

ENVIRONMENTAL PROTECTION

DIFFERENT POLLUTERS FOUND IN TOWNS IN REPUBLIC OF MACEDONIA

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***Abstract:** Republic of Macedonia has about 2 million citizens of whom 2 million live in cities, while 42% live in rural settlements. The density of population is 80 citizens per km². There are 29 cities among which larger cities (with over 50000 inhabitants) are: Skopje, Bitola, Prilep, Kumanovo, etc. The total number of rural settlements is 1637. The entire country has big problems from ecological aspects. There is pollution of soil, water, air and extinction of different species of algae. A large number of bird species have left the area and there is an uncontrolled game hunting. The paper deals with analysis of air in Macedonia, definition of sources of pollution and concentrations of harmful matter and their effect upon the environment and man.*

***Keywords:** pollution, air quality, harmful concentrations, gas emissions*

1. INTRODUCTION

Republic of Macedonia has about 2 million citizens of whom 2 million live in cities, while 42% live in rural settlements. The density of population is 80 citizens per km². There are 29 cities among which larger cities (with over 50000 inhabitants) are: Skopje, Bitola, Prilep, Kumanovo, etc. The total number of rural settlements is 1637.

The industry accounted for 35% of the gross national product and 39.9% of the employees in 1995. Collecting systems for the facilities for waste water purification have been built near the three largest lakes in the country. Most of the urban media have potable water. Protected areas have been defined and the Physical Plan of the Republic of Macedonia has been passed. A special sector has been established within the Ministry of Urbanism, Construction and Protection of Environment. Despite the overall reduction of the industrial production in the state, the industry is still the biggest polluter. The reasons are the obsolete and inefficient production technologies, the inappropriate control equipment as well as the non-observation of the regulations referring to protection of the human environment. Today, the biggest ecological problem is the air pollution in Veles and Skopje, the polluted surface waters due to release of various chemicals and other dangerous liquids as well as the non-ecological treatment in management of solid waste and waste in general. In addition to the soils and the waters, there is an enormous pollution of the air due to industrial

facilities and transportation devices releasing 25.000 tons of carbon monoxide, 10.000 tons sulphur dioxide, 6.500 tons hydrocarbonates, 23 tons nitric oxides, 12 tons lead and other. The enormous use of mineral fertilizers, herbicides, pesticides and fungicides, the intensification of erosion processes, the forest fires, the dying of the woods, the drying of the natural water ecosystems cannot, but have consequences upon the biodiversity.

The extinction of 109 species of algae in The Dojran Lake that has increasingly become smaller, the disappearance of a number of species of birds with the drying out of the Katlanovo marsh, the uncontrolled game hunting in the forests points to the ecocatastrophe threatening our country. More than one third of the forest land is represented by barren land (broadleaf, degraded forests, Kermes oak forests and bushes). Earthquakes belong to the category of natural phenomena that are most commonly associated with catastrophes. These are the consequence of the huge amount of energy of the seismic impacts, the unpredictability of the time of their occurrence and the wide space in which they occur. Since one has to deal with such an abrupt and unusual natural phenomenon that has multiple effects, it is clear that the study of earthquakes equally interests the geologists, the geophysicists, the physicists and the civil engineers and even the economists, planners, sociologists and philosophers. This is a complex and multidisciplinary work that requires collective labour and frequently, an international cooperation with the only goal of preservation of the most precious – the human lives. The central issue in this matter is the adaptation of the Man to the effects of earthquakes, i.e., undertaking of technical measures for protection against earthquakes. All this means that earthquakes as natural phenomena are inevitable and people should consider these phenomena and adapt their activities, i.e., they should find an interrelationship.

2. THE AIR IN R. MACEDONIA

The lowest quality of air is recorded in Veles, Skopje Fig.1., Bitola and Tetovo, meaning exposure of about 30% of the population of Macedonia to such air.



. Figure1. Pollution of cement factory Usje in Skopje

3. SOURCES OF AIR POLLUTION

The main sources of pollution are industrial structures that emit gases containing sulphur, carbon, nitrogen and heavy metals. Most of the factories have been established without taking completely into consideration the problem of pollution and wastewherefore they do not have the technology to face this problem. Some of the big sources of air pollution in R.M. are: the Lead and Zinc Smeltery in Veles, the “Zelezarnica” Iroworks in Skopje, “Jugohrom” in Jegunovce and “Fenimak” in Kavadarci with a total estimated emission of SO₂ amounting to 100000 tons. There are also some chemical factories that contribute to air pollution by emission of specific chemical matters as are: Ohis chemical factory in Skopje, the factory for artificial fertilizers in Zletovo and the Oil Refinery in the vicinity of Skopje. Air polluters are also the thermal power plants in Bitola and Oslomej with emission of SO₂ amounting to about 2000 mg/m³. The central heating of Skopje that mostly uses fuels with large quantity of sulphur is also a big polluter, but it is expected to be replaced, to a greater extent, by the built gasoline. Pollution is also extensively caused by the emission from the cars in densely populated areas, particularly if one takes into account that, on the average, 11 year old vehicles almost without catalyzers, are

used. These vehicles use petrol that contains a high level of lead of 0.6 mg/l and diesel fuel of low quality (with 1% sulphur). The problem with emission from vehicles is particularly typical in Skopje where there are 40% of the total number of vehicles Fig.2.



Figure.2. Pollution in Skopje

Table 1. Relative pollution of air due to Industrial sources

Relative pollution of the air due to industrial sources	
Skopje	3
Veles	3
Bitola	3
Tetovo	2
Kriva Palanka	1
Kavadarci	1

Kichevo	2
Kumanovo	2
Ohrid	2
Prilep	2
Berovo	1
Gevgelija	1
Gostivar	1
Kochani	1
Negotino	1
Resen	1
Strumica	1
Shtip	1

Harmful concentrations:

- Sulphur dioxide:

Large concentrations of this oxide of sulphur and of other oxides of sulphur cause different problems related to the respiratory system and increase of the mortality of the population particularly cancer patients and aggravation of the conditions of those with bronchitis.

