

# Studies of ambient air pollution by sulfur dioxide, nitrogen oxides and ammoniac in the agroecological area of Arad

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Expert paper

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## Abstract

The accomplished researches from Arad agro-ecological area aimed to estimate ambient air pollution with sulfur dioxide, nitrogen oxides and ammoniac on a certain period of time (1998-2005), to point out some aspects regarding pollution level and its evolution for these pollutants and to find some possible causes for the determined emissions' values.

**Key words:** pollution, sulfur dioxide, nitrogen oxides, ammoniac

## Introduction

Today we are witnesses of some global climatic changes resulted very often as a consequence of human activities which pollute our living environment. Disappearance of large forest surfaces which directly influences the temperature increasing, rainfalls diminution, followed by long periods of drought, wide surfaces decertifying, world demographic evolution, all correlated with the aggressiveness of polluted industries' development, wars, nuclear experiments etc, constitute a negative consequence for life.

Civilized man perceives polluted environment as a permanent stress with repercussions on his health. Environmental protection is today's generation obligation, both for herself and future generations especially.

## Material and methods

Ambiental air's pollution with sulfur compounds, nitrogen oxides and ammoniac demonstrates negative effects either on plants, animals and people.

Referring to plants, sulfur dioxide penetrates the tissues and together with water and carbon dioxide produces wounds, deteriorating chlorophyll.

Concerning to negative effects on people, nitrogen oxides destroy lung sockets because posses a higher toxicity than carbon monoxide (nitrogen dioxide manifest the four times monoxide's toxicity).

Regarding studied area, the atmosphere pollutants' emissions were calculated through Corinair method and determinations were carried out at the four collection stations from Arad Town: Astra Vagoane, APM - Environment Protection Agency - Laboratory, A. Saguna Street and Power Station. The analyses were realized in APM Laboratory, using Sibiu type collection pumps, with 24 hours mediation time. Analytical determinations of pollutants' concentrations were carried out using spectrophotometric methods.

## Results and discussion

As a result of accomplished studies, all based on the four collection stations' registrations, SO<sub>2</sub> emissions values function of activity type during 2005 year (Table no. 1), demonstrate that the most important source is represented by the energetic industry's combustions.

In Arad County, the major source of SO<sub>2</sub> emissions is represented by SC CET Arad, through the agency of the ten big combustion installations: SC CET Arad hydrocarbons-based which uses eight combusting installations and SC CET Arad lignite-based with two combusting installations.

Analyzing SO<sub>2</sub> emissions quantities between 1998-2005, obtained data show that in the last two years it is manifested a diminution tendency of these emissions, excepting 1999 and 2002, when the values are smaller (Figure no.1).

Table 1. Report on SO<sub>2</sub>, NO<sub>x</sub> and NH<sub>3</sub> emissions during 2005 year

Sources categories	SO <sub>2</sub> (t/year)	NO <sub>x</sub> (t/year)	NH <sub>3</sub> (t/year)
Energetic industry's combustions	11509	734	0,22
No industrial combustion installations	274	393	36
Combustions came from processing industry	21	8	0,08
Production processes	-	-	0,00048
Road transport	1	3563	-
Another mobile sources	28	141	0,019
Residues treatment and storing	-	-	527
Agriculture	-	-	4492
<b>TOTAL</b>	<b>11833</b>	<b>4839</b>	<b>5055</b>

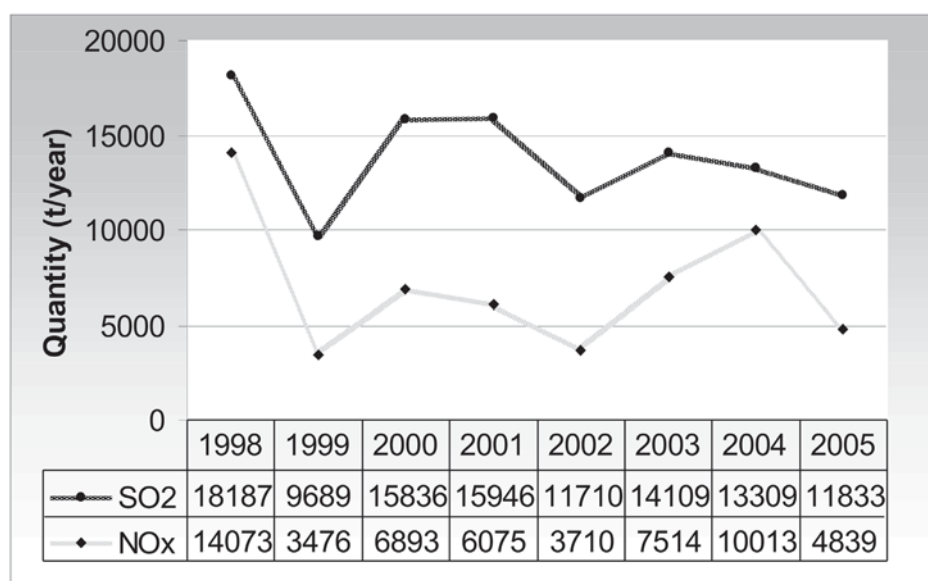


Figure 1. SO<sub>2</sub> and NO<sub>x</sub> Emissions quantities' evolution

Source: Arad County Environment Agency

In Table no. 2 are presented the obtained results in the four collection stations from Arad Town during 2005, MCA for this pollutant not being exceeded.

