Monitoring of Air Quality in Pristina for the Time Period of November, December 2016 and January 2017

Shala Shkumbin[1], Ceka Rushan[2*], Fetoshi Osman[3], Shala Astrit[3*]

[1] University for Business and Technology, Faculty of Engineering Energy, Kalabira 10000, Pristina, Kosovo
[2]South East European University, Faculty of Contemporary Sciences and Technologies, Ilindenska 335, Tetovo Macedonia
[3]University of Applied Sciences, Faculty of Tourism and Environment, University 70000, Ferizaj, Kosovo
[3*] Department of Geography, Faculty of Mathematics and Natural Sciences, University of Pristina, Mother Teresa 5, Pristina 10000, Kosovo

Corresponding author: rushanceka@hotmail.com

Abstract: *Although city of Pristina is a very small country with an area of approximately 572 km2, the pollution in a municipality level is very big, but the main pollution problems are in urban areas which are highly contaminated. The main source of this pollution is: urban and industrial waste dumps (with various local impact), Kosovo Energy Corporation (KEC) power stations - road transport, central heating companies (in Pristina), wood and lignite for household heating. The greatest pollutants are; volatile organic compounds (VOC), CO_2, NOx, CO, sulfur compounds SO2, PM10, PM2,5 etc. In the case of this research we have presented the monitoring of air quality in the region of Pristina where the analysis of air quality are taken from Kosovo Hydrometeorological Institute, for the time period of November, December 2016 and January 2017 by measuring these parameters, SO_2, CO, NO_2, and O3, PM10 and PM 2.5 all these being measured (µg/m3), and always by referring to the directive (2008/50 / EC) and the Law on Air Protection from pollution (no. 03 / L-160).*

Keywords: *air pollution, contamination, industries, organic compounds, observation, analysis, measuring, law, CO, NOX, SO_2, O_3, PM10, PM2,5,*

1. Introduction

Pollution occurs when pollutants contaminate the natural environment. It is caused mainly by human activities, but it may also be the result of natural disasters.Pollution has numerous adverse effects on living organisms, from slight to very severe or even life threatening.One of the biggest problems is the air pollution which is the accumulation of hazardous substances into the atmosphere, where they endanger human lives and other living beings. The major pollutants are: CO_2, NOx, CO, SO_2, emitted suspended particles of PM10 and PM2,5. The main sources of these pollutants are: industries, transport, households, sewage, waste, agriculture, pesticides and volcanic activities. Since pollution today is a global problem, guidelines, conventions, protocols and laws are established to protect the air and help relevant institutions which work to monitor and maintain air quality.

2. Material and Methods

Air quality monitoring in Pristina is conducted in two stations, one of which is located in an urban area (Rilindja) and the other one in a suburban background (IHMK). These stations conduct monitoring of these parameters: SO_2, NO_2, O_3, CO, PM10 and PM2.5.
The first automatic monitoring station of air quality is installed in IHMK, which is equipped with an automatic analyzer for sulfur dioxide (SO_2), nitrogen oxides (NOx), carbon monoxide (CO), ozone (O_3) and dust particles (PM10, PM2.5).The second station is situated in the center of Pristina, inside the courtyard of government building (the former building of Rilindja). This station is a donation from the

Slovenian government, it is equipped with a three channel optical analyzer (Grim Model 180), configured to measure particulate matter (PM10, PM2.5) and other parameters. (EU, 2013).
During air quality monitoring to determine the concentration of pollutants, standard measuring methods are used. These methods are:
• SO2: EN 14212- ultraviolet fluorescence
• NO2 and NOx: EN 14211- chemiluminescent
• CO: EN 14626- infrared spectroscopy (infra-red) non dispersive
• O3: EN 1462 - ultraviolet photometry
• PM10: EN 12341- beta attenuation (Sharp) and optical Measures (Grimm M180)
• PM10: EN 12341- gravimetric.

3. Results And Discussion

The air polluting substances results are given in average and maximum parameters values of SO2, NO2, O3, CO, PM10 and PM2, analyzed by the Hydrometeorological Institute of Kosovo, for the months of November, December 2016 and January 2017.
These results are shown below.

