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ATMOSPHERIC AIR QUALITY IN CALARASI TOWN

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Abstract

The present paper seeks to highlight the appearance of air pollution in Calarasi region on the basis of the annual reports of the environment in recent years and of the integrated air quality management for Călăraşi (data are presented about current and future emissions and concentrations of pollutants) I tried to mark out the impurity of the atmospheric air from this area.Emission data interpretation was made on the basis of the inventory of emissions of pollutants in the air made for fixed and mobile sources in Calarasi town in recent years using the program Corinvent and Corinair emission factors, and imissions data were used to monitor the air quality monitoring network air quality. The index of the quality of the air showed the highest values in winter.There have been occasional instances of the limit provided by law for particulate matter PM_{10}, Calarasi, or being the intense traffic, the topoclimate in summer periods with high temperatures and deficient pluviometric regime, but also because housing fuel winter warming solid. There major problems of environmental pollution of air quality in Calarasi town that falls within the limits imposed by the legislation in force. This is due especially to the fact that many industrial centres have been closed.

Key words**:** *air pollutants, air quality, emissions, imissions, impurity*

INTRODUCTION

The Air quality monitoring is of great importance in monitoring activity because the air is the most important environmental factor for the transport of pollutants is the medium in which their fastest transport takes place in environment.

The air pollution involves changing natural proportions presence of air or gas components in the atmosphere that does not exist normally or whose concentration exceeds certain limits (Enache L., 2007).

The air pollution is altering the physicochemical properties of atmospheric air by entering this environment substances or mixtures of substances foreign to the natural composition of normal air (in the form of solids or liquids, gases, steamers mineral or organic compounds, radioactive substances, microorganisms and so on, including in the form of heat).

Pollution is either local, the concentration of the substance emitted into the atmosphere is distributed in a certain area around the point of emission or regional in nature due to the dispersion of pollutants in the atmosphere (Muntean I.O., 2004).

Their towns and industrial areas, and passageways, are the main gases responsible for the greenhouse (Berca M., 2006).

The importance of protecting this area located in SE Romania shows precisely what elements confer particular interest: the location on the Danube River, the opportunities of the border town positioning and the county transiting The Sun Highway, the beautiful scenery of the islands on the Danube, the fact that agriculture as the dominant industry in the county's economy is significantly influenced by environmental conditions.

MATERIALS AND METHODS

In the county the responsibility for environmental protection is the Environmental Protection Agency.

Environmental activity is regulated by Law 195/2005 and constitutes an obligation of local authorities, institutions, businesses and individuals.

This paper aims to highlight ambient air quality in Calarasi town. For this purpose, the data were collected regarding the air quality in terms of pollutant emissions from different activities and data on ambient air quality. Emissions (emissions are pollutants discharged into the environment, which is manifested and measured starting at the source) data interpretation was based on emission inventory of air pollutants produced for fixed and mobile sources Calarasi the years 2009, 2010 and 2011 using Corinvent program and CORINAIR emission factors and the immission (immission - transfer of pollutants into the atmosphere by a receiver) were used for air quality monitoring data from the air quality monitoring network, using for comparison the corresponding limits presented by Law no. 104/2011. This law aims to protect human health and the environment as a whole, regulating measures to maintain ambient air quality.

CORINAIR methodology (Core Inventory of Air Emissions), updated annually and published on the website of the European Environment Agency, provides information on the types of emission sources in the atmosphere, they generate technological processes and associated emission factors, based on questionnaires received from traders territory.

The Air Quality Monitoring Network in Calarasi area consists of two automatic monitoring stations that are part of the National Air Quality Monitoring, equipped with advanced analyzers and apply reference methods required by European legislation. It has the following structure:

CL1 station (traffic stop) *is located in Orizont area and monitors the impact of traffic on air quality, in order to highlight the level of pollution affecting the population. Pollutants monitored in this station are: SO_2, NO, NO_2, NO_x, CO, PM_{10} gravimetric automatically, Pb (in PM_{10}), benzene, toluene, o-xylene, ethylbenzene, m, p - xylene (on line).*

CL2 station (urban background station) *is located in the Municipal Stadium and monitors the level of pollution in urban areas, the influence of human settlements, without being directly influenced by traffic or industry. Pollutants monitored here are: SO_2, NO, NO_2, NO_x, CO, ozone, lead (in PM_{10}), PM_{10}, Benzene, Toluene, O-Xylene, Ethylbenzene, m, p - xylene (on line). Are also monitored and meteorological parameters (wind speed and direction, temperature, pressure, solar radiation, relative humidity, precipitation).*

Apart from the two stations, the Environmental Protection Agency monitors air quality in the Romanian - Bulgarian border area by two automatic stations located in Chiciu area and the Sanitary Veterinary Directorate area equipped with analyzers, the performance analysis method is DOAS method (optical spectroscopy of Differential absorption). They provide the following monitoring gaseous pollutants: SO_2, NO, NO_2, O_3 (Environmental Annual Report, 2011).

