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THE IMPACT OF ENVIRONMENTAL FACTORS ON POPULATION HEALTH IN AN URBAN AGGLOMERATION

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For as the best health of the population in an urban agglomeration, the quality of the environmental factors plays an extremely important role. Improving the quality of the environment involves a number of aspects which, if met, would lead to the creation of more favorable living conditions in an unpolluted environment. The health of the population is also affected by the climate changes that produce heat waves, floods and fires. Affecting the natural environment has serious repercussions on the quality of life. These effects are manifested by pollution of water, soil, basement and atmosphere. Even if we do not realize it, nature records all the negative, conscious or unconscious actions made by man and stores them up to a certain point. All these negative facts are finally coming back to humanity. In every part of the world, people mercilessly and continuously cut down forests, eroding soil from the surface, polluting the air and water. Thus, the environment is continually degrading and affecting the health of the population in the big cities. Therefore, man is the main guilty for environmental pollution; he is in fact his main destroyer. The present paper aims to analyze the ways of reducing pollution in a large city by comparing the increase or reduction of pollution each year with the main chemical compounds that pollute the environment and which can affect the health of the people in that city.

Keywords: transport of pollutants, emissions, air quality, average concentrations of air pollutants, environmental impact

1. INTRODUCTION

The transport of pollutants through the environment is done by air. The more polluted the air, the more affected the health of the population. Thus special attention should be paid to the activity of monitoring and improving the quality of the air.

The air quality is due to the emissions in air from fixed sources (machines, installations, including ventilation, etc.), from diffuse sources of pollution and mobile sources (road traffic) as well as the transport of pollutants over long distances.

The national air quality monitoring network includes stations for assessing the influence of traffic on air quality, stations for evaluating the influence of industrial activities on air quality, for evaluating the influence of "urban settlements" on air quality but also regional background stations - reference station - for assessment of air quality, far from any source, natural or anthropic, which could contribute to deteriorating air quality.

2. AIR QUALITY

The evolution of the air quality for the Timisoara agglomeration is tracked with the help of 5 automatic stations, classified as follows:

• Traffic stations - located in two areas with heavy traffic. The pollutants monitored are: SO2, NO, NO2, NOx, CO, heavy metals (Pb, Ni, Cd, As - from gravimetric PM10), PM10, volatile organic compounds (benzene, toluene, ethylbenzene, o, m, p-xylene) .

• Industrial station - located near the industrial area. The pollutants monitored are: SO2, NO, NO2, NOx, CO, O3, PM10, volatile organic compounds (benzene, toluene, ethylbenzene, o, m, p - xylene). The station is also equipped with sensors for measuring the meteorological parameters.

• Urban background station - located in the central area of the city, away from local emission sources, to highlight the degree of exposure of the population to the level of urban pollution. The pollutants monitored are: SO2, NO, NO2, NOx, CO, O3, PM2.5 and meteorological parameters.

• Suburban train station - located in Carani. The pollutants monitored are: SO2, NO, NO2, NOx, CO, O3, heavy metals (Pb, Ni, Cd, As - from gravimetric PM10 6), PM10 and weather parameters.

The first gas analyzed is sulphur dioxide. It comes from non-methane gas heating systems, thermoelectric power plants, industrial processes, pulp and paper industry and, to a lesser extent, emissions from diesel engines. Depending on the concentration and the exposure period, sulfur dioxide has different effects on human health.

Exposure to a high concentration of sulfur dioxide over a short period of time can cause severe respiratory distress. People with asthma, children, the elderly and people with chronic respiratory diseases are especially affected. Long-term exposure to low sulphur dioxide may result in respiratory tract

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infections [1].

Sulphur dioxide can potentiate the dangerous effects of ozone. In the atmosphere, it contributes to acidification of precipitation, with toxic effects on vegetation and soil. Increasing the concentration of sulphur dioxide accelerates the corrosion of metals due to the formation of acids. Sulphur oxides can erode stone, masonry, paper, leather and electrical components.

