

## Air Pollution

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**Abstract:** Air pollution is particularly important for the environment because it has a great effect on life on earth. Air pollution has the following effects: - acid rain is formed when carbon dioxide or nitrogen oxides in the atmosphere mix with water steam. Acid rain destroys plants and animals. Whole forests have disappeared due to acid rain. Also, acid rain get into lakes or rivers and lead to destruction of fish and all living beings of water - affecting the planet's ozone layer favors penetration lower atmosphere by ultraviolet light, harmful for life, retaining it by ozone.

**Keywords:** air pollution, particulate matter and sediment particles

### 1. INTRODUCTION

Environmental pollution has emerged with the man, but has grown and diversified since the evolution of human society, becoming one of the major concerns of specialists in various fields of science and technology, of states and governments, the entire population of earth. The danger represented by pollution, increased and growing, requiring urgent action at national and international levels to combat pollution.

Environmental pollution can be natural or anthropogenic.

The main natural sources of pollution are volcanic eruptions, dust storms, natural fires of forests, geysers and decomposition of organic substances.

Volcanic eruptions generate gaseous, liquid and solid products, adversely affecting the purity of the atmosphere. Volcanic ash, water vapor, volcanic dust and other gases reach the atmosphere where it forms thick clouds that can travel long distances and remain in the air for a long time even for 1-2 years.

Dust storms pollute the air also. Dust particles can remain in the atmosphere long time, and their deposition can occur over long distances.

One form of environmental pollution is air pollution.

The atmosphere is Earth's air envelope which interacts with relief, oceans, soil and ice. The atmosphere consists of nitrogen (78.09%), oxygen (20.94%), argon (0.93%), helium, neon and carbon dioxide, components that must be in qualitatively and quantitatively balance. Through pollution appears air pollution, a change in its normal composition.

The causes of air pollution are:

a). factors that characterize modern civilization such as:

- industrial production growth;

- increase in road traffic;
- the appearance of waste incinerated;
- increasing consumption of energy derived from classical fuels;

- increased noise, etc.

b). main sources of air pollution are:

- fuels combustion;
- dust from cement plants;
- gas from the chemical industry;
- radioactive particles from nuclear accidents or nuclear weapons experiments;
- various emissions from fermentation processes, etc.

Depending on the state of aggregation, air pollutants can be:

- gaseous pollutants representing 90% of the total mass of air pollutants;

- solid pollutants which represent 10% of the total mass of air pollutants.

Gaseous pollutants are:

- Carbon dioxide is a dangerous gas because by doubling its concentration in air is a "disruptive climate" leading to increased superficial temperature of the environment, an average of 3.6°C. Growth of the last century due to massive deforestation and excessive consumption of fossil fuels in industry, has led to the "greenhouse effect".

- Carbon monoxide comes from volcanic eruptions, forest fires, burning of fuels, coal, wood, waste, garbage. In normal concentrations is not harmful, but is highly toxic to a higher concentration. Bacteria in the soil absorb carbon monoxide from the air and convert it into methane keep it in normal concentration in air.

- nitrogen oxides and sulfur dioxide from volcanic eruptions and combustion of automobile engines. In the presence of atmospheric moisture, they turn to pure acid floating in the atmosphere and damage the lungs. Also, these acids attack the marble, stone and metal. Nitrogen oxides and sulfur dioxide are carried by winds and reach distance from place of release into the air, which fall as rain or snow. Acid precipitation burn plant leaves and lakes are too acidic for fish and other creatures.

They wash the nutrients from the soil, leaves and needles and they turn yellow and die. Aluminum rain released weakens the tree roots promoting their destruction. Arriving in water, acid rain destroys even eggs fish.

Pollutants come from other sources, too, such as decomposing garbage and other waste that produce

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methane and many household products emit volatile organic chemicals. Emissions of nitrogen oxides has increased rapidly with increasing number of vehicles, they are one of the most damaging pollutants resulting from burning. When fuels are incompletely burned, certain chemicals called volatile organic chemicals entering the air.

Because of ultrafine dust particles released from the soil due to erosion by water and weather conditions that weaken the layers of soil, increasing levels of solids particles from the air.

Volcanoes emit sulfur dioxide and large amounts of pulverized lava rock known as volcanic ash. A large volcanic eruption can blacken the sky over a wide area and affect the whole atmosphere of the earth. Unlike pollutants from human activities, natural ones tend to stay a short period in the atmosphere and do not lead to permanent atmospheric change.

Once in the atmosphere, pollutants often produce chemical reactions from which resulting other harmful compounds. Air pollution can be affected by weather factors that may make the valley or can spread all across the globe to affect regions far from where it is produced.

