RJC

RASĀYAN ***J. Chem.***
Vol. 12 | No. 2 |625 - 629| April - June | 2019
ISSN: 0974-1496 | e-ISSN: 0976-0083 | CODEN: RJCABP
http://www.rasayanjournal.com
http://www.rasayanjournal.co.in

SO_2 CONCENTRATION IN THE AIR IN PRISHTINA DURING THE MONTHS OF MARCH AND JUNE 2017

R.H. Ceka[1], N.V. Bajraktari[3*], M.A. Ismaili[1], M.S. Srbinovski[1], G.F. Kastrati[3] and E.S. Kabashi-Kastrati[2]

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

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

[3]University of Peja "Haxhi Zeka", Faculty of Agribusiness, St. UÇK 30000, Pejë, Kosovo

*E-mail: naser.bajraktari@unhz.eu

ABSTRACT

The atmosphere is a dynamic natural gas system that is essential to life on planet Earth. Air pollution is an environmental and social problem, as it leads to a number of harmful effects on human health, ecosystems, the environment and the climate. Air pollution constitutes the greatest environmental health risk in the city of Pristina. Air pollutants are emitted from anthropogenic and natural sources; they can be transported or formed over long distances and can affect large areas. Some air pollutants float in the environment for long periods and can accumulate in the environment and in the food chain, affecting humans and animals not only through air intake but through water and food intake too. Air pollution is a complex problem that poses multiple challenges in terms of management and mitigation. Effective action to reduce the impact of air pollution requires some good understanding of the sources that cause it, as well as knowledge of the daily status of air quality and its impact on humans and ecosystems. In this research paper, we carried out the monitoring of the air quality in terms of it being polluted with SO_2 in the municipality of Pristina for the months March and June 2017. Air quality analyses have been taken from the SO_2 measurements made in these two months, through monitoring stations. The elaboration of the results are always done for (μg/m3), in full compliance with the Directive.

Keywords: Air, Pollution, Measurement, Monthly Average, Quality, SO_2, Monitoring Stations.

INTRODUCTION

The atmosphere is a dynamic natural gas system that is essential to life on planet Earth. There is air in the atmosphere, which is a very important element for human health and, in general, for our environmental surroundings, and which is constantly exposed to pollution impacts. In general, air pollution is caused by human activities, but it can also be affected by natural phenomena. Sulfur dioxide (SO_2) is emitted mainly from the combustion of fuels containing sulfur. The three constituents of flue gases which mainly affect the acidity of the rains are CO_2, SO_2 and NO_2. The SO_2 emitted to the environment combines with water forms sulfuric acid and similarly, NO_2 formed nitric acid[8]. During the rainy season, the acid formed in the atmosphere falls into ground[7]. The main anthropogenic emissions of SO_2 derive from stationary production of energy, industry, and combustion of commercial, institutional and household fuel. Volcanoes are the largest natural source of SO_2[3]. Air pollution occurs when substances are released into the air in amounts that may harm the health of humans, animals and plants or cause material damage. The major developments in the economy and infrastructure in the last decade have prompted us to have immediate demands for raising our awareness and the environmental culture in general. Kosovo, as a new transition country with multiple challenges, is developing large infrastructure projects in the field of traffic and transport as well as spatial planning.

Rasayan J. Chem., 12(2), 625-629(2019)
http://dx.doi.org/10.31788/RJC.2019.1225085

CrossMark

The geographical position of the city of Pristina is such that it receives pollution from the KEC energy industry but there is also a relatively high level of pollution caused by vehicle emissions. Pollution includes the sense of degradation, loss of quality, distancing from cleanliness and negative environmental impacts[4,7] . Although in Europe and the Balkan states, air quality monitoring has been done for a long time now, in the city of Pristina, this monitoring was only evaluated visually until 2010, through respiratory senses, or through some superficial measurements. From 2008 to 2012, the MESP through direct investments from its own budget and some assistance from the European Commission, Pristina today has a relatively satisfactory system for monitoring air quality. There is four monitoring station in total, two of which are currently out of function.[5] Five parameters are now being monitored, while the EU requires measuring at least 12 parameters, including heavy metals, benzene and so on. In Pristina, these two parameters are monitored through two monitoring stations: NO_2, SO_2, PM10/PM2.5, ozone and CO[5]. Data on air quality in Kosovo are deficient due to the lack of an air quality monitoring network. In addition, no pollutants have been inventoried and the air pollutants cadastra has not been compiled yet[8].

