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EFFECTS OF POLLUTION AND CLIMATE CHANGE IN TIMIȘOARA MUNICIPALITY AND ITS PERIURBAN AREA

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Abstract

The preliminary determination of the article is to investigate the effects of pollution and climate change. In this regard, the authors want to highlight that this real and critical issue must take seriously because each of us contributes to pollution and climate change, which is very real, and which will be aggravated by not taking action. Global warming currently involves two major problems for humanity: on the one hand, the need to dramatically diminish greenhouse gas emissions to stabilize the concentration of these gases in the atmosphere to prevent anthropogenic influence on the climate system and enable ecosystems, contrastingly the need to accommodate to the consequence of climate change, given that these effects are already visible and inevitable due to the activity of the climate system, regardless of the outcome of emission reduction actions. The main problem with pollution is air quality, which has fallen considerably, especially in urban areas. The" World Health Organization" approximates, more than seven million people die each year from air pollution. The authors also conducted a case study on the local effects of climate change - Timişoara and its peri-urban area. Therefore, we concluded that if Timişoara is successful in reducing greenhouse gas emissions, this will create a test market for Romania's ecological technologies and help the environmental industries to locate in Timişoara.

Key words**:** *pollution, climate change, effects, Timisoara, Romania*

INTRODUCTION

Environmental pollution is one of the most disputed contemporaneity issues and the first-rate one for society's management [5].

Pollution is the process of contaminating the environment with materials that mess with human health, gratification, or the natural operation of ecosystems (living organisms and the environment in which they live). Although sometimes environmental pollution is a result of natural causes, most pollutants come from human activities [5, 10].

In the past, when low population density use, almost exclusively, natural products did not differentiate much human life from the simple way of life and did not produce so much residue.

With significant scientific advances, the quantity furthermore, their nature has changed fundamentally. In recent decades, the process of degradation of environmental factors on our planet has evolved more and more worryingly, with the number of pollutants reaching figures beyond imagination [5].

Removing pollution is a problem of correcting the errors that cause it because pollution is the main factor of climate change.

The term **climate** generally defines the average profile of weather conditions in a given area determined over several years. Climatic conditions depend on changes in the ecosphere, with the Earth's energy balance (radiation) playing an important role. In the last 150 years, anthropogenic activity has played a unique role in changing the Earth's climate, participating directly in this change through greenhouse gas emissions [1].

Climate change is not unusual, as the planet undergoes cycles of geological transformation over long periods, requiring adaptations and modifications in nature and its processes.

However, in recent decades, with the intensification of human industrial activity, which has led to a rapid increase in pollution, these climate changes are accelerating and threatening to upset the balance that ensures our existence on Earth [12].

Climate change is a warning threat to the environment facing humanity today.

By climate change, we mean phenomena that go beyond the ordinary pattern and become dangerous for our lives as humans and other living things on the planet [13, 10].

The amount of carbon dioxide in the atmosphere has increased by over 40% compared to the pre-industrial era. The amount of methane has doubled due to human activities, contributing to the greenhouse effect's intensification.

Observations indicate increases in global average water and ocean temperatures, widespread melting of snow and ice, and average global sea-level rise [7].

In a high-emission scenario (an increase in global temperature of 3.2°C - 5.4°C between 2081-2100), coastal areas could suffer economic losses of around EUR 39 billion per year by 2050 and up to EUR 960 billion per year by the end of the century [19].

According to statistics, at the national level, average temperatures will increase in the next 30 years by 1.5 - 2.5°C, and by the end of the century, by 2.5 - 5°C [18].

An increase of up to 6°C is forecast for the south of the country. Practically, at the end of the century, the city of Bucharest would reach the current average temperature of the city of Thessaloniki, located 400 kilometers further south [11].

Timișoara is the municipality of residence of Timiș County, Banat, Romania. In western Romania, close to borders with Hungary and Serbia, on the river's banks, Bega. It is an important industrial, commercial, medical, financial, and university center for Romania. Timișoara is an important industrial, commercial, medical, economic, and university center for Romania. The locality's name comes from that of the Timiș River, combined with the Hungarian noun vár, "fortress," meaning the Timiș Fortress. Located on the Bega River, the city is considered the capital of the historic Banat region [18].