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## 2. MATERIAL AND METHODS

Systematic surveillance of air quality is done by laboratories of the National Network of Air Quality Surveillance. It was found that the level of air pollution remains high in several areas in Romania, exceeding the maximum permissible concentration of many pollutants discharged into the environment.

The most important exceedances were registered to particulate matter and sediment particles, sulfur dioxide, nitrogen oxides, heavy metals, phenol, hydrochloric acid, etc.

Thus, in Baia Mare the frequency of exceeding the maximum allowable limit of particulate matter was 40%. Elevated concentrations of lead and cadmium powders were recorded in Baia Mare and Copșa Mică, where frequencies exceeded maximum allowable limits are above 85% in Baia Mare and over 69% to Copșa Mică.

To establish the air quality in the city of Timisoara, Timis Environmental Protection Agency made measurements in two points, namely: the downtown and industrial area south of the city. Analyses performed followed concentrations of SO<sub>2</sub>, NO<sub>2</sub>, ammonia, particulate matter and sediment particles and were carried out according to the methodology. [STAS12574/87].

## 3. RESULTS

Following the results obtained from several air monitoring stations, Timisoara was declared as one of the city's most polluted by dust.

European Commission threatens Romania with fines of hundreds of thousands of dollars per day for failure to comply with European norms of pollution.

According to the Environmental Guard, traffic, inadequate transportation infrastructure, construction sites organization, construction and demolition waste management, poor technical condition and maintenance of vehicles and emission thermal power plants, agricultural work and lack of protective belts causes high level pollution with powder in Timisoara.

In January 2011 there were 6 exceedances of the limit value for indicator of particulate matter PM 10 at station TM 1 "The Path Șag", 2 exceedances at station TM 3 "Carani" and 3 exceedances at station TM 5 "The Path Arad". In February, dust pollution was even greater, recording 15 exceedances of the limit value for pointer of particulate matter PM 10 at station TM 1 ,, The Path Șag", 8 exceedances at station TM 3"Carani" and 11 exceedances at station TM 5 "The Path Arad". This means 57 exceedances and Timisoara have allowed all over the year 60 exceedances.

Timisoara air quality is monitored continuously in four automatic stations located in Timisoara (The Path Șag, Liberty Square, Street I.Bulbuca and The Path Arad) and one in Carani. Stations monitor the most harmful pollutants that could seriously affect the lives of people, plants, birds and animals.

To reduce dust pollution in Timisoara has initiated a program of cleaning and planting of grass on the boulevards of the city, particularly where there are air qualities monitoring stations.

Another source of dust is construction sites and construction sites that are not meeting environmental standards will be closed.

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Table 1. The concentrations of SO<sub>2</sub>, NO<sub>2</sub>, ammonia, particulate matter, Timisoara

Area	SO <sub>2</sub>	NO <sub>2</sub>	Ammonia	Particulate matter
<b>Central zone</b>				
Annual average concentration (mg/m <sup>3</sup> )	0,002	0,013	0,013	0,050
Maximum daily value (mg/m <sup>3</sup> )	0,023	0,052	0,084	0,222
<b>Southern industrial zone</b>				
Annual average concentration (mg/m <sup>3</sup> )	0,002	0,010	0,040	0,077
Maximum daily value (mg/m <sup>3</sup> )	0,025	0,068	0,099	0,332

Table 2. The concentrations of sediment particles, Timișoara

Area	Maximum value (mg/m <sup>2</sup> /month)	% of CMA
Central zone	38,50	226,47
Southern industrial zone	32,61	191,82

Analysis of data from Table 1 shows the following conclusions:

- It is noted that there were no exceedances of the maximum allowable concentration (MAC) for measurements of SO<sub>2</sub> in Timisoara city. According to the STAS 12574/87 maximum permissible concentration has the following values: 0.06 mg/m<sup>3</sup> for annual average and 0.25 mg/m<sup>3</sup> for maximum daily value. The same conclusion is for NO<sub>2</sub> concentration, too, taking into account the maximum allowable concentration has the value 0.04 mg/m<sup>3</sup> for annual average and 0.10 mg/m<sup>3</sup> for maximum daily value. Regarding the concentration of ammonia in the air, it was found that there were no exceedances of maximum allowable concentrations.

- Daily maximum allowable concentration is 0.10 mg/m<sup>3</sup>, which shows that in the industrial area south of the city have been very close values of maximum allowable concentration (0.099). For this reason it requires careful monitoring to identify the source of pollution. The presence of particles in air is linked to the natural environment and human activity. Anthropogenic sources powder generator includes all activities based on combustion of liquid, solid and gaseous fuels and activities related to road transport.

