

THE LEVEL OF AIR POLLUTION WITH DEPOSITING DUST IN BIHOR COUNTY

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Abstract

The aim of this work is to analyze the space and time variations of the depositing dust in Bihor county; in the present work we have tried an analysis of their evolution as well as an analysis of the factors that generate or impose them. Thus, the evolution of the depositing dust has been noticed in the 14 monitoring points for the period 1994-2010. After having analyzed the monitoring points it comes out that the value of the depositing dust fits within the limits of the maximum admitted concentration of 17 g/m²/month.

Key words: pollution, depositing dust, maximum admitted concentrations.

INTRODUCTION

The analyzed area has the advantage that it is found in lower regions with a large opening to the west, fact which favors a free circulation of the air masses, air that purifies the atmosphere from the unpleasant effects of dust and industrial smoke. The vegetation is also of a great importance as it constitutes a barrier against dust.

From the weather elements that condition the spreading of the dust we can firstly mention the direction and the speed of the wind on the ground and in altitude, the duration and the quantity of rain falls as well as the distribution of the temperature at different levels in the atmosphere, the latter determining the thermic stratification of the atmosphere and through this its degree of stability (Măhăra Gh., 1969).

MATERIAL AND METHODS

For the analysis of the depositing dust from the area of Bihor county we have used data furnished by the Environment Protection Agency of Bihor county.

The depositing dust is determined in low tide in 14 collecting and control points divided in three areas at Bihor county's level, with a monthly collecting frequency: Area I (the north-west area of the county): Tărian, Biharia, Sălard, Ep. Bihor; Area II: Baile 1 Mai, the weather station, A.P.M. Oradea; Area III: Telechiu, Chistag, Peștera, Aleșd, Aștileu, Subpiatră, Țețchea.

In the three monitoring areas from Bihor county we have analyzed the depositing dust for a period of 17 years (1994-2010). The collected evidence has covered all the months of the year.

For the air quality analysis the presence and the quantity of the toxic elements must be taken into consideration comparing them to the maximum admitted concentrations established by STAS 12574/1987 and according to Regulation 592/25.06.2002. The maximum admitted concentration for the depositing dust is of $17 \text{ g/m}^2/\text{month}$.

The main methods used in the present study are: the analysis method, the deductive method, the comparative method, statistics and mathematical methods and graphical methods. The data from the Environmental Protection Agency have been processed with the help of the statistics and mathematical methods. These result were then graphically shown to clearly emphasize the variability in time of the depositing dust.

RESULTS AND DISCUSSION

The yearly and multi yearly evolution of the depositing dust

Following the evolution of the depositing dust quantities from Bihor county during the analyzed period it comes out that the highest quantity has been produced in 1999, in the Subpiatră collecting point and it was of 15.065 g/m^2 , followed by the Episcopia Bihor collecting point where in 2006 a pollution of 12.544 g/m^2 had been registered. The following high values are also registered in the same two points mentioned above, in Episcopia Bihor where in 2008 a concentration of 11.933 g/m^2 had been registered and in the Subpiatră collecting point there was a concentration of 11.433 , in the year 2007.

The lowest yearly average concentrations of depositing dust from the studied area had been registered in 2000 at Băile 1 Mai, and they were of 2.545 g/m^2 . Low values of under 3 g/m^2 were also produced in 2010 in the Telechiu collecting point with a value of 2.706 , followed by the year 1998 in Episcopia Bihor with a value of 2.75 g/m^2 , then by the year 2010 with the Țețchea collecting point with a concentration of 2.801 g/m^2 then by the year 1994 with the Aleșd collecting point where there was a concentration of 2.813 and by the year 2008 when there was a concentration of 2.907 in the Subpiatră locality.

From the multi yearly average of the 17 years studied it comes out that the highest degree of depositing dust is registered in the Episcopia Bihor collecting point with a value of 7.781 g/m^2 , followed by the Aștileu point with a multi yearly average value of 7.602 g/m^2 . The lowest values during the analyzed period were produced in the Băile 1 Mai collecting point with a concentration of 4.138 g/m^2 . Close values have also been registered in the following collecting points, having the mentioned values:

Stația Meteo (4.512 g/m^2), in Tărian locality (4.567 g/m^2), in Telechiu (4.661 g/m^2), Aleșd (4.855 g/m^2) and in Sălard (4.875 g/m^2) (see figure 1).

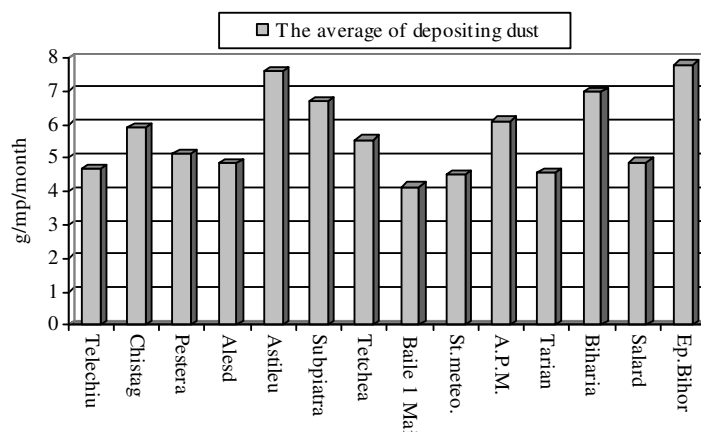


Fig. 1 The evolution of the multi yearly average concentrations of depositing dust in the 14 monitoring points from Bihor county

Following the evolution of the depositing dust in the period 1994-2010 the sanitary norm admitted, meaning $17 \text{ g/m}^2/\text{month}$ had not been exceeded.

