

THE LEVEL OF AIR POLLUTION WITH SEDIMENTABLE POWDERS IN BIHOR COUNTY AREA OVER THE PERIOD 2010-2012

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Abstract

The study of the sedimentable powders from Bihor area has been based on the data obtained from the Environmental Protection Agency from Bihor, for a period of three years, for the time interval 2010-2012. The latter offers the observation of the sedimentable powders in 14 points, divided in three areas, with a monthly collecting frequency.

The data obtained from the surveillance system situated in the three monitoring areas of the sedimentable powders from Bihor county's perimeter as well as the control system allow the identification of the polluted areas and allow a quick action to take strategic and tactic measures to combat pollution and to prevent its accentuation.

Key words: sedimentable powders, monitoring, collecting points, maximum admitted concentration

INTRODUCTION

The pollution of the terrestrial atmosphere with solid particles (dust, smoke, soot, nitrates, azbestos, pesticides, bio aerosols) can be of anthropic nature (burning of the bio mass, industrial processes, road traffic, agriculture activities) as well as natural one.

The pollution of the air environment is an essential preoccupation of the human kind due to the fact that it affects our daily life but also because it can lead to the appearance of certain phenomena. It is because of this fact that the necessity of study and research appears as well as the need of a rigorous monitoring in this particular field (Pereş, 2011).

Research related to the air pollution with solid particles within Bihor county area are numerous. Among those who had had a special contribution we can mention the following: Măhăra, 1969, 1976, 2003; Vancea, 1992; Petrea, 2001; Dumiter, 2005, 2007; Moza (Pereş), 2009, 2010, Pereş, 2011; Köteles, 2010.

MATERIAL AND METHOD

In order to study the pollution of the atmosphere air with sedimentable powders from within Bihor county area we have used data from Bihor's Agency of Environmental Protection which provides observations upon the quality of the air through its own monitoring system (www.apmbh.ro).

These noxa come from activities specific in industry, transport and household activities. The air quality surveillance system must be chosen so that it follows the cumulated effect of all the pollution sources.

In Bihor county there are 14 points, divided in three areas, where the sedimentable powders can be monthly collected from.

- Zone I (the north-west zone of the county): Tărian, Biharia, Sălard, Ep. Bihor;
- Zone II: Băile 1 Mai, Oradea weather station, A.P.M. Oradea;
- Zone III: Telechiu, Chistag, Peștera, Aleșd, Aștileu, Subpiatră, Țețchea.

In the current study the level of pollution with sedimentable powders is analysed for a period of three years for the time interval 2010-2012.

According to STAS 12574/1987 and according to Order 592/25.06.2002 the maximum admitted concentrations for the sedimentable powders are of 17 g/m²/month.

RESULTS AND DISCUSSIONS

Among the most important sources of industrial pollution, situated in the three monitoring areas of the sedimentable powders we can mention the following: S.C. Electrocentrale S.A., S.C. Plastor S.A., S.C. Zahărul S.A., S.C. Holcim S.A. – Aleșd, S.C. Fibrocim S.A., S.C. Helios S.A.

1. The annual and multi annual evolution of the sedimentable powders

Following the evolution of the concentrations of sedimentable powders in 2010 one can notice a higher concentration in the collecting point of Episcopia Bihor with 10.728 g/m², followed by Biharia with a concentration of 8.971 g/m², but fortunately without surpassing the maximum admitted concentrations. In the other monitoring points the degree of pollution with sedimentable powders is relatively uniform with concentrations between 6.211 g/m², at Peștera and 2.706 g/m², at Telechiu (Fig. 1).

The most reduced concentrations are observed in zone III of collecting with the lowest concentrations in Telechiu with 2.706 and in Țețchea there are 2.801 g/m² (Fig. 1).