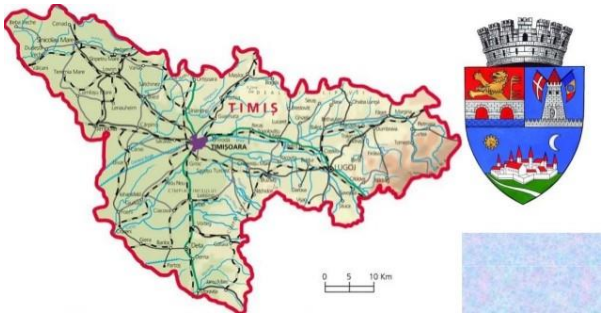

Fig. 1. Timiș County, Timișoara municipality
Source: www.infoimobiliar.ro, Accessed on 12.07.2020 [17].

In 2001, the introduction of the "peri-urban territory" term in the specialized legislation. In Law 350 on spatial planning and urbanism, defined in Annex no. 2 as "the surface around municipalities and cities, delimited by specialized studies, within which alliance relations are born in the economic field, of infrastructure, trips for work, insurance with green spaces and leisure, insurance with agri-food products" [4].

The study of the effects of pollution and climate change is critical, because only in this way can we adapt to these changes and reduce the pollution that contributes to these climate changes.

MATERIALS AND METHODS

The reason for choosing this topic comes from the unique features of this problem in everyday life and our lives' primary importance.

The paper's primary purpose is to emphasize the importance of climate change and the severity of environmental pollution in the city of Timișoara, as well as in the suburbs. In this sense, to follow the purpose of the work, the authors followed several steps:

-First of all, the authors follow the data collection stage,

-Then, the data is subjected to fair analysis and interpretation

-And last but not least, the set of data interpretation.

The main conclusions were expressed in the paper to strengthen the object proposed for research.

RESULTS AND DISCUSSIONS

Pollution is the contamination of the environment with substances generically called pollutants, which harm the environment, human health, or natural goods. The followings are significant environmental pollutants:
-Industria
-Agriculture
-Transporturile
-Human settlements
The **industry** is the primary source of environmental pollution. Industrial pollution of the environment occurs mainly through the breakdown of two essential elements of the natural environment: air and water.
The electricity-producing industry is responsible for the air pollution through the gases emitted from the thermal power plants and other industries: ferrous and non-ferrous metallurgy, chemical and the construction materials production industry.
Agricultural pollution occurs due to the introduction into the soil of substances necessary to increase agricultural production.
Agricultural pollution is mainly due to the overuse of chemical fertilizers, pesticides, industrialization, and excessive agriculture chemization.
Soil, the main factor and production in agriculture, has seen a decline in productivity due to its overexploitation with pesticides and chemical fertilizers. It is observed by the decrease of biocenosis activity, of humus content, of the change in availability of macroelements [9, 14].
Transport is another significant pollutant of the environment.
Land transport produces the most effects in this regard, through its influence on human settlements, cropland, and atmospheric air. Human settlements fall into the category of environmental pollutants.
Urbanization, determined by industrialization, has made cities the engines of the development of a region. The population is continually growing due to new jobs and many facilities, compared to rural areas [9].
Sources of pollution in Timisoara and the suburbs:
-industrial means, located on industrial platforms;
-inhabited areas, densely populated;
-circulation of vehicles;
-construction sites;
-electrothermal power plants;
- unauthorized combustion, in the open air, of some - household waste;
-worn tires, plastics;
- defective sanitation of the public space;
- improper disposal of industrial waste and household waste [15, 19].
Health effects of pollutants
A study by the IHME (Institute for Health Metrics and Evaluation) shows that the number of premature deaths attributed to air pollution has reached 5.5 million per year. More people die from polluted air than from malnutrition, obesity, alcoholism, drugs, or sexually transmitted diseases. Furthermore, World Health Organization estimates are even more pessimistic: methane, ozone, and "black carbon" kill more than 7 million people a year - which is why air pollution ranks 4th on the list of factors at maximum risk premature death [8].
The primary pollutants resulting from human activity and how they affect our health:
Carbon dioxide (CO2)
In principle, carbon dioxide does not directly affect human health unless excessively large amounts in the air we breathe.
Carbon monoxide (CO)
Toxic gas appears when the combustion process is incomplete. It dramatically reduces the blood's ability to carry oxygen, especially to the heart and brain. It provokes heart disease, myocardial ischemia, and chest pain [4, 6].
Sulfur dioxide (SO2)
It affects the respiratory system and lungs. Aggravates asthma and chronic bronchitis but also causes eye irritation. It leads to heart disease and even ischemic strokes. Sulfur