The level of annual average concentrations of air pollutants in ambient air

The evolution of the annual average concentrations of sulphur dioxide recorded between 2009-2014 and 2011-2017 is presented in the following graphs [3]:

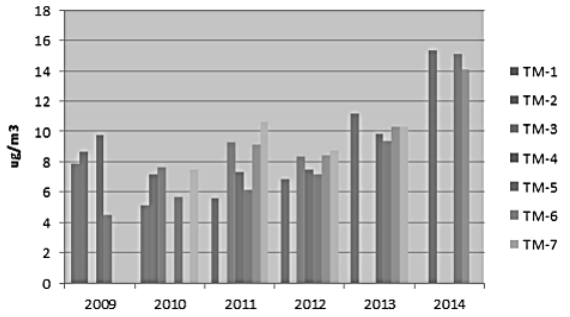

Figure 1. Sulphur dioxide recorded between 2009-2014

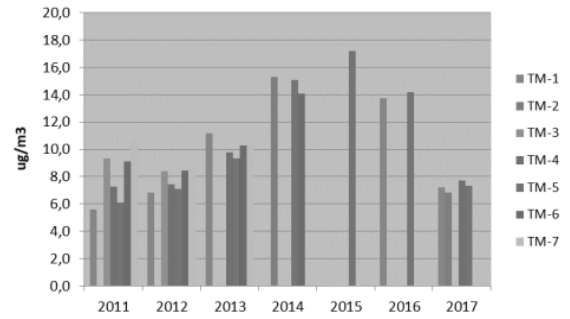

Figure 2. Sulphur dioxide recorded between 2009-2014[3]

From the analysis of the two graphs, a significant increase in the level of sulphur dioxide can be observed in almost all measuring stations up to almost 18 mg/m^3, followed by a significant reduction in all the measuring stations [1], [3]. .

Average annual carbon monoxide concentrations for the period 2009-2014

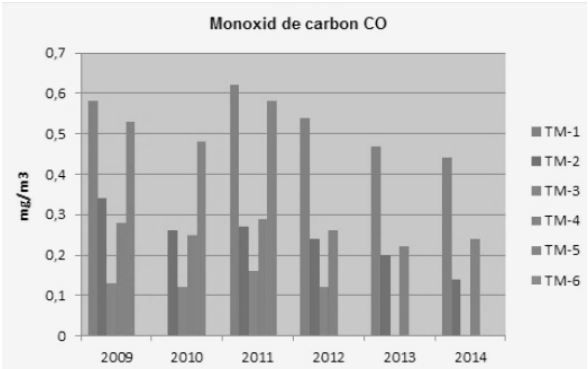

Figure 3. The average annual concentrations of carbon monoxide recorded in the period 2011-2017

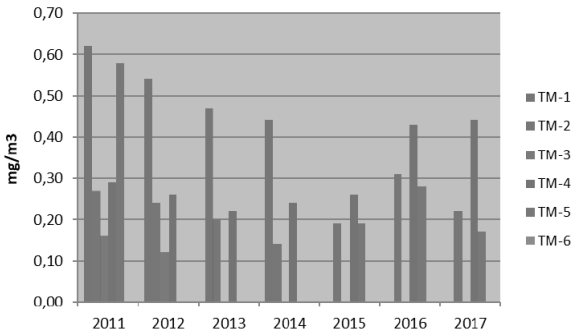

Figure 4. The average annual concentrations of carbon monoxide recorded in the period 2011-2017[3]

By comparing the two graphs you can see an increase in the concentration of carbon monoxide in some areas, but, what is encouraging and a decrease of this concentration [2], [3]. .

Annual average concentrations of suspended particles 2009 - 2014

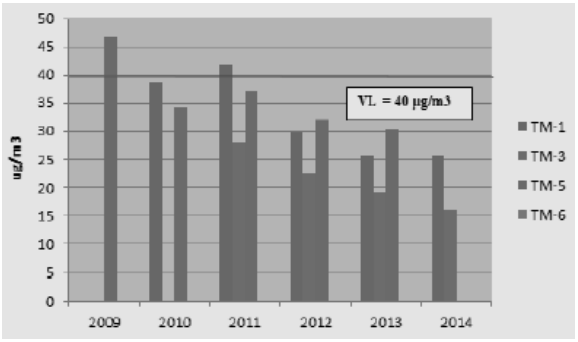

Figure 5. Annual average concentrations of suspended particles 2009 - 2014[3]

