MEASUREMENT OF AIR QUALITY IN THE JIU VALLEY WITH THE HELP OF RNMCA STATIONS

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Abstract: This paper analyzes and monitors an important environmental factor, namely air. This is one of the essential factors for fulfilling the conditions necessary for the existence of life on Earth. The composition of the air is always changing, being influenced especially by human activities, some waste gases can interact with various substances thus forming new ones which are most often harmful to the environment and living organisms.

Keywords : environment, contamination, pollution, air, gases

1. INTRODUCTION

At the foot of the Parang Mountains on the banks of the Jiu river lies the intramontane depression Jiu Valley. The main cities in this area are Petrosani, Vulcan, Petrila, Aninoasa, Lupeni and Uricani.

The main economic activity in the area is coal extraction, especially black coal. In the Jiu Valley, the mines that have remained are Lonea, Lupeni, Livezeni and Vulcan, two of them being in the process of closing.

All the activity of production, extraction, transport, processing and closing produce a series of solid pollutants (powders, dust) and gaseous (CO2, NH2, etc).

This paper analyzes and monitors an important environmental factor, namely air. This is one of the essential factors for fulfilling the conditions necessary for the existence of life on Earth. The air is composed of 78% nitrogen, 21% oxygen, 1% argon and water vapor quantity of between 0.1% and 4% in the troposphere. The air also contains a lot of other gases, but in very small quantities, such as carbon dioxide and methane. The concentration of these gases is measured in parts per million (ppm).

The composition of the air is always changing, being influenced especially by human activities, some waste gases can interact with various substances thus forming new ones which are most often harmful to the environment and living organisms.

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Particles are considered the atmospheric pollutant that affects most human health but also the environment. For example, some particles are so small that not only can they float in the air for very long distances, but they can penetrate very deeply into our lungs or our blood.

Other particles depending on their chemical composition can affect the climate by heating or cooling our planet. For example, fine particles resulting from incomplete combustion of both fossil fuels and sludge. In our area, particles called "Black carbon" are produced by both power plants and vehicles, especially those with diesel engines. These dark colored particles once they reach the environment are deposited on its surface and attract the solar radiation thus appearing the greenhouse effect and the heating of the environment.[7].

2. METHODOLOGY AND RESULTS

The study carried out aims to evaluate the quality of the air through measurements at fixed points taking into account the regulations of the law no. 104/2011. The Romanian Environmental Protection Agency has created a system of air quality monitoring consisting of 148 monitoring stations that have the role of collecting, analyzing and warning in case of emergency. In Hunedoara, where the Jiu Valley depression is, the environmental agency has located 5 stations, one of them located in the Vulcan city of Jiu Valley. [7][4][6]

We studied the suspended particles PM 10 and PM 2.5 generated by road traffic, industrial activity, population heating system, etc. We randomly chose different months of 2019 to see the differences between them. The values were recorded by the Vulcan RNMCA station and to identify the state of particulate pollution in our area.

The months chosen are January, February, June, October and December of the year 2019. The annual limit values for PM10 are 40µg/m3 and for PM 2.5 are 20µg/m3.

For a healthy environment pm values must be between -∞ and 10 $\mu g/m^3$. A very good environment has values between 10 $\mu g/m^3$ and 20 $\mu g/m^3$, and a good one values between 20 $\mu g/m^3$ and 30 $\mu g/m^3$. Values that exceed 30 $\mu g/m^3$ fit the environment in the other part, that is, average with values between 30 $\mu g/m^3$ and 50 $\mu g/m^3$, bad with values between 50 $\mu g/m^3$ and 100 $\mu g/m^3$ or very bad for values exceeding 100 $\mu g/m^3$.[7].

In the graph presented in figure1 it can be observed that in January the values of Pm are quite high so that the state of the environment falls within the accepted medium values from which results an environment with an medium quality. From the 31 days of the month 12 days exceeded the values that included the environment in an unpolluted one.