dioxide is responsible for acid rain and water pollution.

Volatile organic compounds (VOC)

Aromatic hydrocarbons cause various irritations and affect the respiratory system. They are also responsible for decreased neuromotor functions (late response to visual stimuli, poor memory [6].

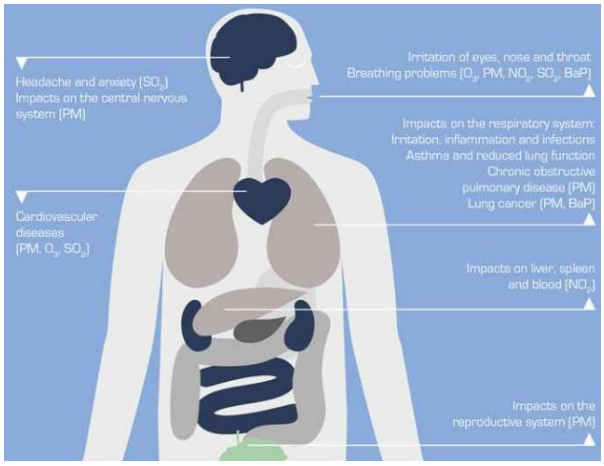

Fig. 2. The effects of pollutants on the body
Source: Ecological information and business platform [16].

Nitrogen oxides (NOX)

It promotes the appearance and development of asthma, as well as chronic obstructive pulmonary disease. It affects the normal development of the lung system in children.

Ammonia (NHX)

It causes respiratory, skin, and eye irritations and promotes the appearance of fine particles.

Fine particles (PM2.5)

With a diameter of 2.5 microns (30 times less than the thickness of a hair!), these particles are formed both by burning fossil fuels and by chemical reactions in the atmosphere between compounds such as NOX, SO2, and volatile organic compounds.

Extremely small, these particles reach the lungs and penetrate the tissues, entering the blood vessels.

Although skeptics of climate change continue to fundamentally criticize the results of the international scientific process of climate change, a significant consensus on climate change has grown in recent years among scientists and politicians [4, 6].

Projections of monthly average air temperature changes at the 94 weather stations for the period 2001-2030 made using statistical downscaling models applied to the three global climate models show the same air temperature rise signal, with some signal strength differences.

The average of all three models' projections is the optimal value (the most probable) [6].

Air temperature

For the period 2001-2030, compared to 1961-1990, a higher average monthly air temperature increase projected in November-December and the warm period of the year (May-September), of about one °C, slightly higher values (up to 1.4°C - 1.5°C,) being in the mountains, the south, and west of the country. In the cold, wintry season of the year, the heating does not exceed one °C (Figure 3). [3].

At the whole country's level, the average annual warming is between 0.7°C and 1.1°C , the highest values being in the mountainous area [1].

