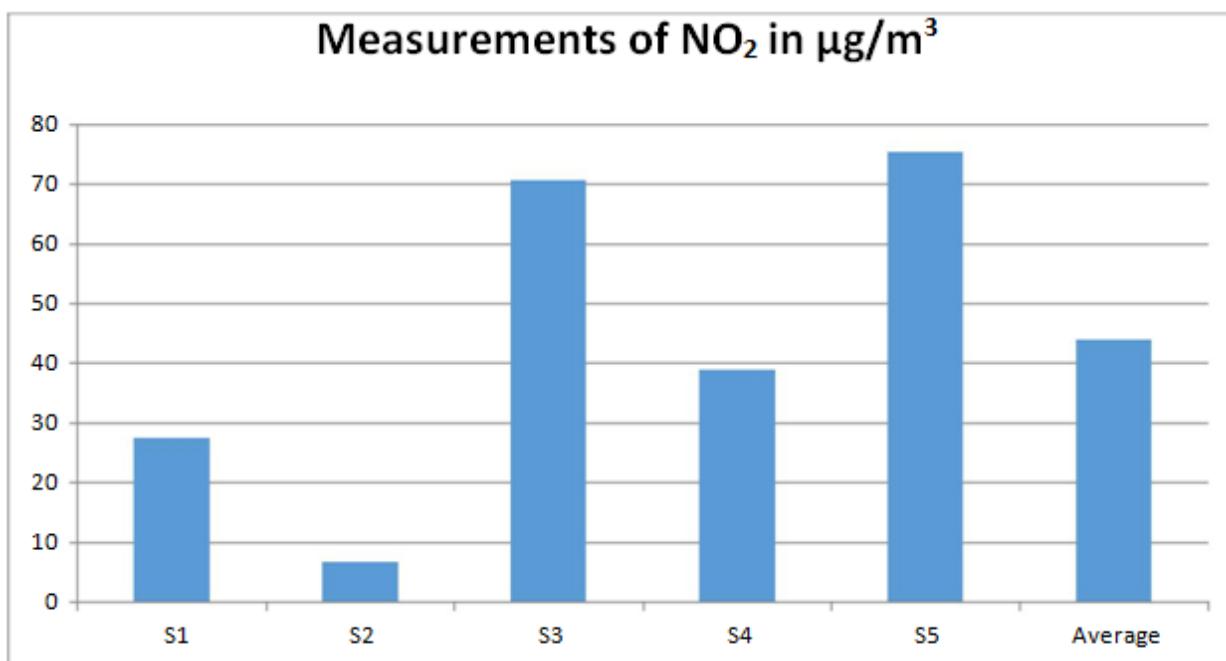
Figure 2: Results of NO₂ during April

This figure shows the values of NO₂ measurements according to the results in 10 locations during April, the monthly average for each monitoring station, and the monthly average of all monitoring stations with a numerical value of 35.88, always calculated in µg/m³. From these

measurements, the minimum value of the monthly average is recorded at monitoring station 9, whereas the maximum numerical value is recorded at monitoring station 10.

Table 3: Third measurements results of NO₂ results in June

Measurements time	From 03.06.2017 until 06.07.2017					Monthly average of all monitoring stations
Measurements according to monitoring stations	Sta. 1	Sta. 2	Sta. 3	Sta. 4	Sta. 5	
Measurements in $\mu\text{g}/\text{m}^3$	27.49	6.70	70.69	38.96	75.36	43.84

**Figure 3: Results of NO₂ during June**

This figure shows the values of NO₂ measurements according to the results in 5 locations during June, the monthly average for each monitoring station, and the monthly average of all monitoring stations with a numerical value of 43.84, always calculated in µg/m³. From these measurements, the minimum numerical value of the monthly average is recorded at monitoring station 2, whereas the maximum value is recorded at monitoring station 5.

CONCLUSION

The above tables and figures show the results of the NO₂ measurements which were made in March, April and June 2017, in different locations with the respective monitoring stations.

Based on Directive 2008/50/EC, Law on Air Pollution Protection (No. 03/L-160), Administrative Instruction on Boundary Values - Air Quality Standards, No.02/2011, from the obtained results of the monthly averages of the NO₂ from the monitoring stations, there are excesses of the air quality index above the permissible threshold of 40 µg/m³, which is harmful to human health.

Of the 10 different monitoring stations in the March period, we have a monthly average exceeding only at monitoring station 3 with a numerical value of 40.20 µg/m³. While in the second measurements of April, from 10 different monitoring stations, we have excess of the monthly average at monitoring station 3 with a numerical value of 45.46 µg/m³ and at monitoring station 10 with a numerical value of 55.37 µg/m³. Meanwhile, in the third measurements of June, in 5 different monitoring stations, we have excess the average values at monitoring station 3 with a numerical value of 70.69 µg/m³ and at monitoring station 5 with a numerical value of 75.36 µg/m³. The reasons why this excess has occurred during these months are heavy traffic during these months, followed by various sectors of industry.

During our calculations and analysis, we came to the conclusion that: the monthly average in 10 monitoring stations for March is 30.47 µg/m³, and for April it is 35.88 µg/m³. While in the 5 different monitoring stations of June, the monthly average is 43.84 µg/m³.

By comparing our empirical results with the dissertation thesis from Besa Veseli - "Impact of Emission of Harmful Substances on Air Quality in the Republic of Kosovo", it is evident that from our results, there are excess of the monthly averages at any time period of the measurements, whereas according to this dissertation, throughout the months of the year, there have been no excess of the monthly average values. The average annual value is 20.82 µg/m³.(B. Veseli).

Based on our results, we can conclude that; Although Kosovo is a very small country, Pristina is still a very polluted place, and as a result, it comes to a variety of diseases in the human body,

which have negative effects on human health and adversely affect in ecosystems and in the natural heritage.

Air pollution, from the results presented in this research paper, is of great concern to the citizens of the Municipality of Prishtina and to the residents of Kosovo in general.

REFERENCES

- Godish, T. (2005). *Air quality*. This edition published in the Taylor & Francis e-Library.
- Komuna e Prishtinës. (2013). *Vlerësimi strategjik mjedisor i planit zhvillimor urban të Prishtinës 2013-2023*. Prishtinë: Komuna e Prishtinës.
- Official Journal of the European Union. (2008, 11 6). 2008/50/EC.
- Prishtinës, K. e. (2013). *Plani Zhvillimor Komunale i Prishtinës*. Prishtinë: Komuna e Prishtinës. Besa VESELI “Impakti i Emisionit të Substancave të Dëmshme në Cilësinë e Ajrit në Republikën e Kosovës”