ISBN 978-9940-611-08-8

COAST
INTERNATIONAL CONFERENCE ON ADVANCES IN SCIENCE AND TECHNOLOGY

III INTERNATIONAL CONFERENCE ON
ADVANCES IN SCIENCE AND TECHNOLOGY

PROCEEDINGS COAST 2024

FACULTY OF MANAGEMENT HERCEG NOVI

HERCEG NOVI, MONTENEGRO

29 MAY - 01 JUNE 2024

BOOK OF PROCEEDINGS

III INTERNATIONAL CONFERENCE ON ADVANCES IN SCIENCE AND TECHNOLOGY
COAST 2024

Publisher:
Faculty of Management Herceg Novi

Editorial board:
Djordje Jovanović, PhD, Editor-in-Chief, Irena Petrušić, PhD,
Jovana Jovanović, PhD, Ivan Stevović, PhD

Design and Computer processing:
Sanja Samardžić, MSc, Jelena Poznanović, MSc, Zvonko Perušina, BSc

Print:
"IRTA" d.o.o. Risan

Circulation:
180 copies

CIP - Каталогизација у публикацији
Национална библиотека Црне Горе, Цетиње

INTERNATIONAL conference on advances in science and technology (III ; 2024 ; Herceg Novi)
Book of Abstracts / International conference on advances in science and technology, Herceg Novi, 29 May - 01 June, 2024 : Fakultet za menadžment, 2024 (Herceg Novi). - 181 стр. ; [editorial board Djordje Jovanović, Irena Petrušić, Jovana Jovanović, Ivan Stevović].

ISBN **978-9940-611-08-8**
COBISS.**CG-ID 30617348**

POLLUTANT PARTICLES IN AIR ON THE TERRITORY OF KOSOVSKA MITROVICA

Svetlana K. Belošević[1], Jovana S. Belošević[2], Maja B. Đukić[3], Marija S. Ristić[3], Danijela Lj. Stojković[4]
[1]Faculty of Technical Sciences, University of Priština in Kosovska Mitrovica, Kosovska Mitrovica, Republic of Serbia
[2]Faculty of Pharmacy, University of Belgrade, Belgrade, Republic of Serbia
[3]University of Kragujevac, Faculty of Science, Kragujevac, Republic of Serbia
[4]University of Kragujevac, Institute for Information Technologies, Department of Science, Kragujevac, Republic of Serbia

Corresponding author e-mail address: svetlana.belosevic@pr.ac.rs (S. K. Belošević)

ABSTRACT:
Climate change is the most common change that has been discussed in the wider scientific community over the last decade. The impact of pollutant particles on all areas of the environment is so great that environmental protection is an extremely important global issue. Air is one of the areas of the environment without which there is no life on the planet. Clean air is the basis for the life of humans, animals, and plants on earth. The composition of gases in the atmosphere plays a very important role in influencing the climate. The change in the composition of clean air due to the presence of pollutant particles has a negative effect on the composition of the atmosphere, which has significant consequences, including damage to the Earth's ozone layer and climate change. Air pollution has been linked to various negative effects on human health, including heart attacks, asthma attacks, bronchitis, and other respiratory symptoms. Therefore, it is very important to monitor air quality and know its composition. In this paper, we will show what pollutants are present in the air, focusing on the Kosovska Mitrovica region, how they affect, and how to reduce them with the aim of a healthier environment.

Keywords: *climate change, air pollution, environmental protection*

---

1. INTRODUCTION

The environment is the space on planet Earth that enables the survival of all living beings. Without a healthy environment, neither humans nor other living beings can survive. The impact of pollutant particles on all areas of the environment is so great that environmental protection is an extremely important global issue. Air is one of the areas of the environment without which there can be no life on our planet. Clean air is the basis for the life of humans, animals and plants on earth. Climate is an important factor influencing air

quality. Climate change is the most common change that has been discussed in the broad scientific community in the last decade.