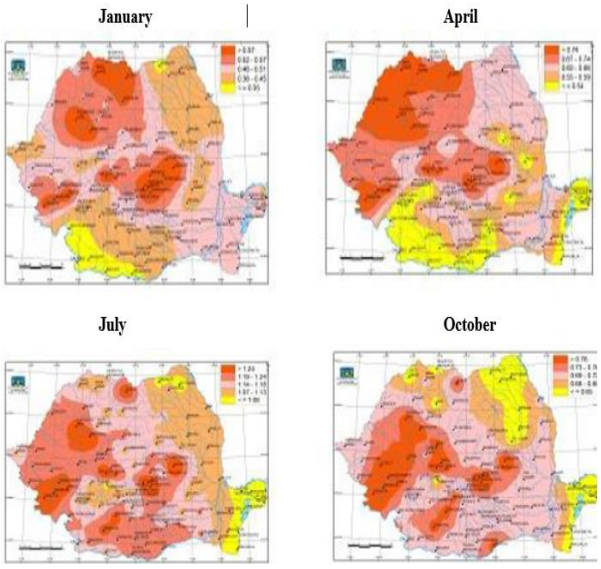

Fig. 3. Changes in the average monthly air temperature at 94 stations in Romania, for the period 2001-2030
Source: Climate change scenarios in Romania for the period 2001 – 2030 [2].

The climate in Timisoara

Like all of Romania, Timisoara is part of the moderate continental temperate climate, characteristic of the Pannonian Depression's southeastern region, with some sub-Mediterranean influences. Its general features distinguish by the diversity and irregularity of atmospheric processes [3].

Case Study

Local effects of climate change - Timisoara, and its peri-urban area

The studies carried out in this respect highlighted the following problems that appeared in the researched area:

-The appearance and expansion of some Urban Heat Islands
-Damage to facades, roofs, structural elements, resistance structures of buildings
-Increasing the number of air conditioners
-Increased energy consumption
-Decrease in gas pressure
-Acute aggravation of chronic diseases
-The appearance of vectors for infectious diseases
-Deformation/cracking of streets and sidewalks (especially at sewers)
-Forested and broken trees;
-Cable collapse/breakage;
-Interruption of power supply
-Partial or total drying of trees
-Change in energy cost (price increase) [13]
-Dust pollution
-Decrease in agricultural production
-Deaths for long periods, which can favor the appearance of uncontrolled fires
-Massive floods
-Changing the quality and quantity of water
-Impact associated with local fauna and flora
-Impact on the health of the population (for rainy periods, the appearance of mosquitoes carrying various infectious diseases, more and more frequent asthma diseases, and lung diseases due to sudden temperature changes) [3].

CONCLUSIONS

If we pollute the air we breathe, we voluntarily destroy our health. Nevertheless, no matter how logical the pollution = problems equation may seem, modern society continues to pollute through inertia through intensive human activity. The main "occupation" is the burning of fossil fuels: oil, coal, and natural gas. But also, intensive exploitation of wood mass - in the conditions in which the forests represent the primary source of oxygen production on the planet [7].

Timisoara cannot prevent global climate change but can set a good example:

If Timisoara is successful in reducing greenhouse gas emissions, this will create a test market for green technologies in Romania and will help green industries to locate in Timisoara. Reducing CO2 in Timisoara will also help reduce fine dust, NOx, CO, and soot particles. Improving and expanding public transport of electric mobility and expanding green spaces will reduce Timisoara's noise level. The elimination of the carbon content from Timișoara will produce positive effects for the health of the citizens of the municipality [4].

Some of the available discount options are everyday opportunities, which can generate multiple social and environmental benefits.

Most global warming reduction solutions are related to:

- the most cost-effective use of energy resources and energy of any kind, in general, for example, in construction, industry, household appliances
- increasing the use of renewable energy (solar, wind, biomass) and combined heat and power generation facilities
- improving public transport, infrastructure and promoting non-motorized means of transport
- reduction of carbon dioxide emissions generated by new cars
- reduction of industrial emissions
- improving the technologies used
- reduction of emissions from agriculture
- green procurement
-reducing deforestation, promoting sustainable forest management
- planting green spaces
- planting new forests
- reduction of emissions from landfills
- waste recycling
- reduction of water consumption for domestic and industrial use

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