The main activities leading to air pollution in Calarasi town are heat production in thermal power plants for commercial, industrial and residential extraction and distribution of fossil fuels, solvent use, road transport, agriculture and mobile sources (other than road) .

Potentially polluting sources of NO_x, SO_x, CO_2 and dust on air quality in Calarasi are: SC TENARIS SILCOTUB SA - Calarasi workstation (mill), SC SAINT GOBAIN GLASS SRL Romania (glass factory), SC COMCEH Calarasi (factory paper), SC Donal SRL Calarasi (mill), SC PREFAB SA Calarasi (building materials) and asphalt stations: SC ROADS AND BRIDGES SA Calarasi, SC ASTALROM SA Calarasi SP GREEN SPACES SA Calarasi.

Specific air quality index is a coding system to levels recorded for each monitored following pollutants: sulphur dioxide (SO_2), nitrogen dioxide (NO_2), ozone (O_3), carbon monoxide (CO), particulate matter (PM_{10}).

The general index is established for each of the stations of the National Network Automatic Air Quality Monitoring as the greatest of specific evidence that pollutants monitored.

In order to calculate the overall index must be available at least 3 specific indices that

pollutants monitored. General and specific indices index are represented by integers between 1 and 6. (Environmental Annual Report, 2011).
The Integrated Air Quality Management is designed to ensure compliance with the limit values laid down by national legislation and international Calarasi and surroundings. It contains estimates of the evolution of pollutants by 2015.
The specific objectives of this program are: to identify areas where limit values are exceeded; quantify the contribution of different emission sources, defining series of measures which should ensure compliance with the limit values , monitoring and evaluation recommendations for improving air quality in the city in the future, defining responsibilities (Integrated Program Management Air Quality for the Calarasi, 2004).

RESULTS AND DISCUSSIONS

Integrated Program Management Air Quality data are presented for the current and future emissions and concentrations of pollutants in Calarasi. Together, these data show that the limit values are exceeded now and they will probably be obsolete in the future, even after the implementation of existing plans to reduce pollution. These data also show that pollution sources are the most important.
By comparing data modelling software and data from the annual average for 2010 revealed the following:

Table 1. Comparing data modelling program with those obtained from the annual average

Analyzed substance	SO_2	PM_{10}	NO_X
Estimates for 2010 (tons / year)	736,4	418	3960
Data obtained by analysis / 2010 (tons / year)	582,8	530	959,48

It can be seen from the table that the most important air quality problems are related Calarasi PM_{10} emissions from solid fuel use in the residential sector. The air quality modelling showed that this significant problem is found not only in the centre of Calarasi, but also in neighbouring residential areas. The other two pollutants monitored were below estimates ranged modelling program.
The general air quality index was achieved by averaging each month individually, and the results obtained are shown in Figure 1.

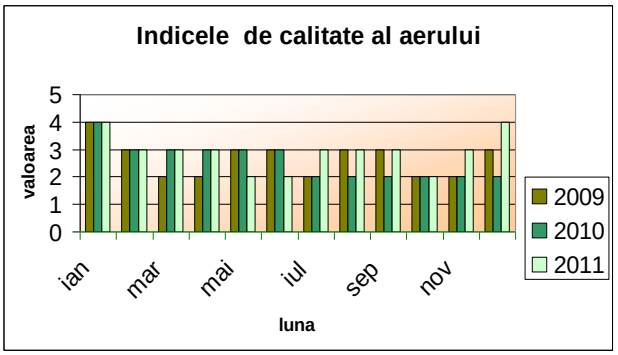

Figure 1. The evolution of the air quality index in 2009-2011

From Figure 1 it can be seen that the highest level pointers. were obtained in the winter months, December and January, which is due to the same particulate matter (PM_{10}) arising from the use of solid fuels (wood, coal) to heat their homes.
Data collected from two monitoring stations in the city (according to Average Annual Reports: 2009, 2010, 2011) have revealed the following:

A. Monitoring Station CL 1

a. Determination of sulphur dioxide - 1 hour averaging time revealed the following situation (frequency exceeded - 0%)

Table 2. Determination of SO_2

Analyzed Element (mg/m^3)	Year			Limit imposed the Order 592/2002
	2009	2010	2011	
SO_2	6,13	9,58	24,11	350