The monthly evolution of the depositing dust

From the monthly evolution of the depositing dust during the analyzed period the average concentration of the 14 monitoring points has the highest value, meaning (14.468 g/m^2) in July 1995 followed by February 1999 with (13.124 g/m^2). High concentrations of over 10 g/m^2 are produced in June 2007 with a concentration of 12.513 , as well as in September 2000 with a value of 10.586 g/m^2 . The lowest concentration is produced in August 1996, meaning 1.690 g/m^2 . Low concentrations with values under 2 g/m^2 are also produced in January 1998 with a concentration of 1.776 g/m^2 , followed by January 2000 with a value of 1.811 and again followed by January the following year with a concentration close to 1.887 . Having in view the analysis of the monitoring points it comes out that the value of the depositing dust fits within the limits of the maximum admitted concentration of $17 \text{ g/m}^2/\text{month}$.

In 1995 in June, in the Biharia și Tărian monitoring points high concentrations had been registered the cause being an accidental pollution as the weather conditions for June 1995 indicate that both the rain falls as well as the wind were within normal parameters (Moza Ana, 2009). As there has not been an individual monitoring at each pollution unit the exact cause and the exact pollution agent can not be known.

The average multi yearly monthly evolution of the 14 monitored localities shows that the month of June has the highest degree of depositing dust with a value of 7.411 g/m^2 , followed by July with the value of 6.996 g/m^2 and by May with 6.923 g/m^2 . January is the month with the lowest value of depositing dust, meaning 3.668 g/m^2 (see figure 2).

The higher degree of pollution with depositing dust from the summer months (June indicates the highest value) is due to the fact that during this period the biggest quantities of rain fall is registered. Through their quantity and duration the rain falls bring a contribution to air purification because in their fall rain takes the air impurities and deposits them on the surface of the ground. The lowest quantities of depositing dust are produced in January when the minimum rainfall is also produced (January – March) (Moza Ana, 2009).

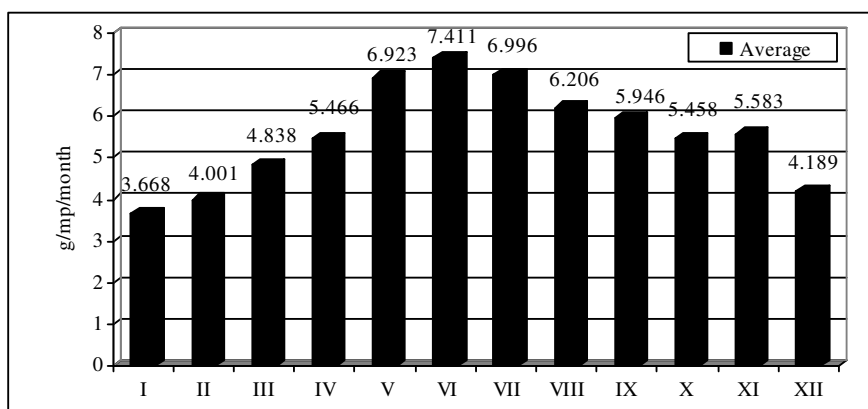


Fig. 2 The evolution of the multi yearly monthly average depositing dust concentration from Bihor county (the average of the 14 points) for the period 1994 – 2010

The evolution on areas of the depositing dust

The multi yearly average of the three areas registers the highest concentration of the depositing dust in area I (5.938 g/m^2) followed by area III (5.634 g/m^2) and the lowest concentration is registered in area II (4.916 g/m^2).

During the analyzed period in Bihor county the area with the highest depositing dust concentration is area I with the highest value in 2008, meaning 7.327 g/m^2 followed by 2010 with a value of 7.203 g/m^2 , then by 1995 with a concentration of 7.119 g/m^2 and by 2007 with a value of 7.083 g/m^2 . The lowest value from area I is registered in 1999, meaning 4.138 g/m^2 . In the Episcopia Bihor monitoring point the observations on the depositing dust are done starting with the year 1998. In the 17 studied years the area with the lowest depositing dust concentration was area III with a

value of the deposits of 3.822 g/m^2 , registered in 1994, followed by area II with a concentration of 3.835 g/m^2 , in 2000.

