DEFINITION OF THE SEDIMENTARY SUBSTANCES - SEDIMENTS IN TETOVO

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Abstract:*:Air pollution in Tetovo happens in different ways and by different pollutants. Each substance, which is released and hurled into the air from different devices, presents pollutants of the air, of the atmosphere. But when it exceeds the allowed values then they are harmful and dangerous for plants, animals, goods and for people. In this paper we will only analyze particulate sedimentary substances – sediments, the size of which are about 10 μm. The analyses are made in the Institute for Health Protection in Tetovo, by monitoring and analyzing the particles that are the result of natural or anthropogenic factors.*

Key words: PARTICULATE SUBSTANCE, SEDIMENTS, AND SOLUBLE AND INSOLUBLE SUBSTANCES, BERGERHOFF'S EQUIPMENT, POLLUTION.

1. Introduction

Substances (particles) which are thrown into the atmosphere are of different natures, types and dimensions. The presence of these particles in the air in larger cases is the result of human activity. Their source are: industrial manufacturing facilities, construction industry, dust and smoke (soot) that are released by combustion, traffic, waste incineration, heating of buildings and the institutions, transport, winds etc..

Collection of samples is done 12 times throughout the year, with the Bergerhoff's equipment and the gravimetric method.

The purpose of this paper is that through the sampling, measuring and their analyzing, the degree of air and atmosphere pollution is controlled from particulate sedimentary substances-sediments. It has been analyzed at which time they are more prevalent and whether they passed the allowed limit, where they become harmful to the environment.

2. Public health institute in Tetovo

In Tetovo this Institute is located in the Central Hospital and currently only measures aero-sediments in four different locations in the city, such as:

1. EMO,
2. The Barracks,
3. School of Music and
4. Inside the hospital

2.1 Analysis of sediments:

I. **The insoluble:** dry substance and dust.
II. **The soluble:** dry residue, Cl^-, Ca^{2+}, SO_4^{2-}, pH, total amount of the rains.

2.2 Progress of work

Sedimentary substances are solid, liquid or gaseous substances, which are not a composite part of the atmosphere, and will sediment with gravitation or with atmospheric rains. In the sedimenting substances dominate the large particles (mostly particles with a size of 20-40 μm). Therefore, the sedimented particles spoil environmental quality and can indirectly affect humans, but are very damaging because through breathing they penetrate the human body.

Appliances for the collection (obtaining) of samples for the filtering particulates are open vessels, which are exposed to the environment at different distances and are of different measurements.

The Bergerhoff appliance is preferred, which is mostly used and thus the continuity and opportunity for comparison of results between habitats is ensured.

The collection and analysis of samples do not require special preparation. The number of samples for each measuring location is 12 during the year, so that each analytical laboratory can process samples with a greater number of measurement locations.

2.3 Type of method

The atmospheric sedimenting substances will collect in the open container under the action of gravitational forces. If the total amount of the sedimented substance is determined, rain (liquid) is evaporated and the rest is determined by the ***gravimetric method.***

The sample can be used for the analysis of other soluble and insoluble substances, important for a particular habitat, in this case the sediment should be separated from the liquid by filtration.

2.4 Description of the Appliance

The Bergerhoff Deposit Dust Gauge stands for a month, and in it dust particles and rains (rain, snow) are collected.

Taking into consideration that during winter with temperatures below 0 C, and during their manipulation, the glass container may break, then in its place a plastic vessel with the same dimensions can be used. In Tetovo, plastic vessels were used in four measuring locations.

2.5 Setting up of appliance

The container for sample collection (sedimented particles) is placed on a tube of metal or wood well reinforced to a height from 1.5 to 2.0 m above the surface of the Earth. In order to allow free movement of air around the device, it is best to place the containers ten times further away than it is their height from buildings or other obstacles. The angle that the roof of the building creates and the point where the device is placed must not be greater than 30 degrees.

2.6 Procedures

2.6.1 Preparing the container

The container must be clean. In some cases a little copper sulphate (CaSO4-0.02m) is inserted to the container in order to prevent formation of algae. Copper sulphate does not affect the result.