Average annual ozone concentrations O3 2009 – 2014

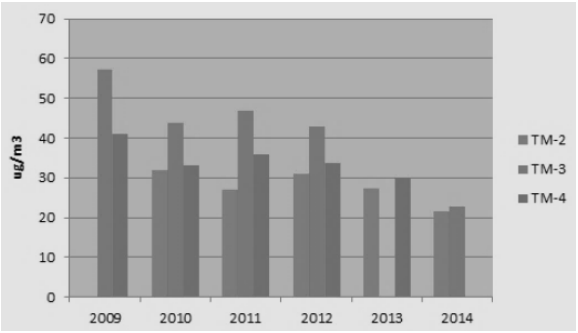

Figure 6. Average annual ozone concentrations O_3 2009 – 2014

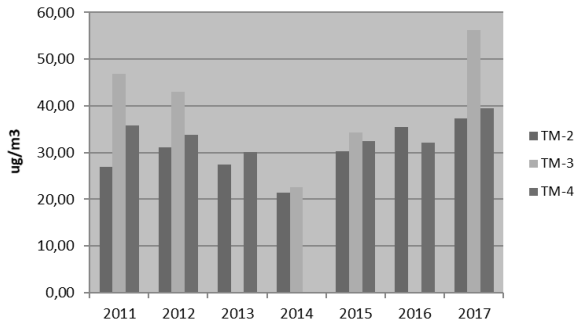

Figure 7. Average annual ozone concentrations O3 2011 – 2017[1]

In the following, a graph is presented which represents a synthesis of the other graphs, which are presented, in the same graph, the most important pollutants.

In the following, a graph is presented that represents a synthesis of the other graphs, namely the most important pollutants are presented in the same graph. These results are presented at several measurement stations and an increase can be observed, in some cases even alarming of PM10 particles [3].

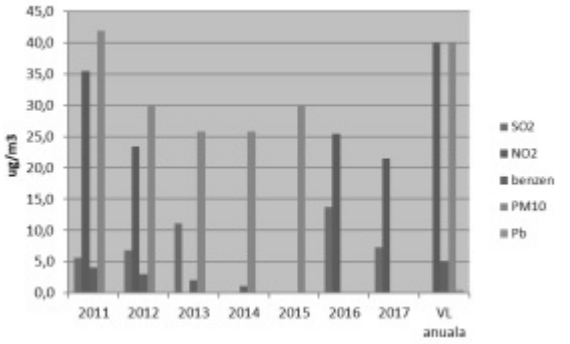

Figure 8. Evolution of the average annual concentrations of atmospheric pollutants registered at the TM-1 traffic station

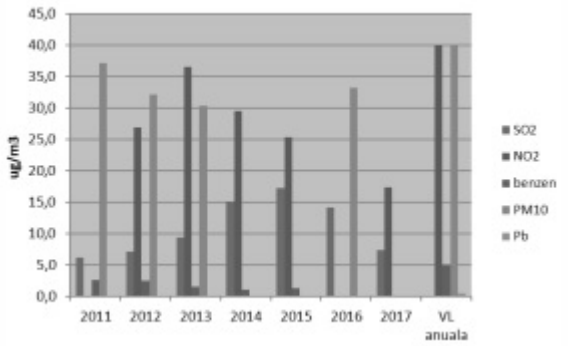

Figure 9. Evolution of the average annual concentrations of „atmospheric pollutants registered at the TM-1 traffic station

3. EMISSIONS OF ATMOSPHERIC POLLUTANTS AND MAIN EMISSION SOURCES

Most atmospheric pollutants come from industrial and social activities and represent a great risk to the health of the population. In Europe, developed countries have taken drastic measures to reduce emissions, so these anthropogenic emissions have been significantly reduced in most developed countries. However, there are also pollutants whose concentration could not be reduced and which harm the health of the population in urban areas. One of the pollutants that endangers the health and life of the population in the cities is the nitrogen surplus.

The problem of polluting emissions is the most serious in the big cities because they produce the acidification of the atmosphere by increasing the concentrations in suspension and of the greenhouse gases (O_3). Thus, the ozone layer is increasingly depleted, leading to increasingly obvious and devastating climate change in recent years [4], [6]..

The main pollutants that can endanger the health of the population are the suspended particles, O_3 and NO2. Their effects are multiple on the health of the population and range from minor respiratory problems to cardiovascular disease. At European level, it is estimated that 5 million people die annually due to PM2.5 emissions. The increased concentration of O3 can negatively influence the growth of vegetation and crop yield. 70% of SO2 emissions and 21% of Europe's NOx emissions are caused by the energy sector, which is the main source of air pollution. Another important source of pollution is road transport which eliminates pollutants such as CO, NOx in the atmosphere, PM2.5 and non-methane volatile organic compounds [2], [3] .

