

## INFLUENCE OF CHANGES OF CLIMATE PARAMETERS IN URBAN AREAS OF THE RE PUBLIC OF SERBIA

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### ABSTRACT

*The territory of our country could not remain immune to the climatic changes that are obviously affected the entire planet. There is a huge impact of these changes on quality of life for people and wildlife on the entire planet. This paper shows how urbanization influences the changes in these parameters generally having a negative impact on quality of life and health of the population. Including changes in concentration of gases, the greenhouse climate models, IPCC predicts warming of 1.1 to 6.4 °C by the end of the 21st century, compared to the period since 1980. to 1999. The global rise in temperature could affect the conditions of life on the planet to such an extent that life on the planet is no longer possible.*

**Keywords:** global warming, climate change parameters, urban environment, quality

### 1. INTRODUCTION

Global warming is the result of human activity is manifested through an increase in the average temperature of Earth's atmosphere and oceans in recent decades and the projected continuing increase of temperature. Global temperatures increased by  $0.74 \pm 0.18$  °C over 100 years until the end 2005 year. IPCC (Intergovernmental Panel on Climate Change) concluded that the greatest increase in temperature during the mid-20th century, caused by increasing concentrations of greenhouse gases is anthropogenic in origin. Natural phenomena such as solar variation and volcanoes probably had a small warming effect from pre - industrial times to 1950 year and a small cooling effect since 1950 onwards. These basic conclusions have been confirmed by at least 30 scientific societies and academies of science, including all of the National Academy of Sciences of major industrial countries. Although some scientists have expressed disagreement with these findings, the majority of scientists working on climate change agree with the conclusions of the IPCC. Projections from climate models show that global temperature is likely to increase by 1.1 to 6.4 °C between the 1990th and 2100 years. (Figure 1.1). The uncertainty in these estimates stems from the use of different estimates of future greenhouse gas emissions and the use of models with different speeds climate. Another uncertainty is how warming and related changes vary from region to region across the world. Although most studies focused on the period by 2100 years expected to continue warming over the next 1000 years, even though the levels of greenhouse gases stabilized. These are the results of a large heat capacity of the ocean. Increasing global temperatures could lead to increased levels of seas and oceans due to melting of ice at the poles. The effect of "greenhouse" is very important when talking about climate change as it relates to the gases which keep the Earth warm, and which belongs to the greatest credit for the existence of life on it. Some of the gases that create greenhouse gases people produce in their daily

activities. This additional amount produced by humans is the main suspect for the enhanced greenhouse effect.

The most constant rush a story about the problem of global warming begins with a discussion of ozone depletion and the formation of so-called ozone hole. Ozone (O<sub>3</sub>) is a form of molecular oxygen. The ozone layer is relatively thin layer of these molecules located lower part of the Earth's stratosphere. Ozone protects the Earth's surface and the living creatures of the devastating impact of solar ultraviolet radiation and other dangerous cosmic radiation. If there were no ozone, life on Earth would be impossible.

What is the major cause of global warming?

The main cause of global warming is CO<sub>2</sub> emissions. He is released into the atmosphere at an incredible rate. 8 billion tons of CO<sub>2</sub> is released into the air last year. Of course, a part of this is the result of natural activities such as volcanic eruptions and human respiration. However, the country is able to absorb all of this as a normal process, but the beginning of global warming is the result of combustion of large amounts of fossil fuels and thus large amounts of CO<sub>2</sub> emissions.

- Currently 40% of the total CO<sub>2</sub> produced by electrical generation. They burn coal, natural gas and diesel fuel. Some power plants burn garbage, while others interact with methane made from garbage.
- 33% of the total CO<sub>2</sub> emissions come from cars and fossil fuels.
- 3.5% of total emissions come from airplanes. Unfortunately, airplanes and other aircraft pollution discharged directly into the troposphere.

The causes of the recent warming are an active area of research. Greenhouse effect was discovered in 1824 by the French physicist Joseph Fourier. It is a process in which the absorption of infrared radiation by the atmosphere warms the Earth. If there were no natural greenhouse effect the Earth would be up to 30 ° C cooler. False analogy, this effect is named after the method of growing plants in closed greenhouses using solar energy to prevent the energy loss of air flow. Earth receives energy from the sun in the form of thermal radiation. If it is assumed that the Earth is in a stable energy balance energy that arrives on Earth has the same volume to be radiated back into space. The radiation leaving the Earth has two forms of reflected sunlight and emitted infrared radiation. Earth reflects about 30% of energy coming from the Sun, while the remaining 70% is absorbed, warming the soil, atmosphere and oceans, and makes life possible on Earth. Reliance on the overall development of civilization in the production of energy by burning fossil fuels has increased the broadcasting of greenhouse gases in the atmosphere. One of the most abundant greenhouse gases is carbon dioxide. The gas formed during combustion of all fossil fuel and wood combustion, gasoline, oil, natural gas, etc. If you reduce the volume of the combustion of fossil fuels and slow / stop the cutting of forests is likely to reduce the amount of greenhouse gases around the Earth. Whatever the drastic measures taken, it is now too late to stop global warming and climate change, although it is possible to influence the intensity of these changes.