In the year 2011, the concentration of the sedimentable powders registers, in general, an increase in comparison with the previous year the maximum value is produced in Biharia locality where the concentration is of 8.606 g/m², without the maximum admitted concentration being surpassed. Concentrations over 8 g/m² are registered in the following localities: Episcopia Bihor and Aștileu. In the Aștileu collecting point a close concentration is registered (8.359 g/m²), being with 2.45 g/m² higher in comparison with the previous year. The lowest and most reduced concentration is registered in Țețchea, with 3.43 g/m², being higher with 0.62 g/m² in comparison with the previous year (Fig. 1).

When we talk about the year 2012 it can be noticed that there is a higher concentration in zone I of monitoring, with the maximum concentration in Biharia locality (7.038 g/m²), being with 1.56 g/m² in comparison with the previous year and in comparison with 2010 it has reduced with 1.93 g/m². Concentrations higher than 6 g/m² are also registered in localities Sălard and Episcopia Bihor, with 6.745 g/m² and 6.912 g/m². The most reduced concentrations are registered in zone III with the lowest concentration in Telechiu locality (2.239 g/m²) and Aleșd (2.353 g/m²) (Fig. 1).

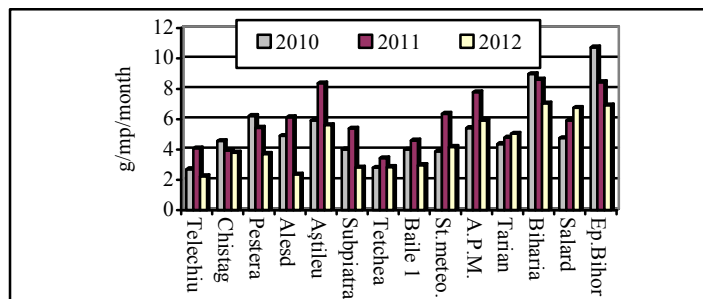


Fig. 1. The evolution of the average concentrations of sedimentable poeders in Bihor county for the time period 2010-2012.

Following the course of the sedimentable powder quantity from Bihor county area, during the analysed period, it comes out that the highest quantity has been produced in 2010 in Episcopia Bihor collecting point, that being of 10.728 g/m^2 , followed by Biharia collecting point where in the same year a pollution of 8.971 g/m^2 has been registered. The next high values are registered in 2011 in the two collecting points but also in Astileu locality, meaning that in Biharia collecting point there was a concentration of 8.606 g/m^2 , In Episcopia Bihor collecting point there was a concentration of 8.436 g/m^2 , and in Aștileu 8.359 g/m^2 . The lowest annual average concentrations of the sedimentable powders from the studied area, have been registered in 2012 in Telechiu with a value of 2.239 g/m^2 and in Aleșd with a concentration of 2.353 g/m^2 . Low values of under 3 g/m^2 have also been produced in 2010 in the Telechiu collecting point with a value of 2.706 followed by Țețchea collecting point with a concentration of 2.801 g/m^2 , followed by the year 2012 with the localities Subpiatră and Țețchea with concentrations of 2.821 g/m^2 , and of 2.853 g/m^2 respectively then by Băile 1 Mai locality where there was a concentration of 2.981 (Fig. 1).

From the average of the three years taken into study it comes out that the highest degree of sedimentable powders is registered in the Episcopia Bihor collecting point with a value of 8.692 g/m^2 , followed by Biharia and Astileu points with a multi annual average value of 8.205 g/m^2 and 6.625 g/m^2 . Having in view the period of time analysed, the lowest values have been produced in the Telechiu and Tettecha collecting points with a concentration of 3.009 g/m^2 and 3.028 g/m^2 (Fig. 2).