4. THE ENERGY

The energy sector has one of the largest contributions to air pollution in large cities by eliminating significant amounts of sulphur dioxide, carbon monoxide, carbon dioxide, nitrogen oxides, small particles as well as the discharge of waste water into the atmosphere. According to European Union standards, reducing the environmental impact of energy systems can be done by:

•Modernization of power plants

•Modernization and continuous monitoring of large combustion plants

•Reduction of pollutant emissions from major refineries

•Rehabilitation of polluted soils

Another very important source of pollution is the emission of CO and PM2.5 from burning of wood, coal and gas. Due to the high price of natural gas, there was a slight increase in the combustion of fuels, which is also highlighted in the graphs of this paper, with high sulphur content (coal, fuel oil). Thus, in the case of combustion of fuels with high sulphur content, it is imperative to install the technology of desulfurization of the flue gases.

Although energy is essential for economic and social well-being, its increased consumption leads to pressures on the environment, producing climatic changes and important effects on population health.

The energy consumption at national level, by activity sectors and by types of fuel, is shown in figure 10-11 [5].

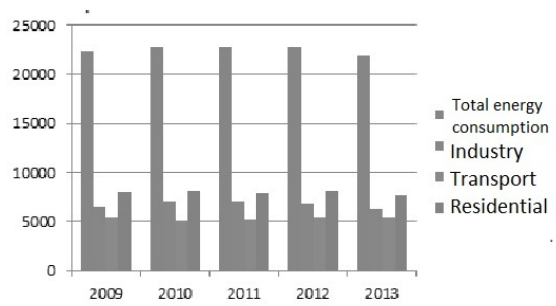

Figure 10. Energy consumption by activity sectors

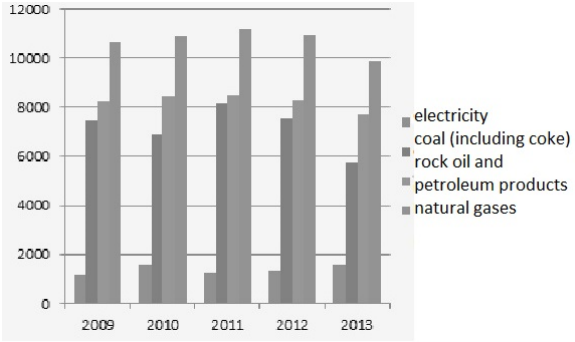

Figure 11. Energy consumption by types of fuel

Following the studies carried out over the years it was found that the concentration of pollutants depends on many factors, of which the most important are:

• traffic intensity and types of vehicles, respectively number of starts at institutions, enterprises, parking lots, oil distribution stations, traffic lights, etc.;

• the configuration of the terrain, the prevailing winds, the height and homogeneity of the buildings that border it;

• weather conditions that contribute to the dispersion of pollutants.

In order to reduce air pollution in urban areas, there are many measures which unfortunately require investment. Among these measures we mention:

•delimiting areas with high emissions and restricting access to more polluting vehicles

•development of transport, by acquiring less polluting means of transport, encouraging cycling, including walking.

•encouraging the use of cleaner fuels and vehicles, by providing economic incentives.

CONCLUSIONS

Maintaining the quality of the surrounding air aims to protect the health of the people and the environment. This is done by regulating the measures intended to maintain ambient air quality where it corresponds to the established ambient air quality objectives. The most important measures that should be imposed are:

• setting objectives for ambient air quality aimed at avoiding the occurrence of harmful events and reducing their effects on human health and the environment;

• assessment of the ambient air quality throughout the country based on methods that comply with the norms of the European system;

• It is very important and it is imperative to gather information regarding the quality of the air in the big cities to support the fight against air pollution and the discomfort caused by it. It is also necessary to monitor the long-term effects of pollution on the health of the population. At the same time, the trends and the improvements resulting from the measures taken at national and European level are monitored;

• promoting permanent cooperation to the highest standards with the other EU Member States aimed at reducing air pollution;

• fulfilment of the obligations assumed by the international agreements, conventions and treaties to which Romania is a party.

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