

ASPECTS CONCERNING THE AIR POLLUTION WITH AIR-FLOATED MATTER (PM₁₀) IN BOTOSANI TOWN AREA

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Abstract: *The present study presents the results of a monitoring in the period 2000-2010 of pollution with particulate matter, the fraction PM₁₀, in the air of Botosani municipality, having as main objective the evaluation of the atmosphere degree of pollution. The atmosphere contamination with air-floated matter can have natural causes, as entrainment of particles from the surface soil by the wind, or anthropogenic: the traffic because of fuels burn and emission, because of brake and tires wear, by lifting non-skid material on roads but also from the production processes (metallurgical industry, chemical industry etc), burns in the energetic sector, building sites and road transport, industrial and municipal dumps stockpiles and storehouses, individual heating systems, especially those which use solid fuels.*

Keywords: *particulate matter, evolution tendency, average concentrations, Botosani(town).*

1. Introduction

The reference method for PM₁₀ sampling and measurement is described in EN 12341 and consists of collecting filters of PM₁₀, fraction and determining the mass with the help of the gravity-metric method.

The directive 2008/50 brought the biggest change in the field of air-floated matter, because we pass to a limit apron four times smaller than the one practiced at present. There is not taken into account PM₁₀ matter, but they are reduced four times, the landmark being the matter with the diameter smaller than 2,5 micrometers (PM 2,5).

In these conditions, to the European Union States are required, until January 1, 2015, the limit value of air-floated matter emissions to be at most 25 μg/m³, as yearly average, and in 2020 this one to decrease at 20μg/m³.

Related to matter inhalation danger we don't have to omit the features of the children respiratory tree. The respiratory paths being shorter, make them to be exposed to pollutants. In the same timer it is important the fact that generally children spend more time outdoor and most of the times they make

exercises followed by increasing the respiratory frequency and by penetration of a higher air quantity in the lungs.

2. Materials and methods

In Botosani municipality, the sectors which emit the largest amounts of PM₁₀ are represented by the traffic, industry and thermal plants which use solid fuels. Industry reduces visibly emissions especially in the energetic branch, while in the construction materials industry the emissions increase. On the whole, also in traffic, there is registered an emission reduction, mainly due to improving fuels quality.

Repair of these sources on the municipality territory is not uniform. In the North of the municipality there is the industrial area and the plant for producing thermal energy plus traffic, because on this segment the municipality doesn't have a ring road. In the same time in the West and South of the municipality in the last ten years appeared new villas neighbourhoods which needed demolitions, heavy traffic and handling specific building

materials. In the East, the powder pollution sources are also house building, their heating, the inhabitants activity in agriculture and uncontrolled burning of waste specific from courtyards and households.

3. Results and discussions

The evolution of particulate matter in the analyzed interval shows that the most increased yearly average value was registered in 2001, $63.56 \mu\text{g}/\text{m}^3$, and the lowest value in 2003, $38.68 \mu\text{g}/\text{m}^3$ (tab.1, fig.1). According to the rules established by the legislation previously exposed, the yearly limit value was exceeded in Botosani in eight of the eleven years analyzed. Exceedings have averaged 1,3 to 1,5 times since 2000 until

2007, and in case of the years 2009 and 2010 over 2,2 times.

The European Commission broke out, in March 2011, the infringement procedure for 5 areas in Romania, because of the atmospheric pollution caused by air-floated matter and because in Romania the legislation concerning air quality doesn't respect the European requests, monitoring the air quality is incomplete, and population doesn't have a handy method to evaluate realistically and coherently the quality of air they breathe. Towns where there weren't registered exceedings of air-floated matter limits (PM 10) were: Galați, Timișoara, Craiova, Cluj and the North of Romania.

Tabel.1.

Yearly average concentration of PM_{10} ($\mu\text{g}/\text{m}^3$) in Botosani municipality, in the period 2000-2010

	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
PM10 ($\mu\text{g}/\text{m}^3$)	52.92	63.56	62.73	38.68	42.81	39.43	41.8	46.07	39.25	43.08	45.8
Yearly limit value until 2007 ($\mu\text{g}/\text{m}^3$) according to OM n. 592/2002	40	40	40	40	40	40	40	40			
Yearly limit value until 2010 ($\mu\text{g}/\text{m}^3$) according to Directive 2008/50									20	20	20
Limit value for human health protection, 24 h ($\mu\text{g}/\text{m}^3$) according to Directive 2008/50	50	50	50	50	50	50	50	50	50	50	50

Source: EPA Botosani

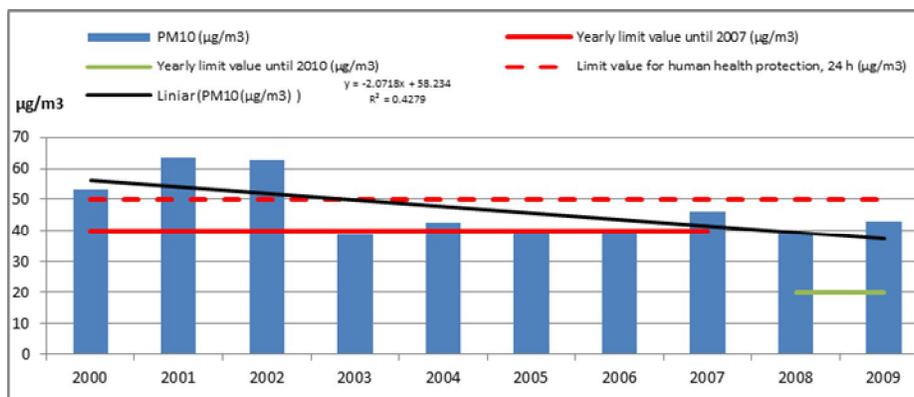


Figure 1. Evolution of PM_{10} ($\mu\text{g}/\text{m}^3$) yearly average concentrations in Botosani municipality, in the period 2000-2010