2.6.2 Collection of samples

The container for sample collection will be placed in a certain location with the records of the measuring place and the day of placement. The lid will be uncovered and it will stand there throughout the month, ie 30 ± 2 days, which means that in every measuring location 12 samples will be taken per year. At the end of the month the containers with samples will be taken, covered and replaced with another one. The containers with the sample are sent to the lab for analysis.

2.6.3 The preservation of the sample until analysis

The containers with the samples of sedimentary substances along with fluids may stay in the laboratory for a maximum of 14 days until analysis, but located/preserved in a cool and dark place, in order to prevent the growth of microorganisms, worms and algae.

3.0 Analysis of sample

The samples of the sedimentary substances along with rain waters are filtered in fibre membrane filters (size 3μm) with the help of vacuum or electric suction funnels. If the volume of fluid is less than 150 cm^3 or there are no seed, then distilled water 150-200 cm^3 is added to the containers and the procedure is the same. The measured part of the filtrate (150cm^3) will first be placed in the thermostat, cooled in executor will be measured along with kërxholën (porcelain cup/dish) and put in the thermostat at a temperature of 105 ^{0}C. After evaporation the cup/dish is measured again. In this way the portion of the ***soluble sedimentary substances*** is assigned.

The paper filter with the ***non-soluble substance*** is placed in another cup/dish for evaporation, which was kept earlier with the empty filter in the thermostat at a temperature of 105 ^{0}C, cooled and weighed (measured) in an exicator. After this, even this cup/dish will be placed in the thermostat to evaporate at a temperature of 105 ^{0}C. After evaporation both cups/dishes must remain at the same temperature for an hour. After that they are put in an exicator over $CaCl_2$ and will stand for half an hour before measuring/weighing in the vicinity of the scale.

3.1 Calculation and presentation of results

I The calculation of the amount of soluble sedimentary substances.

$$G_1 = (W_1-W_0)\, V_1/V_2$$

G_1-mass of soluble substances in mg
W_1-mass of cup/dish with soluble substance in mg
W_0 - mass of empty cup/dish in mg
V_1 - total volume of the filtrate cm^3
V_2 - The evaporated filtrate volume cm^3

II Calculation of the insoluble substance

$$G_2 = W_2-W_0$$

G_2 - mass of the insoluble substances mg
W_2-mass of cup/dish with insoluble substance mg
W_0 - mass of empty cup/dish mg

Total Mass/Measure of sedimentary substances

$$G = G_1 + G_2$$

The average mass/measure of sedimentary substances precipitated every day by units of surface are calculated by the formula:

$$\check{G} = G/A\ t$$

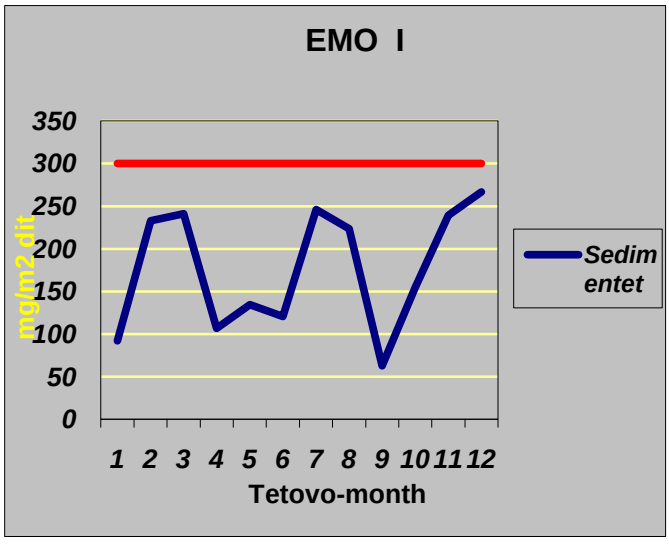
$\check{G}$ – sedimentary substance mg m^{-2} d^{-1}
G - mass of sedimentary substances mg
A - open surface of the sample collection container in m^2
t - time of the collection of samples per day.