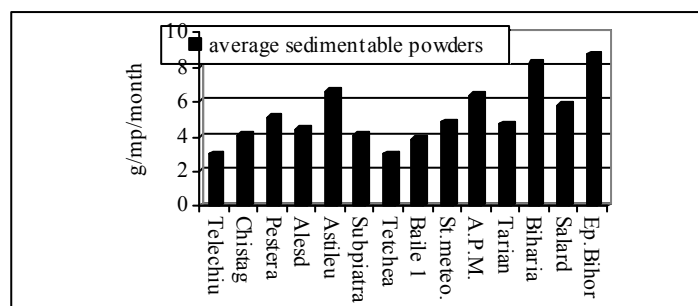


Fig. 2. The evolution of the multi annual average concentrations (2010-2012) of sedimentable powders in the 14 monitoring points from Bihor county

Following the evolution of the sedimentable powders for the period 2010-2012, the sanitary admitted norm of $17 \text{ g/m}^2/\text{month}$ has not been surpassed.

2. The monthly evolution of the sedimentable powders

From the monthly evolution of the sedimentable powders, during the analysed period, the average concentration of the 14 monitored points has got the highest value (8.095 g/m^2) in April 2012, followed by June (7.898 g/m^2) in the year 2011 (Fig. 3).

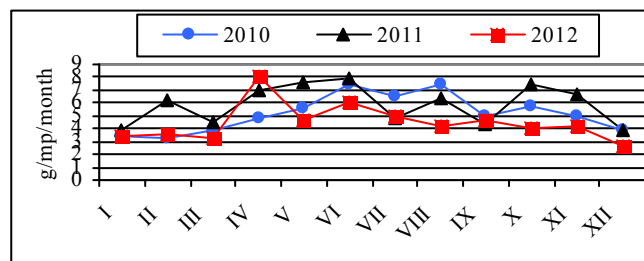


Fig. 3. The monthly course of the sedimentable powders from Bihor county (the average of the 14 points)

Higher concentrations of over 7 g/m^2 are also produced in May 2011 with a concentration of 7.68 g/m^2 , then in June 2010 with a concentration of 7.472 g/m^2 , in August 2010 when the concentration is of 7.485 g/m^2 as well as in October 2011 with a value of 7.438 g/m^2 (Fig. 3). The lowest concentration is produced in December 2012, that being of 2.573 g/m^2 .

After having analysed the monitored points it comes out that the value of the sedimentable powders is within the limits of the maximum admitted concentration of $17 \text{ g/m}^2/\text{month}$.

The multi annual monthly evolution of the average of the 14 points of monitoring shows the fact that June has got the highest degree of pollution with sedimentable powders with a value of 7.138 g/m^2 , followed by April with the value of 6.602 g/m^2 and August with 6.032 g/m^2 . In December and January the degree of pollution with sedimentable powders registers the lowest concentrations with 3.473 g/m^2 and 3.544 g/m^2 (Fig. 4).

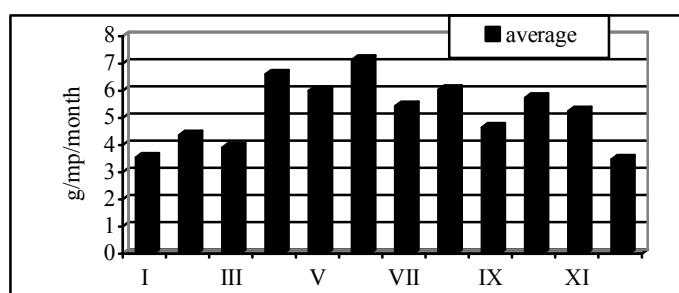


Fig. 4. Evolution of the multi annual monthly average concentrations of sedimentable powders from Bihor county (the average of the 14 points)

The higher degree of pollution with sedimentable powders from the summer months is due to the fact that during this period we register the highest quantity of rainfall (Pereş, 2011).

3. Zone evolution of the sedimentable powders

In Bihor county, during the analysed period, the zone with the highest concentrations of the sedimentable powders is zone I that has had the highest value in 2010 with 7.203 g/m^2 , followed by 2011 with a value of 6.937 g/m^2 , while in 2012 the lowest concentration is registered for zone I that of 6.436 g/m^2 (Fig. 5).