Monthly average concentrations (tab. 2, fog. 2) of air-floated matter (PM_{10}) have the

most increased concentrations in cold months, January ($51.76 \mu\text{g}/\text{m}^3$) and November (50.82

$\mu\text{g}/\text{m}^3$), when there are frequently registered exceedings of daily limit values, and the lowest concentrations in the warm months of the year, May ($40.37 \mu\text{g}/\text{m}^3$) and June ($40.42 \mu\text{g}/\text{m}^3$). High values in the cold period coincide with the periods when there is used non-skid material, when the emissions in traffic are higher and the energetic industry

function at full capacity. Exceedings met are due to traffic, road modernization works in the warm season, and in the cold season to thermal plants functioning and to weather conditions (atmosphere calm) which favoured maintenance of pollutants close to the soil.

Table 2.

Monthly average concentration of PM_{10} ($\mu\text{g}/\text{m}^3$) in Botosani municipality, in the years 2000-2010

	I	I I	I II	I V	V	V I	V II	V III	I X	X	X I	X II	A n
Mo nthly ave rage	5	4	4	4	4	4	4	4	4	4	5	4	4
	1.76	9.37	9.55	7.82	0.37	0.42	6.72	3.10	5.84	5.46	0.82	7.75	6.58

Source: EPA Botosani

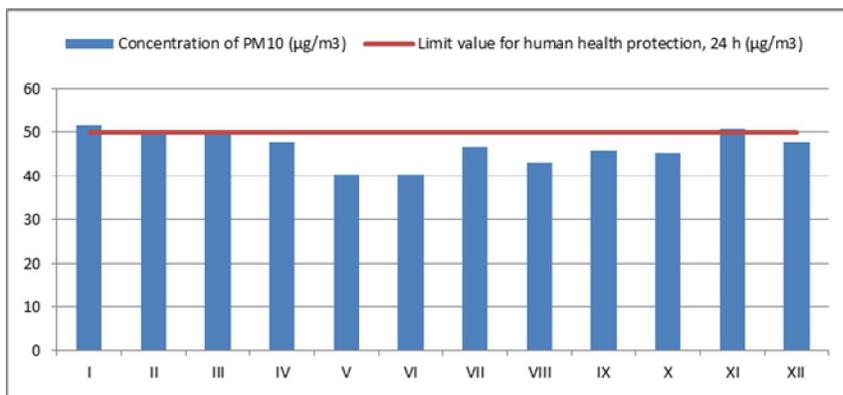


Figure 2. Variation of monthly average concentration of PM_{10} ($\mu\text{g}/\text{m}^3$) in Botosani municipality, in the years 2000-2010

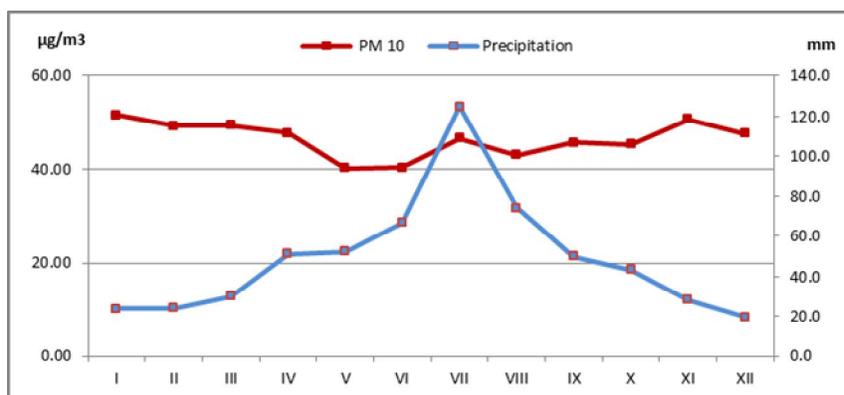


Figure 3 Evolution of monthly air-floated matter average concentrations (PM_{10}) and precipitations in Botosani (2000-2010)

The precipitations according to the form, value and length, produce atmosphere washing, and the soil surface, if it is wet, it

doesn't allow reactivation of new matter amounts.

The connection between these two phenomena, evolution of air-floated matter

amounts, and also the evolution of the precipitations are presented in figure 3. There can be observed a relation of inverse proportionality between the monthly precipitations amount and monthly average concentrations of air-floated matter.

4. Conclusions

For the analyzed period of time, the yearly limit value and that for human health protection in 24 h, of air-floated matter, frequently exceeded maximum admitted values. The dominant direction of winds (NW-SE sector), contributed to this unhappy situation, the winds dissipating the pollutants agents in the central areas of the town. The areas critical from the air pollution point of view are situated near the intersections, the building sites and industrial dumps warehouses.

The lowest air pollution level with air-floated matter is registered in warm semester, when the precipitations amount has the property to wash the atmosphere, while the highest pollution level is registered in the cold semester, the increased values being influenced by traffic and by thermal plants functioning.

The influence of fog and atmospheric calm doesn't have to be minimized, phenomena which prevent pollutants dispersion and determines their retention close to the soil.

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