EXPERIMENTAL

SO_2 measurements were done by indirect methods, through adequate pipes for measuring air pollution. The measurement of air pollution by using this method is done through some pipes, which are placed at each monitoring station; two pipes are placed in locations where there is more air pollution.

Tubes do not fit on the edges of the buildings, because air turbulence will affect the measurements. In addition, the most crowded roads may also not produce concise measurements if they are in open areas. On the other hand, higher concentrations can be observed on a less crowded road with high buildings on both sides (the effect of the road canyon). In addition, it is not recommended to place the pipes near trees and shrubs, near air-conditioning devices, or heat pipes. The air will circulate within a tube that has an open end, so it is important that the end of the tube be placed in a location where there is free air circulation. For this reason, the tubes are held with some clips keeping them at least 5cm away from the walls, because air circulation affects the measurements[7]. The white cover should stand on the bottom side. During the measurements, this cap should be removed from the tube and stored in a safe place. After the tube has been removed, the cap is placed in it; values are read and then sent to the lab. The installation of the pipes should be done appropriately, being careful not to place them in very high positions, because the higher the air pollution is the lesser. In addition, when placing the pipes, we must be careful not to put them too low, because they can be damaged.

The measurement of these pollutants was done by following this schedule:

- The first measurements of SO_2 were done in March. The measurement period was from 02.03.2017 to 29.03.2017. We focused on ten different locations, with ten monitoring stations and two measurement pipes;
- The second measurements of SO_2 were done in June. The measurement period was from 03.06.2017 to 06.07.2017. We focused on five different locations, with five monitoring stations and two measurement pipes[7].

After obtaining the results from different roads in Pristina, all of the results were collected and sent to be examined. The examinations were done in a renowned institute in London - Gradko Environmental.

RESULTS AND DISCUSSION

The SO_2 measurements were carried out along the main roads in Pristina, through monitoring stations during the months of March and June. The analysis and processing of the measurements were done by being calculated in µg/m3, in full compliance with the Directive (Official Gazette of the European Union, 2008), (Kosovo Parliament - Law on Air Protection from Pollution (No. 03 / L-160), (2010), and the following results were obtained:[1,2,7]

Initial Results from SO_2 Measurements, March 2017

The above charts include the numeric values of measurements of SO_2, based on the results from ten locations during the month of March, the monthly average for every monitoring station, as well as the monthly average of all ten monitoring stations (3.64 µg/m^3). The lowest numeric value of the monthly

average was recorded in station 7 (3.02 µg/m^3), whereas the highest value was recorded in station 10 (4.47 µg/m^3)[7].

If we refer to Directive 2008/50/EC, the Law on Protection of the Air from Pollution (No. 03/L-160), Administrative guidelines (No. 02/2011) on norms on air quality, we can see that according to the monthly average values there are no values that exceed the SO_2 limits in any of the examined stations. The presented data show that the SO_2 concentrations in the air in Pristina is at acceptable levels, since it is far from the critical values in terms of annual averages of these gasses (20 µg/m^3SO_2).

Table-1: Numeric Values of SO_2, per Station, March 2017

Measurement Time	From 02.03.2017 to 29.03.2017										Monthly Average from All Stations
Measurements per Station	1	2	3	4	5	6	7	8	9	10	
Measurements in µg/m^3	3.44	3.95	4.39	3.06	3.92	3.02	3.57	3.53	3.14	4.47	3.64