Climate change poses a fundamental threat to human health. It affects the physical environment and all aspects of both natural and human systems – including social and economic conditions and the functioning of health systems. [1] It is therefore a threat multiplier, undermining and potentially reversing decades of progress in the health sector. In the wake of climate change, more frequent and intense weather and climate events are being observed, including storms, extreme heat, floods, droughts and forest fires. These weather and climate hazards impact health both directly and indirectly, increasing the risk of death, non-communicable diseases, the occurrence and spreading of infectious diseases and health emergencies. All aspects of health are affected by climate change, from clean air, water and soil to food systems and livelihoods. Further delay in addressing climate change will increase health risks, undermine decades of improvement in global health, and run counter to our collective obligations to ensure the human right to health for all.

In general, climate change is expected to worsen air quality in several densely populated regions by altering atmospheric ventilation and rarefaction, precipitation and other decomposition processes, and atmospheric chemistry. Reduced air quality will have a direct impact on human health and affect ecosystems in a way that could also affect human health and climate in a feedback loop. Several studies indicate that climate change is already having an impact on air quality. For example, Fang et al. [2] simulated that from pre-industrial times (1860) to the present (2000), global population-weighted particulate matter ($PM_{2.5}$) concentrations increased by 5% and near-surface ozone concentrations by 2% due to climate change. According to Silva et al. [3] the change compared to pre-industrial times resulted in up to 111,000 and 21,400 additional premature deaths due to particulate matter and ozone, respectively, as a result of climate change. Over the past two decades, approximately every degree of warming (°F) in the observed data was associated with a 1.2 ppb increase in ozone concentrations. As the climate continues to change, these effects are expected to continue in the future.

Climate and air quality are inextricably linked (Figure 1.). Many sources of “conventional” air pollutants are also sources of CO_2, other greenhouse gases and/or particulates that affect the climate. These air pollutants interact with solar and terrestrial radiation and disrupt the planetary energy balance, leading to climate change. As the climate continues to change, these effects are also predicted for the future. The composition of gases in the atmosphere plays a very important role in influencing the climate. The change in the composition of clean air due to the presence of pollutant particles has a negative impact on the composition of the atmosphere, with significant consequences, including damage to the Earth's ozone layer and climate change. Air pollution has been linked to a number of negative effects on human health, including heart attacks, asthma attacks, bronchitis and other respiratory ailments. It is therefore very important to monitor air quality and know its composition.

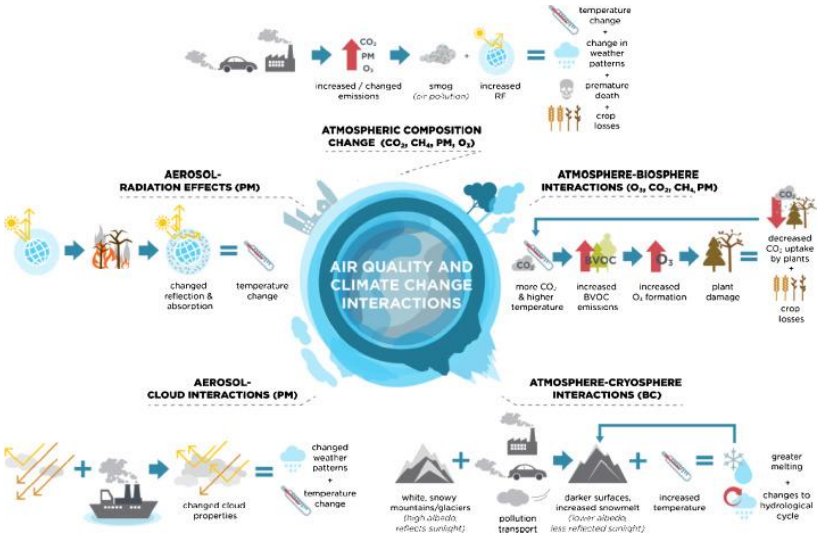

Figure 1. Air quality and climate connections [4]