Results are presented in tabular and graphical way.

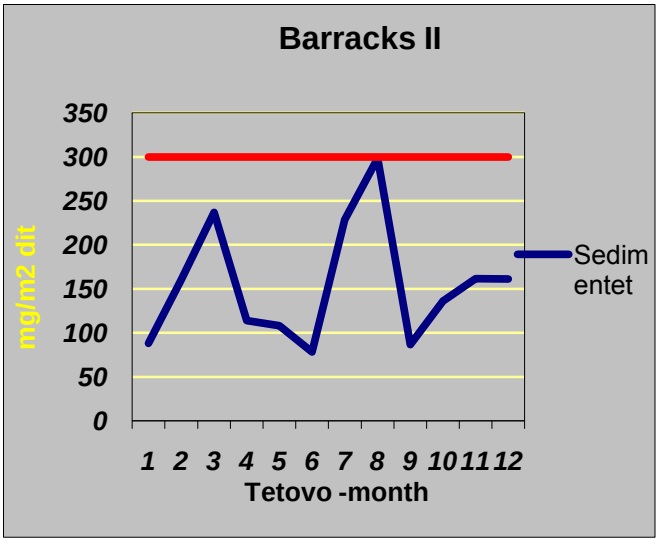
Tab.no.1 Calculated values of aero-sediments

Month	No. of m. sites	No. of samples	VALUES FOUND OF AERO-SEDIMENTNTS mg/m^2 per day				Average monthly values
1	2	3	I	II	III	IV	4
Jan.	4	4	92.28	88.21	181.55	179	135.26
Feb.	4	4	232.85	160.22	73.01	109.09	143.7925
Mar.	4	4	241.11	237.01	151.27	175.16	201.1375
April	4	4	106.67	113.76	134.17	123.45	119.5125
May	4	4	134.71	108.11	128.15	154.56	131.3825
June	4	4	120.86	78.17	132.2	197.23	132.1325
July	4	4	246	228.46	246.2	258.07	244.6825
Aug.	4	4	223.73	**298.54**	199.04	272.05	233.34
Sept.	4	4	**62.72**	86.51	79.57	144.19	93.2475
Oct.	4	4	155.39	136.24	157.91	126.86	144.1
Nov.	4	4	239.39	161.46	176.2	178.07	188.78
Dec.	4	4	266.7	161.28	224.82	298.36	237.79
Ave-rage ann. conc.			**176.867**	**154.83**	**157**	**184.67**	**167.09**
Source: Institution for Health Protection Tetovo							

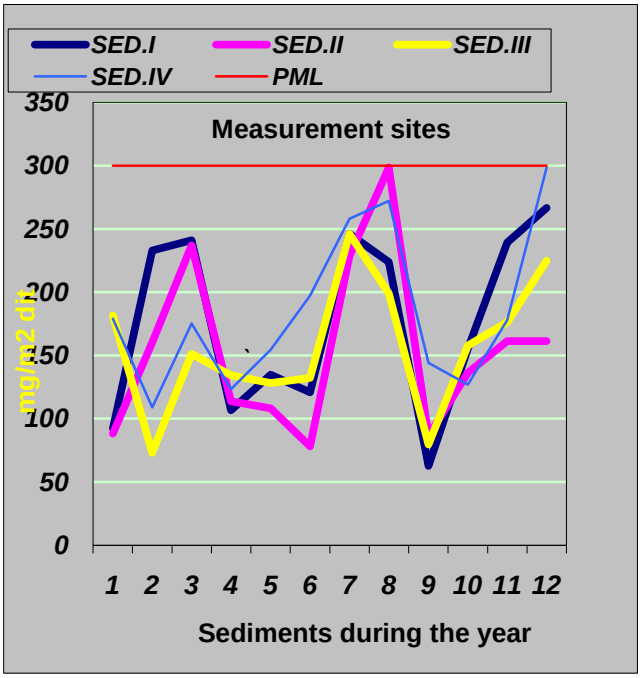
1. Month
2. The number of measurement sites
3. Number of samples
4. Average monthly values