## **2. ANALYSIS OF CLIMATE CHANGE PARAMETERS**

The influence of urban areas is not limited to ambient temperature but also on the precipitation regime, and so on. In any case, all these parameters (and their variations) that determine the characteristics of the climate of a region significantly affect the quality of people's lives and health of the population.

The characteristics of climate in Serbia are also, especially in recent decades, undergone significant changes. This paper specifically discusses the changes of some climate parameters (temperature and precipitation) in some urban areas of Serbia.

Climate of Serbia can be described as temperate continental, with more or less distinct local characteristics. The spatial distribution of climate parameters caused by geographic location, relief and local influence, as a result of combination of relief, the distribution of air pressure of a large scale, exposed terrain, presence of river systems, vegetation, urbanization, etc.

The prevailing meridional position of the river valley and plains in the north allowing deep penetration of polar air masses to south of country.

The subject of this analysis is the parameters obtained from three weather stations:

- Meteorological station in Belgrade (Novi Beograd, 44° 48 'north latitude and 20° 28' east longitude at an altitude of 132 m
- Meteorological station in Kragujevac (44° 02 'north latitude and 20° 52' east longitude to 185 m above sea level.
- Meteorological stations in Zlatibor (43° 44 'north latitude and 19° 43' east longitude at an altitude of 1028 m. above sea level.

These cells were chosen for two reasons:

- Existence and availability of data needed for specific analysis.
- Diversity in terms of climate.

Reference period for the specific climate data (based on the recommendations of the World Meteorological Organization - WMO) is currently valid last thirty year period 1961-1990 (the previous was from 1931 to 1960). In this sense, the tables give an overview of these parameters for that period for all three selected weather stations. The period from 1999 to 2010 was typical on a global level, because eight of the ten warmest years belong to precisely this period.

The tables below and Figure 1 are given the average monthly mean temperature of Kragujevac in the period 1921-1940, 1961-1990 and 1999-2010.

Month	Year		
	1921-1940	1961-1990	1999-2010
January	-0.2	-0.1	1.2
February	0.8	2.2	2.8
March	5.8	6.3	7.6
April	11.5	11.3	12.2
May	16.3	16.1	17.4
June	20.1	19	20.9
July	22.4	20.6	22.7
August	21	20.2	22.2
September	17.3	16.7	16.7
October	12.4	11.4	12.5
November	8	6.4	7.2
December	1.2	1.8	2.2

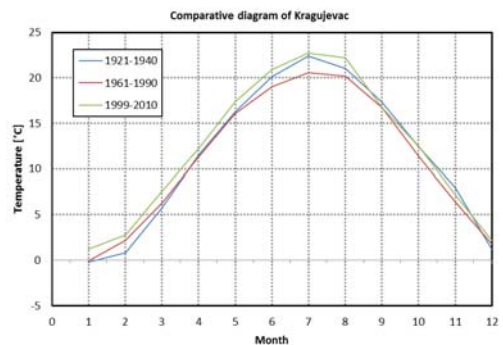


Figure 1. Comparative diagram of temperature for Kragujevac.

This period coincides with the first phase of global warming. It is noticeable, however, can be seen from the data presented, that the average temperature in Kragujevac, Belgrade and Zlatibor in every month or every year significantly lowers than today's values. No doubt it could be argued that in addition to the impact of global warming here and present a significant influence of the urban environment and its increase (only the population has increased nearly tenfold from 200 000 to nearly 2 000 000) are sure to heat increased considerably greater number of times.