The U.S. Environmental Protection Agency (EPA) [5] defines air pollution as the presence of contaminants or pollutants in the air that adversely affect human health or welfare or cause other adverse environmental effects. [6] The definition of an air pollutant or air pollution depends on the temporal and spatial context and the effects of a particular situation. [7] Air pollutants affect both human health and ecosystems. It has been reported that in developing countries, the majority of air pollution (approximately 70–80%) is caused by vehicle emissions, particularly from a larger number of older vehicles with low maintenance, poor fuel quality and inadequate road infrastructure [8,9]. The United Nations Environment Programme estimates that indoor and outdoor air pollution is responsible for nearly 5% of the global burden of disease, including excess incidence of asthma and other allergic respiratory diseases and adverse pregnancy outcomes (e.g. stillbirths and low birth weight) [10]. People in developing countries are particularly at risk from air pollution. The effects of air pollution on living systems such as plants, animals and humans as well as other materials are worse. It can impair the biochemical and physiological processes of plants and ultimately lead to yield losses. The pollutants present in the air cause three specific types of damage: they harm human health, they destroy and degrade the environment and ecosystems, and they damage property and cultural monuments. The most important air pollutants are PM particles, ozone (O_3), carbon monoxide (CO), sulphur dioxide (SO_2), nitrogen dioxide (NO_2) and lead (Pb).

2. EXPERIMENTAL

2.1. Study area

Kosovska Mitrovica is located on the southeastern edge of the Dinaric Mountains, in the northern part of the Kosovo region, where the Ibar makes a large bend before flowing into the Ibar Gorge, before which it joins its largest tributary Sitnica on the right. The town is located in the north of the Kosovo basin at 496 metres above sea level. It is surrounded to the east, north and west by the mountains of Mokra Gora and the slopes of Golija and Kopaonik, to the south by the foothills of Čičavica and to the northwest by the foothills of Rogozna. The Ibar River flows through the town, dividing it into its southern and northern parts, Sitnica and the Ibar Ljušta tributary, the mouth of which is located in the town itself. From the city to the north of the town, through which the Ibar flows to Kraljevo, where it flows into the Western Morava.

2.2. Analysis

The analysis of the concentrations of sulfur dioxide, soot and nitrogen dioxide was carried out at two measuring points in the area of the district of Kosovska Mitrovica. The air samples are taken with modern PRO-EKOS AT 801 x 2 devices.
The sulfur dioxide values are determined using the spectrophotometric pararosaniline method and the soot values using the reflectometric method (photoelectric reflectometer). The nitrogen dioxide values are determined using the spectrophotometric method with N(1-naphthyl)ethylenediamine.
The results of the analysis of systematic monitoring of the level of air pollution on the territory of Kosovska Mitrovica District were compared with the regulations on limit values, methods of immission measurement, criteria for determining measurement points and the Regulation on the conditions for monitoring and requirements for air quality ("Official Gazette of RS", No. 11/10, 75/10, 63/13).

3. RESULTS AND DISCUSSION

The results of the measurement of pollutants in the air are shown in the Table 1. Measurements were made at two measuring points: Measuring point 1 “Zavod“ Kosovska Mitrovica and Measuring point 2 “Elementary school“ Zvečan.

Table 1. Pollutants in the territory of Kosovska Mitrovica during the month of March

Measuring point 1	**SO_2 µg/m³**	**Soot µg/m³**	**NO_2 µg/m³**
Average monthly value	9.86	7.77	9.43
Minimum value	1.32	0	0.07
Maximum value	25.97	14.48	21.84

Measuring point 2	**SO_2 µg/m³**	**Soot µg/m³**	**NO_2 µg/m³**
Average monthly value	6.30	5.88	4.25
Minimum value	0.00	0	0.28
Maximum value	24.32	30.40	10.80

The measurement of air pollution from sediment in the urban environment was carried out at eight measuring points in March. The measured values of total sediments below the MDV (450 mg/m²/day) at all measuring points are listed in Table 2.