Because APM Arad Laboratory isn't equipped with a proper system (according to 592/2002 Normative) of collection and analysis of gas pollutants in order to observe the necessary mediation times, during 2005 were weekly carried out indicative samples, on mediation time of 60 minutes, in two collection stations which are considered significant polluted: Podgoria and UTA Squares. The results are showed in Table no. 3.

As a conclusion of these results, we can notice that during 2005 year determined concentrations for indicative analyses were higher than averages of determined concentrations at impact stations from Arad city, average concentration for SO<sub>2</sub> being 9,62 times higher.

Table 2. Monthly average concentrations of SO<sub>2</sub> (2005)

Crt. No.	Month	Average concentration, mg/m <sup>3</sup>				
		Astra Vagoane	APM Center	Saguna Street	Power Station	City
1	January	0,0011	0,0020	0,0033	-	0,0021
2	February	0,0007	0,0057	0,0007	-	0,0023
3	March	0,0001	0,0002	0,0001	0,0001	0,0001
4	April	0,0007	0,0007	0,0013	0,0004	0,0008
5	May	0,0006	0,0004	0,0006	0,0001	0,0004
6	June	0,0003	0,0002	0,0005	0,0002	0,0003
7	July	0,0004	0,0003	0,0005	0,0003	0,0004
8	August	0,0004	0,0004	0,0005	0,0002	0,0004
9	September	0,0004	0,0003	0,0004	0,0002	0,0003
10	October	0,0006	0,0007	0,0008	0,0003	0,0006
11	November	0,0009	0,0032	0,0010	0,0004	0,0014
12	December	0,0024	0,0021	0,0013	0,0074	0,0033
15	Average concentration	0,00074	0,00137	0,00095	0,00109	0,00104
16	MCA	0,250				
17	Exceeding, %	0,00	0,00		0,00	0,00

Table 3. SO<sub>2</sub> concentrations in indicative samples

Zone	Collection station	Number of samples	Concentration, mg/m <sup>3</sup>			MCA	Exceeding %
			average	max	min		
Arad	Podgoria Square	52	0,011	0,041	0,00		0
Arad	UTA Square	52	0,009	0,038	0,00	0,450	0
Arad	City	104	0,010	0,041	0,00		0

NO<sub>x</sub> emissions values, function of activity type, are presented in Table no. 1. According to this, road transport presents the highest weight.

Analyzing NO<sub>x</sub> emissions' evolution between 1998-2005, one can see a significant diminution in 2005, especially comparative with 1998 and 2004 (Figure no. 1).

Taking into account existent results, one can find the fact that during 2005, MCA for this pollutant was not exceeded (MCA = 0.100 mg/m<sup>3</sup>) and determined concentrations in indicative samples were higher than averages of determined concentrations at impact stations from Arad city, average concentration for NO<sub>x</sub> being 1,83 times higher.

The most important, by quantitative point of view, ammoniac pollution source comes from agriculture, through the agency of biomass combustion which is obtained as a result of disafforests and animal residues fermentation. Also, cultivated soils emit high quantities of ammoniac. Not at last, the wrong administration of household residues (collection, transport and storing) determine ammoniac high quantities emissions of ammoniac, as a result of their fermentative process which is favoured by air's humidity and high temperatures.

Obtained data pointed out in Table no. 1 indicate that the major source of NH<sub>3</sub> is agriculture (which represent 88,86% of total emissions), followed by residues treatment and storing (which represent 10,42% of total emissions).



## Conclusions

During 2005 year, in leading station, qualitative parameters of gas pollutants didn't exceed admitted values; concerning to the impact stations, it's noticeable the fact that gas pollutants didn't frequently overtake accepted values.

The quantities of pollutants emitted in atmosphere during 2005, by varied activities carried out in Arad area, suffer a diminution tendency toward last years because of the changes manifested of the main polluting sources (industry, road transport).

Discussing about atmosphere pollution, the critical areas in Arad are: SC CET Arad lignite-based, SC CET Arad hydrocarbons-based, SC IMAR SA, road transport.

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