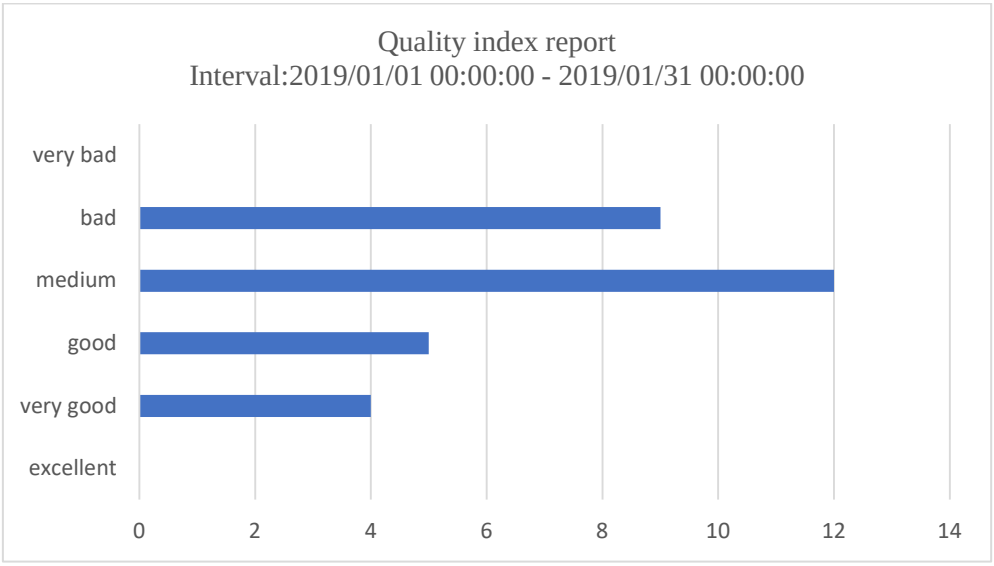

Fig.1 Graphical representation for month January

The next selected month is February. This month presents values that exceed the ideal values, namely -∞ and 10 µg/m^3. In the 28 days of February, 12 days had values between 30 µg/m^3 and 50 µg/m^3, so the quality of the environment is average. This month we also had values that exceeded 100 µg/m^3 so some days had a very bad quality.

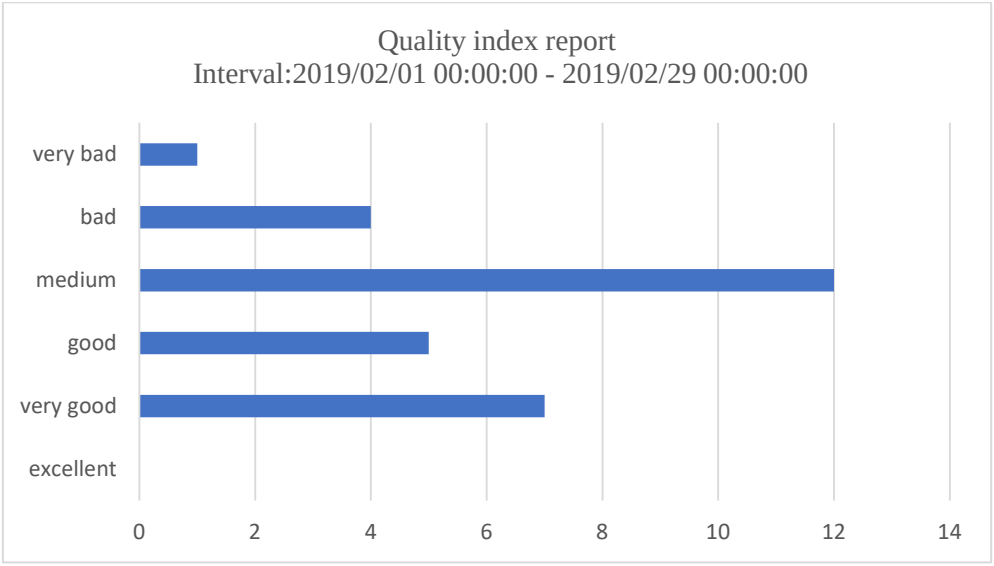

Fig.2 Graphical representation for month February

June is the 6th month of the 12 months of the year and after the study it was established that it is the cleanest air of all the months of the year.

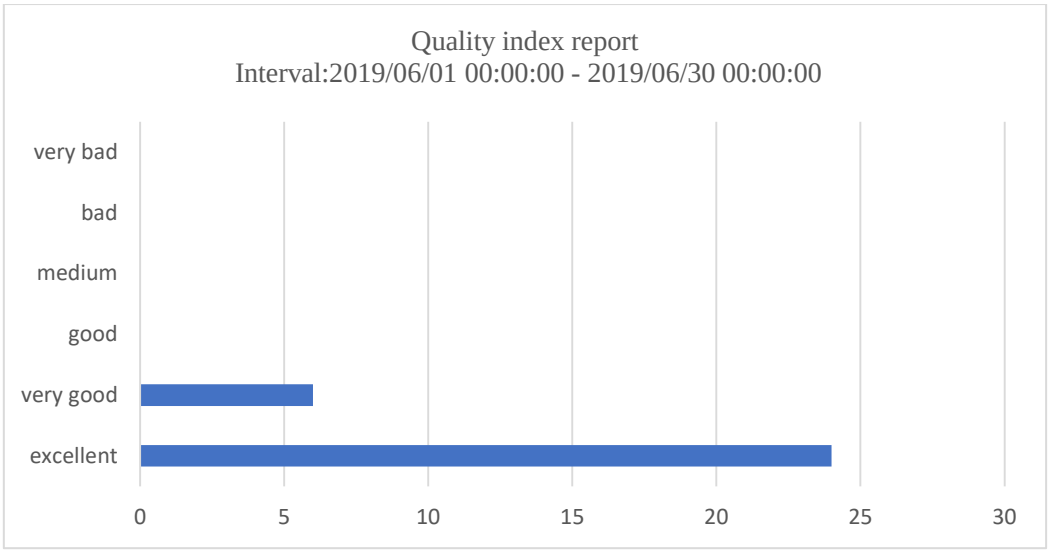

Fig.3 Graphical representation for month June

From the 30 days of June, 24 had ideal values between -∞ and 10 µg/m^3, and 6 had values between 10 µg/m^3 and 20 µg/m^3, therefore the month is considered a month with an extremely clean air without any impurity.