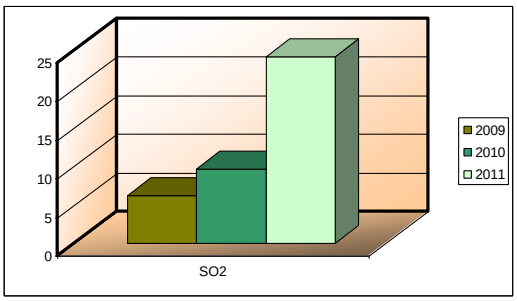

Figure 2. Evolution of SO_2 in 2009-2011

According to Figure 2, SO_2 emissions have greatly increased due to the opening of the new factory reopening Saint Gobain and improved Donasid steelworks. But it is an important and increasing traffic.
Sulphur dioxide (SO_2) comes from heating the population that does not use gas, power plants, industrial processes (steel, refinery, sulphuric acid production), pulp and paper industry and to a lesser extent, emissions from diesel engines.

b. Determination of nitrogen dioxide - 1 hour averaging time revealed the following situation (frequency exceeded - 0%):

Table 3. Determination of NO_2

Analysed Element (mg/m^3)	Year			Limit imposed the Order 592/2002
	2009	2010	2011	
NO_2	13,01	13,34	15,72	200

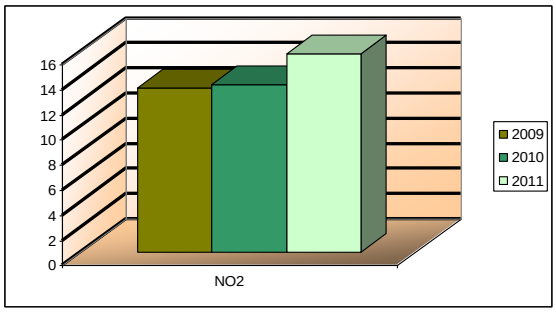

Figure 3. The evolution of NO_2 in 2009-2011

According to Figure 3, NO_2 emissions have increased slightly since 2009 and until 2011, due to increased traffic continuously.
Nitrogen oxides - NOx, NO_2 is formed especially in the combustion process when fuels are burned at high temperatures, but more often they are the result of road traffic, industrial activities, producing electricity.

c. Determination of carbon monoxide - 1 hour averaging time revealed the following situation (frequency exceeded - 0%):

Table 4. Determinations of CO

Element analyzed (mg/m^3)	Year			Limit imposed the Order 592/2002
	2009	2010	2011	
CO	0,15	1,63	1,71	10

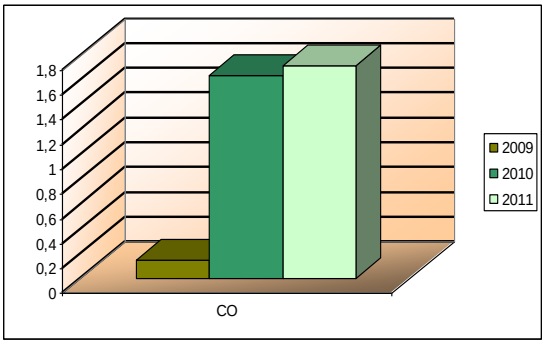

Figure 4. CO evolution during 2009-2011

In Figure 4 is shown the close connection between the CO and the growing number of vehicles in Calarasi town. Road produces the highest percentage of CO released into the atmosphere (about 85%). Amounts of CO (g) are produced by biomass burning, industrial processes and some biological activities.
Carbon monoxide (CO) - is formed mainly by incomplete combustion of fossil fuels, iron and steel production, oil refining, road, air and rail.

d. Determination of particulate matter - 1 hour averaging time revealed the following situation (frequency exceeded - 0%)

Table 5. Determinations of PM_{10}

Element analyzed (mg/m^3)	Year			Limit imposed the Order 592/2002
	2009	2010	2011	
PM_{10}	48,28	38,77	29,6	50

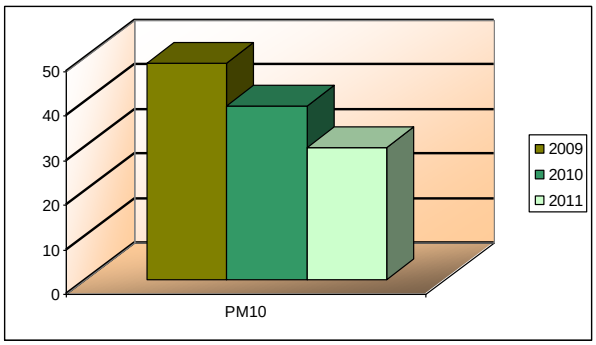

Figure 5. The evolution of PM_{10} in 2009-2011

Figure 5 shows the decrease in the amount of PM_{10} recorded in the three years. This is due to the installation of more and more thermal power stations and renunciation solid fuel domestic heating.