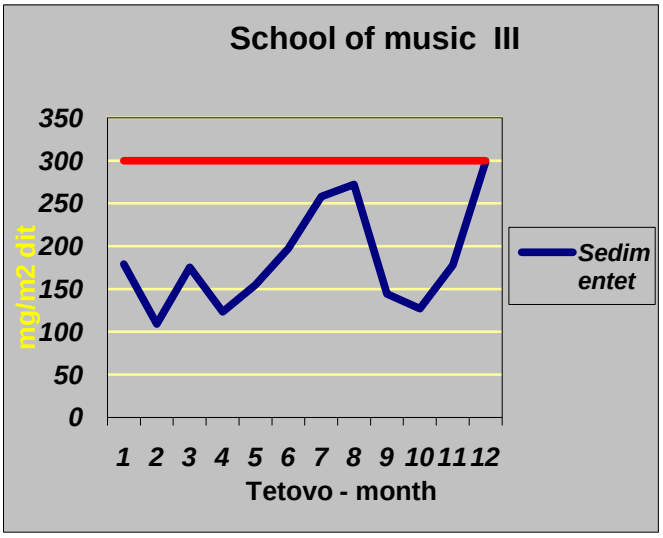
Graph no.1 Monthly average value of sediments at the measurement site I



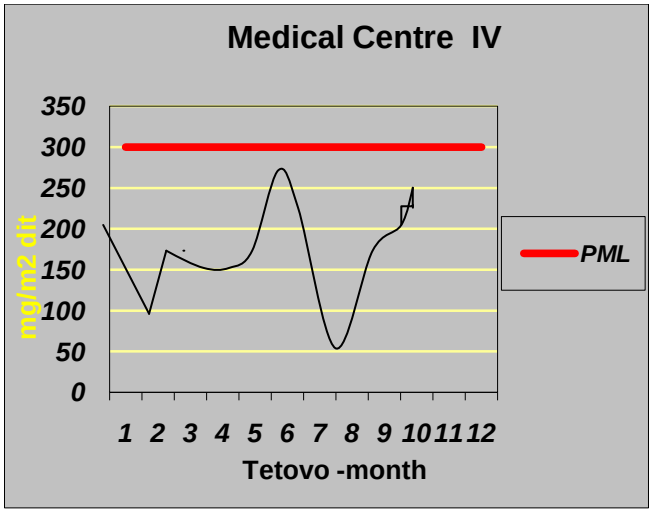
Graph no. 2 Average monthly value of sediments at the measurement site II



Graph no. 5 Monthly average value for the four measurement sites



Graph no. 3 Monthly average value at the measurement site III



Graph no. 4 Monthly average value at the measurement site IV

3.2 Analysis of results

- Average monthly values, but also the individual ones, in no measurement site and any month are not above allowed values. Only in two cases and in two places they are near the allowed limit and that in the month of August where the value was 298.54 mg/m^2 per day, at the measurement site II, and in December, at the measurement site IV the value was 298.36 mg/m^2 per day.
- Monthly average value was greater in July 244.6825 mg/m^2 per day, and the lowest was in September and 93.2475 mg/m^2 per day.
- Whereas, the average measurement sites throughout the year has been greater within the hospital (IV). This value was 184.67 mg/m^2 per day, but it has been less at measurement site II (Barracks) 154.83 mg/m^2 per day.
- Annual average concentration at the four measurement sites at the city level is 167.09 mg/m^2 per day.

CONCLUSION

From what we saw on the terrain we can confirm:

From the deployed appliances, only the one which is within the spaces of Edtko Enterprises meets the conditions described above, whereas other appliances do not meet these conditions.

From the analysis carried out, it is evident that particulate substance is present in the air. But, this particulate substance, at any time and in any location throughout the year has not been over the permitted limit. These values are the result of industrial facilities built on the outskirts of the city, the reduction of the production capacity and the banning of heavy vehicles within the city. So this is rather as a result of preventive measures and not as a result of technological and technical measures and placed appliances. 5.0

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