Study Regarding the Atmospheric Pollution Degree in Craiova City

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Abstract. In order to improve the air quality is to apply in practice the national policy of environmental protection through: promoting economic activity of appropriate technologies for retention of the pollutants at source; source management to reduce air emissions to the lowest levels in order to not exceed the regenerative capacity of the atmosphere, and the use of fuels of low-sterile.

The study was undertaken in the period 2006-2008 in Craiova city and targeted air pollution in major areas of concern, namely urban area, traffic area, and two industrial areas.

There were monitored a number of pollutants with modern specialized equipment, such as NOx, PM10, BTX, SO\textsubscript{2}, O\textsubscript{3}, CO, NO\textsubscript{2}.

Following the systematic data on environmental quality in the Craiova area we have established that: the emissions of nitrogen oxides have two trends: at the major industrial stations, the concentrations decrease, and at the representative stations of the traffic, the levels increase, witnessing the transfer of pollution from the industry to traffic.

Key words: air pollution, monitoring, traffic, industry, Craiova city.

INTRODUCTION

Urbanization is the process of intense development and growth with an accentuated rhythm of the cities number and urban population. The process of urbanization has become a general phenomenon specifically and irreversibly, as a result of objective factors like: development of industry and trade, and developing transport and the increase of the cars number.

With population growth and development fund for small and medium enterprises and the continued use of polluting technologies, there have been observed changes in climatic factors associated with increased content of pollutants in the atmosphere.

Thus to achieve this study, in the period 2006-2008 were monitored a number of pollutants and climatic factors in different locations of the city of Craiova, placing the emphasis on industrial and traffic areas, as well as urban and regional areas.

MATERIAL AND METHOD

In view of the study during 2006-2008 were determined climatic conditions, namely: the average monthly temperature and annual rainfall, wind direction and also the pollutants emitted into the atmosphere, namely: SO\textsubscript{2}, NO\textsubscript{2}, NO\textsubscript{x}, PM10, CO, O\textsubscript{3}.

The monitoring network structure consists of 5 stations placed in different areas of Craiova City (Fig.1):
Fig. 1. The automatic air quality monitoring in the City of Craiova

1. CRA 1, Calea București - the station is part of the most intense traffic area, with a volume of over 10,000 vehicles per day, is situated at an altitude of 118 m and has an representative area of 10-100 m.

2. CRA 2, City Hall - is an urban background station located in an area that its not exposed directly to traffic nor industry, at an altitude of 120 m and the representative area is: 1-5 km.

3. CRA 3, Billa - this station is the type of industry, at an altitude of 83 m and an representative area of 100 m-1 km. The intense traffic has also an important influence over this station.

4. CRA 4, Ișalnița - this is also an industrial station, situated at an altitude of 98 m, with an representative area of 100 m-1 km and its under the influence of the Power Plant CET I Craiova and of the Chemical Plant S.C. Doljchim S.A.

5. CRA 5, Breasta - type regional station is situated at an altitude of 128 m, with an representative area of 25-150 km, located away from all major sources of pollution coming from the city.

For the studied pollutants we have taken account of sampling characteristics, needed for the correlation between them and the emissions of pollutants, namely: location of sampling point (building facade, sidewalk, gardens, yards); height of sampling point: 2.5 m; sampling line length: 2 m; the time during the sampling: continuous.

The pollutants we have monitored were determined by specialized methods and equipment such as: non-dispersive infrared spectrometric method, ultraviolet fluorescence method, chemiluminescence method, under the ISO 4224/2000 standards and ISO 10498/2004.

RESULTS AND DISCUSSIONS

In the monitoring carried out during 2006-2008, the climatic factors recorded the following values: the yearly average temperature has values of 12.4 °C with a maximum of
42.6 °C on 24.07.2007 and a minimum of -11.1 °C on 20.12.2006; the average amount of rainfall in the study was 752.3 l/m²; and the predominant wind direction was west, with an average speed of 16 m/s. During the monitoring of the degree pollution in the city of Craiova, in the period 2006-2008, we have realized that:

- At the traffic station Calea București the maximum allowed was exceeded for NO₂, NOx and PM10, a higher degree of pollution was observed in the years 2006 and 2007. Also there was reported an overrun in the case of CO in 2008, but not very significant. According to Ord. 592/2002 maximum allowable concentration for NOx is 30 µg/m³ for PM10 is 40 µg/m³, and for CO is 1 µg/m³, (Fig. 2).

![Fig. 2. The evolution of air quality in the area Calea Bucuresti](image)

- In the urban station - City Hall, in all the years studied NOx exceeded the allowable limit, with values ranging between 36-45 mg/m³ and for SO₂ is an exceedance of the maximum allowed in 2006 (maximum permissible concentration for SO₂ was 20 µg/m³, (Fig. 3).

![Fig. 3. The evolution of air quality in the City Hall area](image)
At the Billa Station – the maximum allowed have been exceeded in all the years studied in both case of NOx and PM10. Nitrogen oxides had a very high value of 70 mg / m³ in the year of 2007 due to the intense traffic because of the rapid growth of cars number over the last three years and the existence of different industries in the area, (Fig. 4).

- At the station Ișalnița were reported exceeded maximum permissible limits for NOx, in all years studied with values ranging between 44-46 mg / m³; for SO₂ in the years of 2006 and 2007 with values of 24 mg / m³ and 21 mg / m³, and in the case of PM10 were recorded values between 65-70 mg / m³ exceeding the maximum allowed in all the years in our study due to industrialization area, (Fig. 5).

- In the regional station Breasta was reported exceeded the limit allowed only for PM10 in 2006 and 2007, (Fig. 6).
CONCLUSION

Following the systematic data on environmental quality in the city of Craiova, the following situations are found most significant:
- Emissions of nitrogen oxides have two trends: at the major industrial stations concentrations decrease, and at the representative stations of the traffic, levels increase due to auto traffic mostly, witnessing the transfer of pollution from the traffic to the industry. An insignificant value of nitrogen oxides is registered at the station Breasta;
- In the case of sulfur dioxide were found exceeding the limit allowed, the urban station and industrial station from Ișalnița, coming from traffic and from incomplete combustion of coal needed to produce electricity;
- PM10 exceeds in all cases the limit allowed, coming from both traffic and industry, higher values were reported especially in the industrial areas, due to the inappropriate management of the processes from the Power Plant CET I Craiova, and also from the Chemical Plant Doljchim S.A and particularly because of the bad monitoring and inadequate maintenance of the slag and ash warehouse existing in the Ișalnița area.
- The values of the other monitored pollutants have not been significant in terms of overcoming the maximum permissible concentrations.

By carrying out this study there was observed an improvement in the air quality in the city of Craiova, a lower level of pollution was recorded in 2008 compared with 2006 when the pollutants had higher values.

To reduce pollution are recommended the following measures to limit the emissions of pollutants into the atmosphere, namely:
- Restricting traffic in some areas in the weekends;
- Better cleaning and maintenance of the city streets;
- The maintenance of vehicles through periodic inspection procedures for exhaust gases;
- The purchase of a better system of aeration for the cleaning gas station of the Chemical Plant;
- The purchase of an installation of desulphurisation of the combustion gases for the Power Plant CET I Craiova;
- More efficient monitoring and the need of better stabilization of the slag and ash deposit through the planting of tree species so that the wind do not dispel the ashes to the near ares of the deposit;
- Raising public awareness on the impact of pollutants on health and environment through education, publishing brochures.

REFERENCES