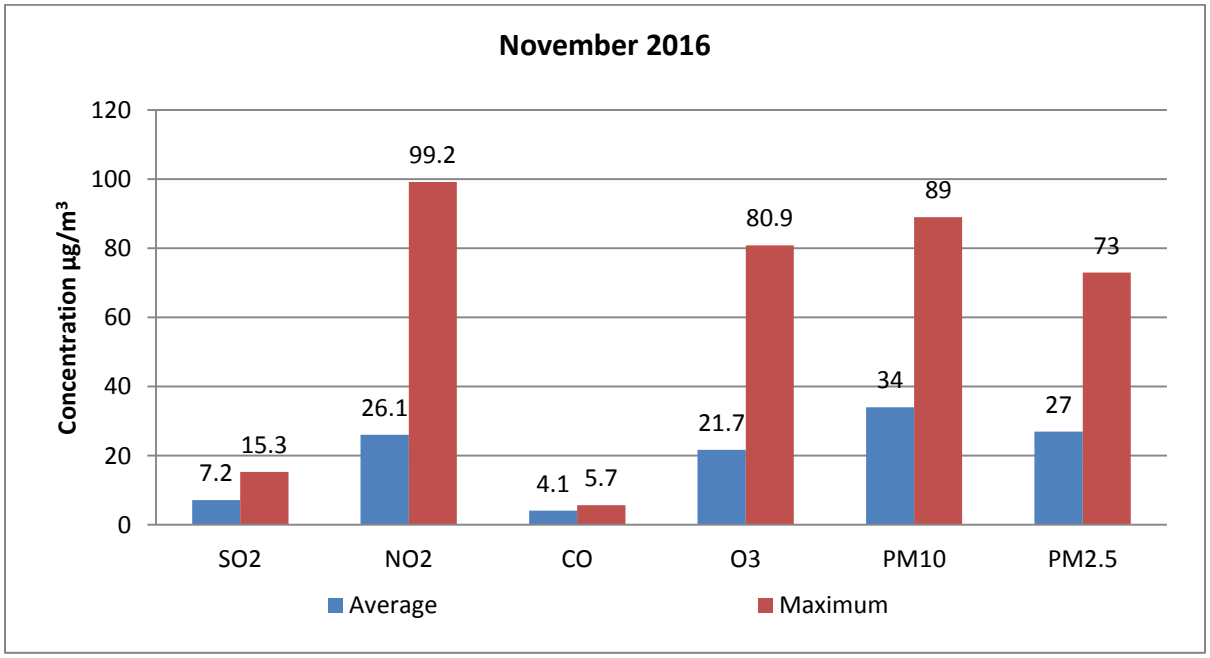

Fig. 1.The results of analysis for November, 2016

Sulfur dioxide - is the most frequent contaminant of the atmosphere in urban environments, released by the burning of fossil fuels (industry, households, transport). Sulfur dioxide causes acidification of soils, streams and lakes and it affects the damage of building materials, including cultural heritage. Based on the results for the months of November, December 2016, and January 2017. As shown in (Fig. 1, 2, 3), for sulfur dioxide can be ascertained that this parmeter has not exceeded values, within the year, has not exceeded 125 ug / m3 the average rate permitted hours under Directive (2008/50 / EC), but there are differences in months, where in the month of January 2017 are seen higher values to 37.9 g / m3 than in November and December 2016
Nitrogen oxides (NOx) - it includes a general term for a group of highly reactive gases, which contain nitrogen and oxygen. Nitrogen oxides (NOx) formed during combustion of coal and are primarily nitric oxide (NO) and nitrogen dioxide (NO2). Together these are known as commonly referred NOX. Many of

nitrogen oxides are colorless and odorless. However, nitrogen dioxide (NO2) along with particles in the air can often be seen as a thin layer of red-brown shape in many urban areas. As shown in (Fig. 1, 2, 3) for nitrogen oxides (NOx) can be ascertained that this parameter has exceeded the values based on the World Health Organization (WHO) standards for the month of January 2017, the analyzed values were 212 g / m3, whereas in November and December 2016 there have been no exceedance.