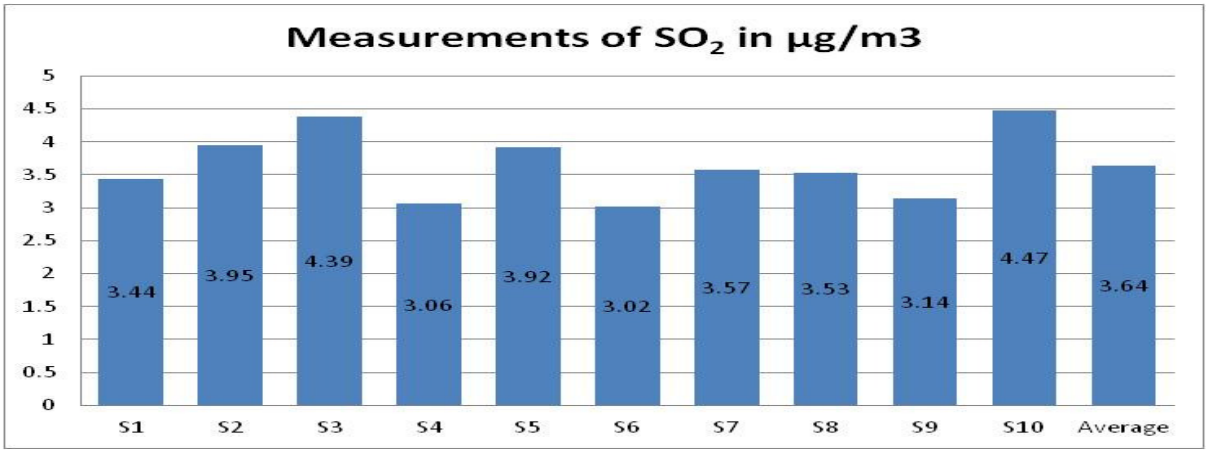

Fig.-1: Values of SO_2, per Station, March 2017

Second-round Results from SO_2 Measurements, June 2017

The air monitoring continued in the month of June, by doing the second-round measurements in several locations in Prishtina[7]. There were five locations with five monitoring stations where the presence of SO_2 was measured. The results are as follows:

The above charts include the numeric values of measurements of SO_2, based on the results from five locations during the month of June, the monthly average for every monitoring station, as well as the monthly average of all five monitoring stations (2.13 µg/m^3). The lowest numeric value of the monthly average was recorded in station 3 (1.47 µg/m^3), whereas the highest value was recorded in station 4 (2.91 µg/m^3). If we refer to Directive 2008/50/EC, the Law on Protection of the Air from Pollution (No. 03/L-160), Administrative guidelines (No. 02/2011) on norms on air quality, we can see that according to the monthly average values there are no values that exceed the SO_2 limits in any of the examined stations. The presented data show that the SO_2 concentrations in the air in Pristina is at acceptable levels, since it is far from the critical values in terms of annual averages of these gasses (20 µg/m^3SO_2).

Table-2: Numeric Values of SO_2, per Station, June 2017

Measurement Time	From 03.06.2017 to 06.07.2017					Monthly Average from all Stations
Measurements per Station	SP 1	SP 2	SP 3	SP 4	SP 5	
Measurements in µg/m^3	2.44	2.04	1.47	2.91	1.79	2.13