October changes its air quality slightly, the particles appear again, the month still having a good air, 12 days having values between 20 µg/m^3 and 30 µg/m^3 and only one day with values over 100 µg/m^3.

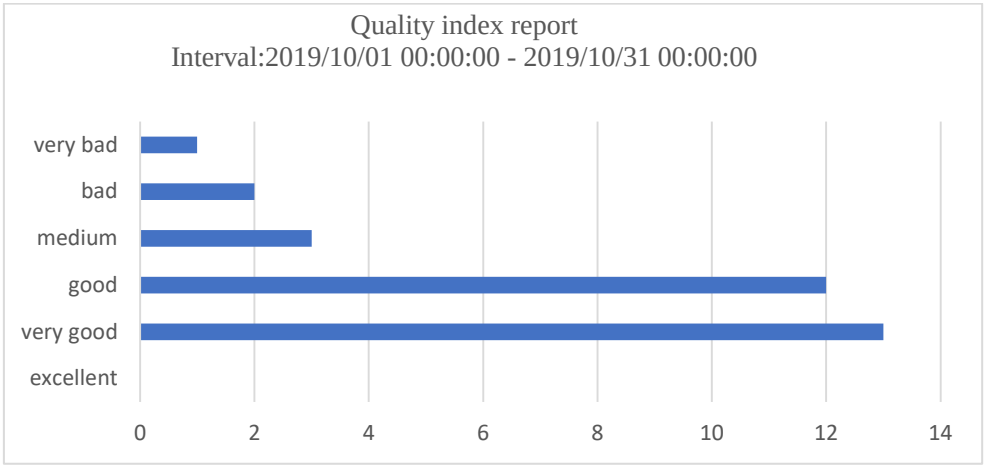

Fig.4 Graphical representation for month October

The last month chosen for this paper is December, where the air quality varies greatly from days with excellent air to days with extremely polluted air, from days with ideal values between -∞ and 10 µg/m^3 to days with values over 100 µg/m$^{3.}$

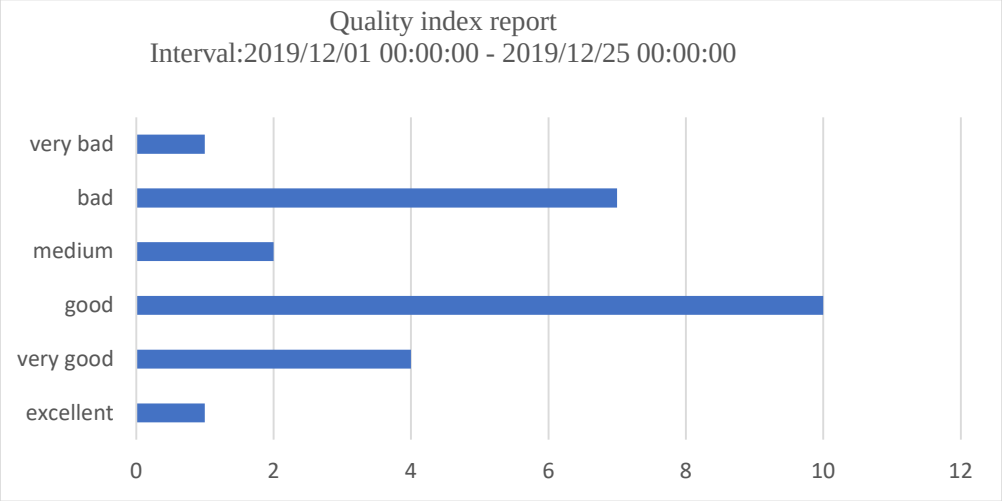

Fig.5 Graphical representation for month December

3. CONCLUSIONS

The main objective pursued by this work is to check the air quality in the Jiu Valley. In the winter period, the phenomenon of thermal inversion appears more and more, best shown by the accumulation of a layer of low altitude clouds called "stratus" in the cities. This leads to the retention of pollutants near the ground thus charging the air with pollutants from the exhaust gases, the thermal power plants, the burning of fossil fuels etc.

In the study, it was observed that the colder months have days with much more particles that affect the quality of the air than the summer months where the number of particles is extremely low so the air quality is very good.

By applying the guidelines established by the Romanian legislation, the verification and comparison of the values registered with the standard values we can say that overall the quality of the environment from the Jiu Valley is a good one.

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