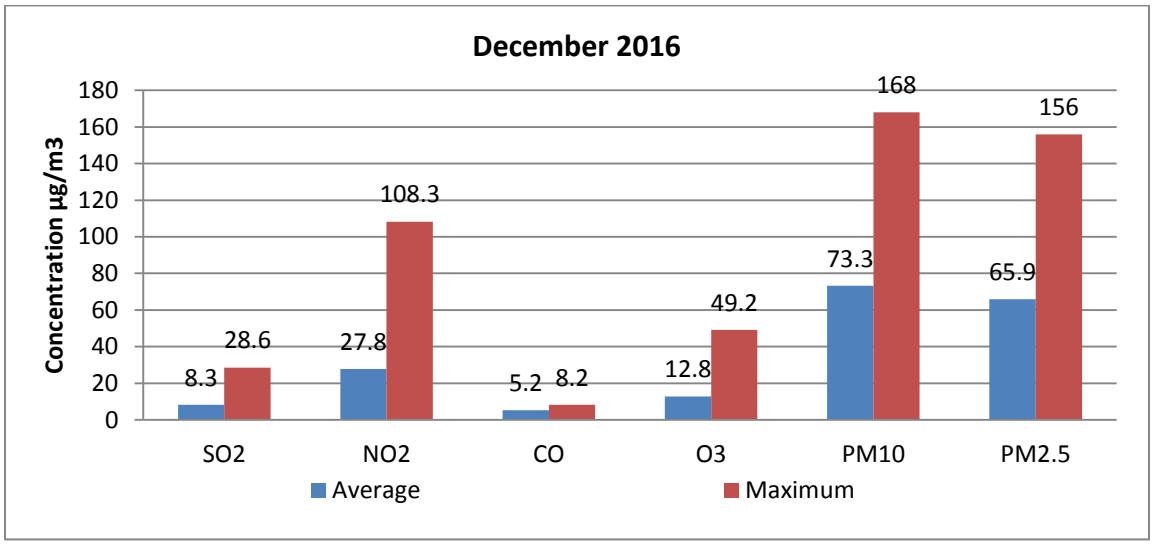

Fig. 2.The resultsof analysis for December, 2016

Carbon monoxide (CO)- is a colorless, odorless and tasteless gas, is lighter than air, is flammable and does not help the burning. CO is a widespread air pollutant which is formed during fossil fuel burning. From the results (Fig. 1, 2, 3) can be ascertained that this parameter has not exceeded values based on WHO standards for the month of January 2017, the analyzed values are 17µg / m3, and there is no increase of emission limit value when compared with the results of months of November and December 2016.