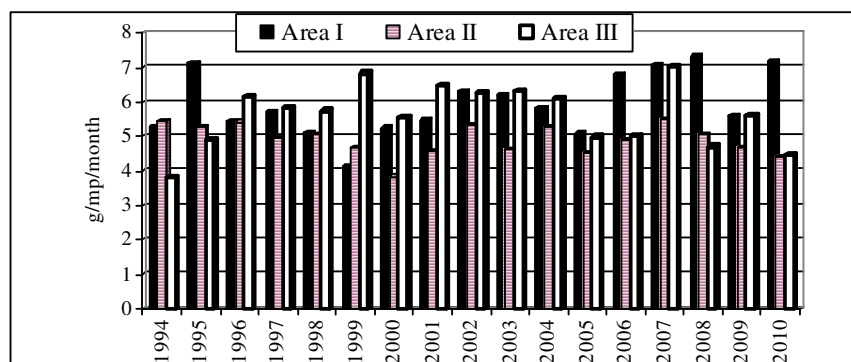


Fig. 3 The evolution of the yearly average concentration of depositing dust in the three areas from Bihor county

In area I the year with the highest degree of depositing dust is 2007 with 5.509 g/m^2 , followed by the concentration from the year 1994 with 5.430 g/m^2 , and in the year 2000 the lowest value is registered meaning 3.835 g/m^2 .

In area III the highest concentrations of the depositing dust has been produced in 2007 with a concentration of 7.024 g/m^2 , followed by 1999 with a concentration of 6.831 g/m^2 . In 1994 the lowest value from this area is registered, meaning 3.822 g/m^2 (see figure 3). In Aștileu the monitoring started in 1997 and in Subpiatră and Țețchea in 1999.

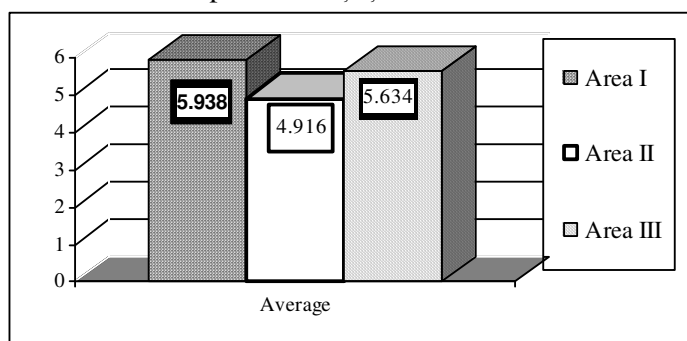


Fig. 4 The distribution of the multi yearly average depositing dust concentrations in the three areas of Bihor county in the period 1994 - 2010

Analyzing the three areas (the average of the 17 years studied) it can be noticed that the highest concentrations of depositing dust is to be found in area I with a concentration of $5.938 \text{ g/m}^2/\text{month}$; this area I is situated

near the industrial part of the town, and it is followed by area III which has a value of $5.634 \text{ g/m}^2/\text{month}$ (see figure 4) due to the fact that within this area one can find the most important sources of pollution with depositing dust and these pollution sources are: The Holcim Company, the Fibrocim company and the Helios company. The third area with a depositing dust pollution degree is area II and it has the lowest pollution degree of only $4.916 \text{ g/m}^2/\text{month}$ because the collecting points are situated away from the industrial area (see figure 4).

CONCLUSIONS

Following the yearly evolution of the depositing dust quantities from Bihor county during the analyzed period (1994-2010) it comes out that the highest quantity had been produced in 1999 in the Subpiatră collecting point and it was of 15.065 g/m^2 , followed by the Episcopia Bihor collecting point where in 2006 a concentration of 12.544 g/m^2 has been registered. The lowest yearly average depositing dust concentrations from the analyzed area was in 2000 Băile 1 Mai with a value of 2.545 g/m^2 .

From the multi yearly average of the 17 studied years we can notice that the highest degree of depositing dust is registered in the Episcopia Bihor collecting point with a value of 7.781 g/m^2 followed by Aștileu with a multi yearly average value of 7.602 g/m^2 . The lowest values in the analyzed period were produced in the Băile 1 Mai collecting point with a concentration of 4.138 g/m^2 .

During the year the highest concentrations with depositing dust are registered in summer months (June indicates the highest value) due to the fact that in this period the highest quantities of rainfall are registered. These rainfalls through their duration and their quantity help purify the air because when the fall they take the air impurities and deposit them on the surface of the ground. The lowest quantities of depositing dust are produced in January when the minimum rainfalls are also produced (January – March).

Analyzing the three areas it can be noticed that the highest depositing dust concentrations are found in area I with a concentration of $5.938 \text{ g/m}^2/\text{month}$ this area being situated close to the industrial area of the town, followed by area III with a value of $5.634 \text{ g/m}^2/\text{month}$ due to the fact that in this area one can find the most important pollution sources with depositing dust, these pollution centres being the following: the Holcim Company, the Fibrocim Company, the Helios Company. The third area as a depositing dust pollution area is area II; it has the lowest pollution degree of $4.916 \text{ g/m}^2/\text{month}$ due to the fact that the collecting points are away from the industrial area.

Following the evolution of the depositing dust in the period 1994 - 2010 the sanitary admitted norm of $17 \text{ g/m}^2/\text{month}$ had not been exceeded.

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