Figures 2, 3 and 4 are provided the average temperature values of Belgrade, Kragujevac and Zlatibor for 2005-2010 years

Month	Year					
	2005	2006	2007	2008	2009	2010
January	1.7	-0.5	7.6	3.2	-0.2	0.6
February	-1.3	1.9	7.2	6.3	2.9	3.7
March	5.8	6.5	10.2	9.1	7.9	8.2
April	12.7	13.7	14.9	13.8	15.8	13.5
May	17.7	17.4	19.5	19.3	19.9	18.1
June	20.3	20.2	23.8	23	21	21.3
July	22.6	24.7	25.8	23.7	24.1	24.4
August	20.6	20.9	24.2	24	24.1	24.1
September	18.4	19.2	16.2	17	20.6	17.8
October	12.8	15.2	11.8	14.8	13.1	10.6
November	6.7	8.9	5.2	9.1	9.9	12.2
December	3.4	4.3	1.1	4.6	4.7	2.5

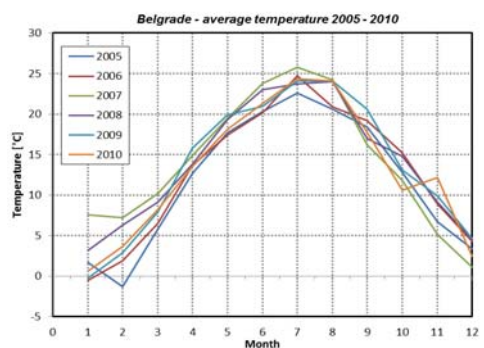


Figure 2. Diagram of average temperature for Belgrade.

Month	Year					
	2005	2006	2007	2008	2009	2010
January	1.4	-1.6	6.3	2.5	0.3	0.8
February	-1.7	1.3	6.4	4.4	2.1	3.2
March	4.7	6	9.1	8	6.8	7.2
April	11.6	12.7	12.1	12.6	13.4	12.1
May	16.5	16.6	18.3	17.4	17.8	16.5
June	19.3	19.8	22.9	21.8	20.2	20.2
July	21.7	23.1	24.8	22.4	22.6	23
August	20	20.6	23.3	22.9	22.3	22.3
September	17.4	17.7	15.6	15.8	18.1	16.7
October	11.5	13.3	10.9	13.1	11.7	9.4
November	5.7	7.6	4.5	8.5	9.1	11.3
December	3.4	3.4	0.4	4.2	3.9	2.4

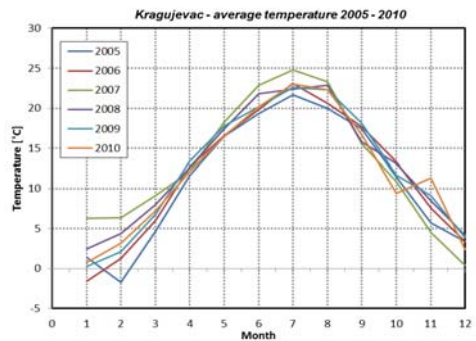


Figure 3. Diagram of average temperature for Kragujevac.

Month	Year					
	2005	2006	2007	2008	2009	2010
January	-2.5	-4.8	2.2	0.6	-1.8	-2.6
February	-4.7	-2.3	2.6	1.2	-2	-0.3
March	0.9	1.7	4.7	3.7	1.7	2.6
April	7.2	8.3	9.3	8	9.7	7.8
May	12.5	12.4	13.8	13.6	14.3	12.3
June	14.7	15.2	17.8	17	15.5	16.1
July	17.4	17.8	20.6	17.8	18.7	17.9
August	15.9	16.4	19.4	18.8	18.3	18.4
September	13.4	13.9	11.1	11.3	14.3	12.5
October	8.1	10.5	7.2	10.4	7.6	6.1
November	2.4	4.2	0.4	5.1	6.7	8
December	-1	-0.1	-3.1	0.2	0.6	-0.4

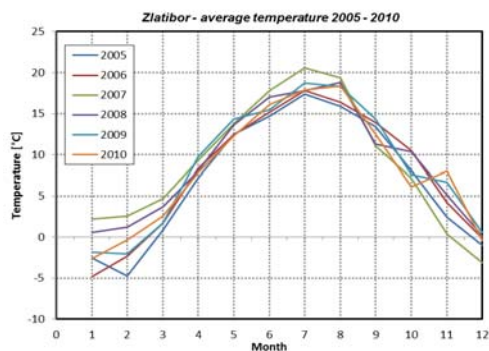


Figure 4. Diagram of average temperature for Zlatibor.

### 3. CONCLUSION

Based on the tables and diagrams can be concluded:

- Increase the average monthly and annual mean temperature is recorded at all three sites chosen Belgrade, Kragujevac, Zlatibor.
- In the analyzed period there are periods with a number of consecutive days with extremely high temperatures and in this sense is often a need to introduce some kind of "emergency". Indirect effects are numerous, such as impacts on agriculture, tourism, energy, etc.
- Changes in the planet's climate system are already evident, but much bigger danger threatens us from the consequences of anticipated changes that may take on catastrophic proportions.

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