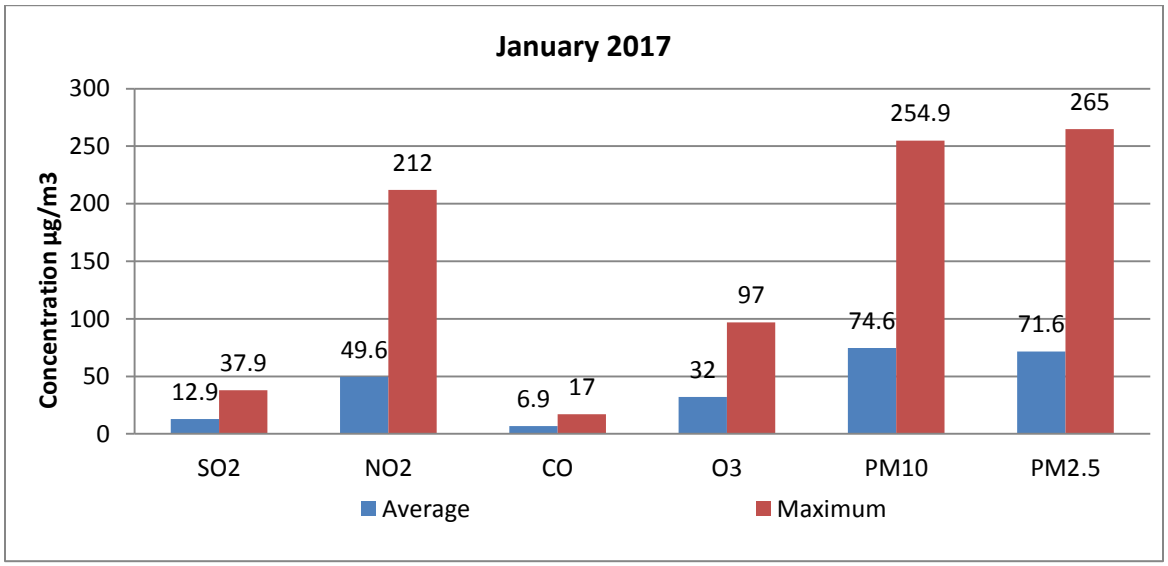

Fig. 3.The resultsof analysis for Jenuary, 2017

Ozone (O3) - in standard conditions, ozone is a blue gas with a distinctively pungent smell and unstable. The presence of ozone in the atmosphere derives from natural sources as well as from antropogenic

sources. Ozone from natural resources is formed in the atmosphere from the sun's ultraviolet rays and during electrical discharge. Its highest percentage is reached at an altitude of 20-30 km in the stratosphere. Ozone plays a vital role in the atmosphere in providing life on earth as it prevents ultraviolet sunrays, which are harmful to life. Moreover, it absorbs earth's infrared rays and thus prevents its cooling. Ozone as a pollutant in the troposphere layer is formed as a result of complex reactions between primary pollutants that are present in the atmosphere and solar radiation. From the results (Fig. 1, 2, 3) ozone shows that has no excess of values based on WHO standards for the month of January 2017, November and December 2016

PM10 and PM 2.5 **-** (PM - particulate matter) dust particles are particles that are found in the air that includes dust, soot, smoke, and liquid droplets. The particles can stay in the air for long periods of time. Because of their small size of the fine particles can penetrate deeper into the lungs, causing serious damages (EPA, 2015).

Our results have shown that the PM 10 and PM 25 have had exceeded values compared with the European Union results, but have not exceeded the value in terms of frequency.

4. Conclusions

- From the analysis described above results it can be ascertained that high concentrations of PM10 and PM2.5 are responsible for the unhealthy air quality in Pristina.
- This situation is affected by the emissions of pollutants from sources such as industry, transport, and utilization of solid fuels used for heating, as well as unfavorable conditions for the dispersion of the pollution emitted into the air.
- During these months, for which we are examining the air quality situation in Pristina was dominated by a densely foggy weather (visibility <30 m), high air humidity above 85% and the absence of wind. When to all of these conditions is also added the emissions of pollutants into the air, then comes to the creation of the smog situation (called the Great Smog of London), which is a winter season characteristic that emerges during the months of November, December and January by causing cough expectoration and bronchitis.
- In these cases, it is recommended that the vulnerable category such as people with respiratory diseases problems to avoid staying long hours in such environments.

5. Literature

[1] Botrore, B. (2011). *Analiza mjedisore e shtetit.* Kosovë: Kosovë.
[2] EPA. (2015). *EPA (http://www.epa.gov/pmdesignations/faq.htm#0), 2015.*
[3] Evropian, K. K. (2013). *Tryeza tematike për Mjedis, Energji, Transport zhvillim rajonal Kosova 2020.* Prishtinë: Raport.
[4] HAPËSINOR, M. E. (2015). *Raport për Gjendjen e Ajrit në Kosovë 2013-2014.* Prishtinë: AMMK
[5] http://www.tropical-rainforest-animals.com/pollution-effects.html. (a.d.).
[6] https://www.kosovalive360.com/per-nje-vit-835-vdekje-te-parakohshme-nga-ndotja-e-ajrit.html. (a.d.).
[7] Kosovës, A. p. (2012). *Raporti për gjëndjen e ajrit.* Prishtinë.
[8] MMPH. (2015). *Raport për Gjendjen e Ajrit në Kosovë 2013-2014.* Prishtinë: MMPH
[9] Oilgae (http://www.oilgae.com/ref/glos/nox_emissions.html), 2. (a.d.).
[10] Oilgae (http://www.oilgae.com/ref/glos/nox_emissions.html), 2. (2015). *NOx Emissions.*