- Carbon monoxide:

Increased quantities of this oxide particularly negatively affect the nervous and cardiovascular system of man. It can lead to strong headaches, suffocation and poisoning and finally death. This oxide disturbs the oxidation processes within the cells.

- Nitric oxides:

Increased concentrations of these compounds may cause coughing, accelerated pulse, headaches, nausea, change in body temperature, change in blood and even death. These compounds irritate the mucous membrane of the eyes, the nose and the respiratory system.

- Carbon-hydrogen:

Larger concentrations of these compounds may cause coughing, accelerated pulse, headache, nausea, change of body temperature, blood changes and even death. These

compounds irritate the mucous membrane of the eyes, the nose and the respiratory system. Types of pollution that affect people's health and human environment are the following: The lead in the air and in the soil originating from the lead and zinc smeltery as well as the transportation devices. The dust in the air originating from stoves in households, small enterprises, electrical and thermal power plants, metallurgical and other big factories. Sulphur dioxide and other gases. Nitrates in the water originating from inappropriately maintained or designed farms and agricultural enterprises, inappropriate

application of fertilizers and inappropriate rural septic tanks. Pollution of food and water through presence of heavy metals.

Table 2. Emissions in the air per municipalities

Emissions in the air per municipalities (kg/h)					
Municipality	CO ₂	□□□	SO	SO ₂	Dust
Bitola	9.540	0.01	0.13	562.920	0.500
Veles	0.757	0.11	0.11	18.355	2.764
Gostivar	0.040	0.35	0.35	12.338	0.018
Delchevo	0.003	-	-	-	-
Kavadarci	0.040	0.03	0.03	1.846	-
Ohrid	0.001	0.08	0.08	1.631	-
Krushevo	-	-	-	0.078	-
Negotino	0.060	0.02	0.02	1.915	-
Strumica	0.005	-	-	-	-
Kratovo	0.009	0.01	0.01	1.235	-
Tetovo	0.281	0.01	0.01	22.055	3.040
Kriva Palanka	-	-	-	-	0.075
Prilep	-	-	-	-	0.635
Struga	-	0.39	0.39	1.620	-
Kichevo	0.870	0.10	0.10	145.800	0.156
Kochani	-	-	-	-	0.425
Sveti Nikole	0.002	-	-	0.220	-
Skopje	3.692	1.00	1.00	42.678	0.154
Macedonia	15.720	3.00	3.00	812.691	8.666

Table 3. Emissions from cars

Emissions from cars (in tons)						
Location	CO ₂	Organic carbon	SO	NO ₂	Rb	Total suspended particles
Macedonia	457	16.732	48.148	11.348	83	1.830
Skopje	89	4.252	16.400	2.600	310	410

4. AIR QUALITY IN VELES

Veles is the second city according to air pollution. The main polluter is the lead and zinc smeltery. Here, there are two monitoring stations that have registered considerably high levels of SO₂ around the smeltery and in the city. So, in the period 1990 to 1993, the concentration of SO₂ in the city exceeded the maximum allowable limits for 38, 39 and 32 times at annual level. Although smoke is not the main problem of the town, Fig. 3. high concentrations of lead,

zinc and cadmium were measured. The presence of such heavy metals is a threat for the population and the human environment.



Figure 3. Concentration of lead and zinc in Veles

5. AIR QUALITY IN SKOPJE

The main problem with the air pollution of Skopje is due to the inappropriate location of industrial structures located in the immediate vicinity of the settlements. The city itself is surrounded by mountains that create conditions for the increase of the concentrations of harmful gases in the air. In the city, there are seven measuring stations. Based on these stations, the following results have been obtained: For the last 8 years, the maximum daily concentration of sulphur dioxide (SO_2) has been exceeding the allowable limit of 150 mg/m^3 up to 35 times at annual level. Unlike other measuring stations that have been showing satisfying normal concentrations of SO_2 , the three measuring stations in the centre of the city have shown a considerably higher average value (92.68 i 75 mg/m^3). The maximum daily concentration of smoke exceeds the allowable limit of 50 mg/m^3 up to 123 times per annum Fig.4.



Figure 4. Concentration of smog in Skopje

6. CONCLUSION

There are 16 hot points on the black list in R. Macedonia. The black slag hill behind the Lead Smeltery in Veles, 100 000 tons of linden stored in barrels in the courtyard of OHIS in Skopje, the tailing dams of Buchim mine are the top three most heavy polluters in Macedonia. The black list of polluters also reads the former mine for chrome, arsenic and antimony in Lojane (Kumanovo area) and the Sasa mine in Makedonska Kamenica. The group of dangerous polluters also includes Jugohrom from Jegunovce as well as the Toranica lead and zinc mine in KrivaPalanka. The industrial capacities Makstil from Skopje and REK Bitola are part of the red ecological points, while the list additionally also reads the Zletovo lead and zinc mine in Probishtip. There should also be mentioned FENI from Kavadarci, the factory for artificial fertilizers in Veles, REK Oslomej I and the OKTA refinery. The smeltery in Veles has not been operational since 2003 but the results of its several decades of merciless environmental pollution are felt even today. The Veles soil is polluted with extremely cancerous and poisonous metals that directly endanger the health of the people who inhale or consume these in this city. A few years ago, there started development of repair plans with financial requests for the elimination of the industrial sources of pollution financed by the European Union for the needs of our Ministry of Environment. If these plans are realized, the dangers for the people and their lives will be partially reduced.

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