PM_{10} particulate matters derive from the industrial activity, population heating, thermal power stations. The road traffic contributes to particulate pollution caused by car tires to stop them both and because of incomplete combustion.

B. Monitoring Station CL2

a. Determination of sulphur dioxide - 1 hour averaging time revealed the following situation (frequency exceeded - 0%):

Table 6. Determination of SO_2

Analyzed element (mg/m^3)	Year			Limit imposed the Order 592/2002
	2009	2010	2011	
SO_2	5,71	8,22	13,7	350

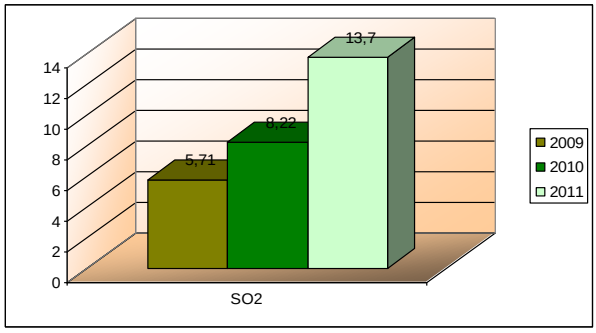

Figure 6. Evolution of SO_2 in 2009-2011

According to Figure 6, SO_2 emissions have increased dramatically in the past three years without becoming dangerous.

b.Determination of ozone - 1 hour averaging time revealed the following situation (frequency exceeded - 0%):

Table 7. Determinations of O_3

Element analyzed (mg/m^3)	Year			Limit imposed the Order 592/2002
	2009	2010	2011	
O_3	62,77	55,31	51,56	120

According to Figure 7, ozone is constantly decreasing. Ozone is a gas emitted. The only source of air are chemical reactions. Eliminating ozone include chemical reactions (preferably with organic surfaces).

The air is harmful when inspired O_2 instead of its derivative called ozone. The effect of troposphere ozone is harmful photochemical smog. Substances responsible for the formation of troposphere ozone are volatile organic compounds, NO_x, and Freon-type substances.

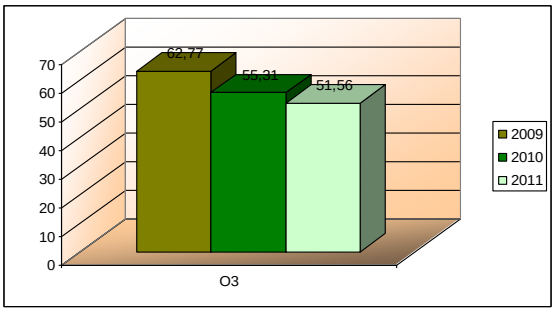

Figure 7. O_3 evolution in the period 2009-2011

CONCLUSIONS

The application of the measures in the Integrated Air Quality Management Program Program in Calarasi area can lead to maintaining and improving the air quality in Calarasi town.

Exceeding of the daily values of particulate matter each year, recorded especially in cold periods is due to the north-east section of serious environmental problem areas: industrial area abandoned and vacant lots, being misused for waste disposal, housing in the area used for heating combustible solid or unconventional.

This situation will be resolved in the future by extending the natural gas network in the north and east of Calarasi town.

In the analysed period,, there was occasional exceeding of the limit laid down by Law 104/2011 for particulate matter PM_{10} in Calarasi town, exceeding due to the heavy traffic (especially in the station CL-1-Orizont), local topoclimate in dry summer periods, but also due to heat houses with other fuels, except methane (especially in the representativeness of DSV station).

The air quality monitoring has improved slightly during 2009 - 2011 due to diminishing economic activities and programs of refurbishment and modernization at the level of industrial units and increasing the activity of the Environmental Protection Agency (increasing the number of inspections

at companies with activity that produces an impact on air quality).

In 2011, progress has been made in terms of air quality in Calarasi town (Environmental Annual Report, 2011):

- Economic operators in the city have limited air pollution emissions by measures included in the compliance programs in order to meet the requirements of BAT (for applying the best available techniques) and the limits imposed by environmental permits.
- Online monitoring of emissions by economic operators: SC TENARIS SILCOTUB and SC SAINT GOBAIN GLASS ROMANIA SRL.
- Reduction of particulate emissions from the production process at SC PREFAB SA Calarasi the installation of dusting equipment.
- Reducing heat consumption by rehabilitating 6 units of education in Calarasi town, by accessing the Environmental Fund.
- The local heavy transport was disposed on arteries that try to avoid the central area.
- The inner road infrastructure was improved in Calarasi municipality.

Due to the involvement of economic operators and local authorities, the issue of air quality in Calarasi town tends to improve.

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