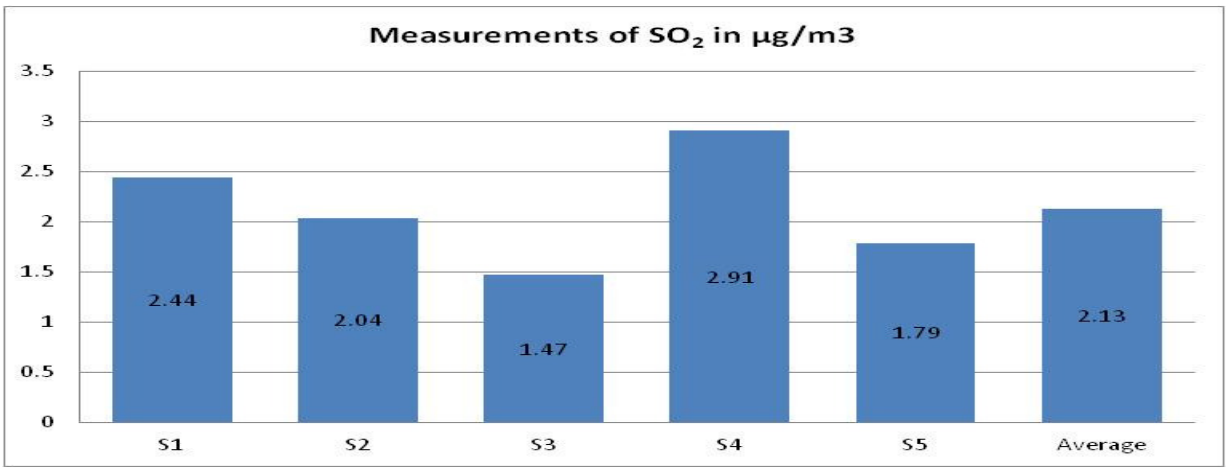

Fig.-2: Values of SO_2, per Station, June 2017

CONCLUSION

According to Directive 2008/50/EC, the Law on Protection of the Air from Pollution (No. 03/L-160), (Government of Kosovo - Administrative guidelines on allowed levels of pollution-Norms of Air Quality, No. 02/2011), we analyzed and processed the results of the SO_2 presence for months of March and June.

The former charts include the numeric values of measurements of SO_2, based on the results from ten locations during the month of March, the monthly average for every monitoring station, as well as the monthly average of all ten monitoring stations (3.64 µg/m^3). The lowest numeric value of the monthly average was recorded in station 7(3.02 µg/m^3), whereas the highest value was recorded in station 10 (4.47 µg/m^3).

The latter charts include the numeric values of measurements of SO_2, based on the results from five locations during the month of June, the monthly average for every monitoring station, as well as the monthly average of all five monitoring stations (2.13 µg/m^3). The lowest numeric value of the monthly average was recorded in station 3 (1.47 µg/m^3), whereas the highest value was recorded in station 4 (2.91 µg/m^3). If we refer to Directive 2008/50/EC, the Law on Protection of the Air from Pollution (No. 03/L-160), Administrative guidelines (No. 02/2011) on norms on air quality, we can see that according to the monthly average values there are no values that exceed the SO_2 limits in any of the examined stations.

SO_2 concentrations in the air in Pristina were not recorded in 2015 and 2016 either, in terms of their exceeding the allowed limits of 20 µg/m^3 of SO_2.

SO_2 concentrations in the air are below the critical values in many other European countries. Out 37 European countries, 27 reported the measurements of SO_2 with 75% data coverage in 2015 from 1,322 monitoring stations[3]. The SO_2 concentrations in the air (in %) are still lower than the critical values, even though the allowed daily average limit suggested by the WHO is often exceeded. In 2015, six stations (28) recorded concentrations above the allowed limits per hour length. Four stations (29) also recorded high SO_2 concentrations per daily amount. In addition, 30% of the stations had measured levels of SO_2 concentrations in the air higher than the recommended guidelines of 20 µg/m^3 by the WHO in 2015 (Air quality in Europe-2016 report, 2016).

REFERENCES

1. EU, 2008, Directive 2008/50/EC of the European Parliament and of the Council of 21 May 2008 on Ambient Air Quality and Cleaner Air for Europe (OJ L 152, 11.6.2008, p. 1–44) (http://eur-lex.europa.eu/LexUriServ/LexUriServ.douri=OJ:L:2008:152:0001:0044:EN:PDF) accessed 4 September 2015.
2. MMPH, (Kosovo Parliament - Law on Air Protection from Pollution (No. 03 / L-160) (2010)
3. EEA, Air Quality in Europe- 2016 Report, EEA Report No 28/2016, European Environment Agency(2016).
4. Godish. Air Quality. New York: Lewis Publishers A CRC Press Company Boca Raton London New York Washington, D.C.(2003)

5. Komuna e Prishtinës, Vlerësimi strategjik mjedisor i planit zhvillimor urban të Prishtinës 2013-2023, Prishtinë (2013)
6. Goverment of Kosovo - Udhëzimin Administrativ për Vlerat Kufitare-Normat e Cilësisë së Ajrit, Nr.02/2011 (2011)
7. R. Ceka, G. Kastrati, M. Ismajli, M. Serbinovski, K. Bislimi, B. Troni, *International Journal of Agriculture and Environmental Research*, **4(1)**, (2018)
8. D. S. N. Prasad and R. Sharma, S. Acharya, M. Saxena, A. K. Sharma, *Rasayan Journal of Chemistry*, **3**, 328(2010)
9. https://www.eea.europa.eu/

[RJC_5085/2018]