During the three analysed years the lowest concentrations of sedimentable powders have been registered in zone III with a value of the powders of 3.340 g/m^2 in 2012, of 4.441 g/m^2 in 2010 and 5.248 g/m^2 in 2011.

In zone II, the year with the highest degree of pollution with sedimentable powders is 2011 with a concentration of 6.238 g/m^2 , followed by 2010 with 4.427 g/m^2 , and in 2012 the lowest value is registered of 4.354 g/m^2 (Fig. 5).

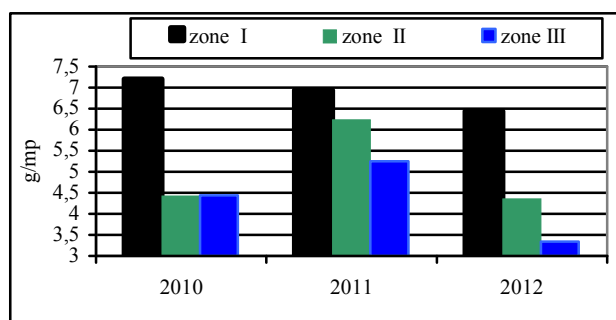


Fig. 5. Evolution of annual average concentrations of sedimentable powders in the three zones of Bihor county for the time period 2010-2012

Analyzing the three zones (the average of the three years taken into study) it can be noticed that the highest concentrations of sedimentable powders are to be found in Zone I with a concentration of 6.859 g/m²/month, this zone being situated near the industrial area of the town.

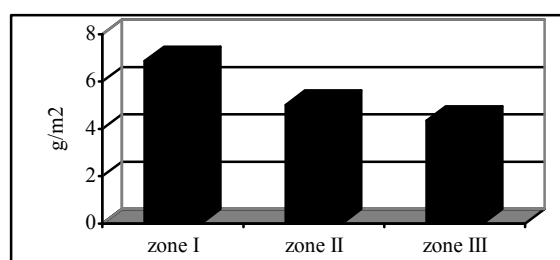


Fig. 6. Distribution of the multi annual average concentrations of the sedimentable powders in the three zones of Bihor county for the time period 2010-2012

Zone II registers a multi annual average of sedimentable powders of 5.006 g/m²/month. Zone III produces the lowest concentration of the powders with 4.343 g/m²/month (Fig. 6).

CONCLUSIONS

In the time period taken into study the average of the 14 collecting points emphasizes the fact that the degree of pollution with sedimentable powders registers the higher concentration in 2011 with 5.943 g/m², followed by the year 2010 with a concentration of 5.227 g/m², and the lowest concentration was in 2012 with 4.442 g/m².

The monthly multi annual evolution of the sedimentable powders emphasizes the fact that in the summer months the highest concentrations are registered, due to the high quantity of rainfall existant during this period of the year, whereas in the winter months show the lowest concentrations of sedimentable powders.

The highest concentrations of sedimentable powders are to be found near the industrial area of the town of Oradea, meaning in Zone I but the maximum admitted concentration of 17 g/m²/month is not surpassed.