Table 2. Precipitable substances in the territory of Kosovska Mitrovica during the month of March

	pH	**Ep***	**SO_4 ****	**Cl ****	**Ca ****	**NO_2 ****	**NO_3 ****	**NH_3 ****
Average monthly value	6.81	44	1.74	8.97	15.86	0.42	48.17	0.37
Minimum value	6.07	34	1.07	3.93	9.45	0.24	34.86	0.19
Maximum value	7.97	54	2.68	12.93	20.43	0.78	59.46	0.80
µS/cm** * mg/m²/day**								

The measured values correspond to the expected results for this area, the quality of the air and its level of pollution.

3. CONCLUSION

The fast pace of human life brought with it many advantages as well as many disadvantages. The daily need of people to get to work on time, but also to get home faster to their families, has caused the daily use of cars, which are among the biggest air polluters. In almost all cities in Serbia and Europe, traffic is allowed in confined spaces. Modern construction tends to be high and beautiful buildings with little greenery and many parking lots due to the excessive number of cars. All this leads to an excessive concentration of exhaust fumes that pollute the air in populated areas.

Various measures must be taken to reduce the concentration of pollutants in the air:
- Renewal of heating systems and use of natural gas as a source of thermal energy;
- Introduction of traffic-calmed zones in the immediate urban area and expansion of pedestrian zones and cycle paths;
- Increasing the number of filters in industrial chimneys;
- Increasing green spaces and planting;

- Educating the population to raise awareness of the need to reduce air pollution.

One of the principles of environmental protection is: the polluter pays. The air is available to people completely free of charge, so the question arises: Is it necessary for humans to pay for the air, and would they then pollute the air less and care more about preserving the environment? It is our duty to preserve our environment, our surroundings and the air we breathe, because we have not inherited this planet from our ancestors, but borrowed it from our descendants.

4. LITERATURE

[1] Kinney P. L. (2008), Climate change, air quality, and human health. Am J Prev Med. 35(5):459-67. doi: 10.1016/j.amepre.2008.08.025.
[2] Fang, Y., Naik, V., Horowitz, L. W., and Mauzerall, D. L. (2013), Air pollution and associated human mortality: the role of air pollutant emissions, climate change and methane concentration increases from the preindustrial period to present, Atmos. Chem. Phys., 13, 1377–1394, https://doi.org/10.5194/acp-13-1377-2013.
[3] Silva R. A. et al. (2013), Global premature mortality due to anthropogenic outdoor air pollution and the contribution of past climate change, Environ. Res. Lett. 8 034005 doi: 10.1088/1748-9326/8/3/034005.
[4] Maione M., Fowler D., Monks S. P., Reis S., Rudich Y., Williams L. M., Fuzzi S. (2016), Air quality and climate change: Designing new win-win policies for Europe, Environmental Science & Policy, 65, Pages 48-57, https://doi.org/10.1016/j.envsci.2016.03.011.
[5] U.S. Environmental Protection Agency | US EPA
[6] Environmental Acronyms, Abbreviations and Glossary of Terms, National Service Center for Environmental Publications, 1991, https://nepis.epa.gov/Exe/ZyPURL.cgi?Dockey=9100VQRW.txt
[7] Saxena P., Naik V., Air pollution: sources, impacts and controls. doi: 10.1079/9781786393890.0000
[8] Wanga J., Lia C., Wanga E. (2010), Potential and flux landscapes quantify the stabilityand robustness of budding yeast cell cycle network”, PNAS, 107, 18, p. 8195–8200.
[9] Bigazzi A., Figliozzi A. M. (2014), Review of Urban Bicyclists' Intake and Uptake of Traffic-Related Air Pollution, Transport Reviews, 34, 221-245.
[10] Holdren P. J., Smith R. K. (2000), Energy, the environment, and health. In: Goldemberg J, editor. The world energy assessment: energy and the challenge of sustainability, New York: UN Development Programme; 61-110.