REFERENCES

1. Ciulache S., 2004, Influența condițiilor meteorologice și climatice asupra poluării aerului, Com. Geogr. V, Editura Univ. București.
2. Domuța C., R. Brejea, 2010, Monitoringul mediului, Editura Universității din Oradea.
3. Dumiter Aurelia Florina, 2005, La pollution et la protection de l'atmosphère dans la ville d'Oradea, *Analele Universității din Oradea, Seria Geografie, Tom.XV*, pag. 157-164.
4. Dumiter Aurelia Florina, 2007, Clima și topoclimatele orașului Oradea, Editura Universității din Oradea
5. Köteles N., Ana Cornelia Pereș, 2010, Air pollution with powders in suspension (pm_{10} and $pm_{2.5}$) in Oradea city area. *Analele Universității din Oradea, Fascicula Protecția Mediului, Vol XV, Anul 15*, Editura Universității din Oradea, 2010, 1224-6255, pag. 657-660.
6. Köteles N., 2011, Noțiuni practice și teoretice de poluare și depoluare a aerului atmosferic, Editura Universității din Oradea, ISBN 978-606-10-0694-6.
7. Măhăra Gh., 1969, Contribuții la studiul nocivității atmosferice în orașul Oradea, Institutul Pedagogic Oradea, Lucr.Științifice Seria A, Oradea, pag.139-147.
8. Măhăra Gh., 1976, Poluarea aerului și a apelor din spațiul Câmpiei Crișurilor și a zonelor limitrofe, în *Buletinul Societății de Științe Geografice din RSR, Seria IX, Vol IV (LXXIV)*, București 1976, pag.170-177.
9. Măhăra Gh., A. Dudaș, O. Gaceu, 2003, The dynamics of the atmosphere and the impact of the air pollution due to the waste dumps situated close to the western industrial platform of Oradea, *The Environmental and Socio-Economic Impact of Industrial Tailing Ponds*, Universitatea din Oradea, Tom XIII, pag. 5-18.
10. Mănescu S., M. Cucu, Mona Diaconescu, 1994, *Chimia sanitară a mediului*, Editura Medicală București.
11. Moza (Pereș) Ana Cornelia, 2009, Clima și poluarea aerului în bazinul hidrografic Crișul Repede, Editura Universității din Oradea, ISBN 978-973-759-775-5, nr. pag. 286;
12. Moza (Pereș) Ana Cornelia, E. Jude, 2009, Aspects regarding the air pollution with powders in suspension (PM_{10} and $PM_{2.5}$) in Oradea city area, *Analele Universității din Oradea, Fascicula Protecția Mediului, Vol XIV, Anul 14*, Editura Universității din Oradea, 2009, ISSN 1224-6255, pag. 758-762.
13. Moza (Pereș) Ana Cornelia, N. Köteles, 2010, Pollution with sedimentary powders in Crișul Repede drainage area. *International Symposium „Trends in the European Agriculture Development”*, May 20-21, 2010, Timișoara, Banat's University of Agricultural Sciences and Veterinary Medicine Timișoara, Faculty of Agriculture and University of Novi Sad Faculty of Agriculture.
14. Pârloiu Cornelia Maria, 2011, The annual evolution of the suspension powders in correlation with the rainfall in Arad county area, *Analele Universității din Oradea, Fascicula Protecția Mediului, Vol. XVII, Anul 16*, Editura Universității din Oradea, 2011, ISSN 1224-6255, pag. 779-784.
15. Pereș Ana Cornelia, 2011, Poluarea și autopurificarea atmosferei, Editura Universității din Oradea, ISBN 978-606-10-0693-9.
16. Pereș Ana Cornelia, N. Köteles, Cornelia Maria Pârloiu, 2011, The Level of Air Pollution with Depositing Dust in Bihor County. *Analele Universității din Oradea, Fascicula Protecția Mediului, Vol. XVII, Anul 16*, Editura Universității din Oradea, 2011, ISSN 1224-6255, pag. 793-800.
17. Petrea Rodica, 2001, Aspecte de poluare și de protecția mediului în Municipiul Oradea, *Analele Universității din Oradea, Seria Geografie, Tom XI, Oradea*.
18. Vancea V., N. Păcală, Maria Martin, 1992, Unele aspecte privind poluarea aerului în zona Municipiului Oradea și măsuri de protecție, *Analele Universității din Oradea, Geografie, Tom.II*, pag. 55-59.
19. *** Ministerul Apelor și Protecției Mediului, 2002, Normativ din 25 iunie 2002, privind stabilirea valorilor limită, a valorilor de prag și a criteriilor și metodelor de evaluare a dioxidului de sulf, dioxidului de azot și a oxizilor de azot, pulberilor în suspensie (PM_{10} și $PM_{2.5}$), plumbului, benzenului, monoxidului de carbon, și ozonului în aerul înconjurător, București.
20. www.apmbh.ro.