- At powder suspended is found exceeding the annual average concentration (maximum allowable concentration is 0.075 mg/m<sup>3</sup>) in the industrial area in southern city and the high percentage that the daily highs exceeding the daily maximum allowable concentrations (0.15 mg/m<sup>3</sup>) both the center and the south of the city. Powder suspended has an effect of impaired respiratory function which is even stronger as the particles are smaller. In addition to this effect appears the carcinogenic and mutagenic effect caused by heavy metals of powder. According Ord.592/2002, the annual limit value for human health protection is 0.040 mg/m<sup>3</sup>, and daily limit value for human health protection is 0.050 mg/m<sup>3</sup>. Therefore, it is found exceedances of limit values imposed, both the mean annual and maximum daily values.

Measurements of sedimentation powder (Table 2) of Timisoara show large excesses maximum allowable concentration in the central area and in the south of the city.

Urban air pollution is known as smog. It is a mixture of carbon monoxide and organic compounds from incomplete combustion of fossil fuels such as coal and sulfur dioxide from fuel impurities. Smog can be produced also by combustion in vehicles motor and aircraft engines that produce nitrogen oxides.

Most pollutants are washed by rain, snow and fog, but sometimes, after having traveled long distances, even continents.

Another problem created by air pollution is global warming caused by the accumulation of atmospheric gases such as carbon dioxide.

Air pollution also affects human health and especially children. From existing records were taken into account only diseases that may be affected by air pollution such as: angina and acute tonsillitis, laryngitis, acute tracheitis and other upper respiratory tract infections, chronic pharyngitis, chronic nasopharyngitis, chronic diseases of tonsils and adenoids, bronchitis, acute and chronic bronchitis, asthma, chronic obstructive pulmonary disease, conjunctivitis, urticaria.

It was found that in areas where air pollution is increased there is an increased incidence of diseases that may be affected by this pollution. Also, there was a direct correlation between sediment particles pollution and morbidity.

For Timis County the results were taken from Regional Environmental Action Plan 2006-2013.

Greenhouse gases specified in the Kyoto Protocol are CO<sub>2</sub>, CH<sub>4</sub>, N<sub>2</sub>O, PFC, HFC, SF<sub>6</sub>. In the county of Timis have obtained the following results:

The energy sector contributes to emissions of greenhouse gases with a rate of 43.7% of total CO<sub>2</sub> emissions. (Table 3)

Table 3. Quantities of CO<sub>2</sub>, CH<sub>4</sub>, N<sub>2</sub>O

Gases	CO <sub>2</sub> t/an	CH <sub>4</sub> t/an	N <sub>2</sub> O t/an
Timiș	998,67	223172,24	72,04

The presence of some pollutants in the air from chemical reactions, lead to changes in pH levels of the air, rainfall and even soil. (Table 4)

Table 4. Quantities of SO<sub>2</sub>, NO<sub>2</sub>, NH<sub>3</sub>

Gases	SO <sub>2</sub> t/an	NO <sub>2</sub> t/an	NH <sub>3</sub> t/an
Timiș	3973,56	1380,56	9395,63

Emissions of heavy metals have different source of industrial processes and traffic, for lead. (Table 5)

Table 5. Quantities of Hg, Cd, Pb

Gases	Hg kg/an	Cd kg/an	Pb kg/an
Timiș	12,57	31,81	223,82

Emissions of mercury, in higher proportion and of cadmium in smaller proportion, also come from treatment activity and landfill.

The particulate matter and sedimentation indicators are exceeded maximum allowable concentrations frequently. Sources of pollution of the atmosphere with these pollutants are: road traffic (where cleanliness of towns and road maintenance are inadequate), steel and metallurgical industries, cement industry, household waste and sterile deposits. (Table 6)

Table 6. Annual average and maximum annual concentration of sediment particles

	Annual average concentration mg/mc	Maximum annual concentration mg/mc	% from CMA	Frequency of exceedances %
Timișoara	0,0712	0,441	294	7,51

The amount of gases emitted by large combustion plants is: (Table 7)

Table 7. Quantities of SO<sub>2</sub>, NO<sub>2</sub>, Particulate

Gases	SO <sub>2</sub> t/an	NO <sub>2</sub> t/an	Particulate (t)
Timiș	2333,122	956,703	120,051

#### 4. CONCLUSIONS

Based on evaluation of environmental quality has been identified a number of environmental problems. Rank the issues were carried out using a statistical system for prioritizing evaluation. Air pollution is potentially the most serious short-and medium-term problem in terms of health. Air pollution is more difficult to avoid and its effects of which penetrate everywhere damage health and deteriorating buildings.

Environmental protection is a priority of economic and social development to achieve a clean and healthy environment that does not affect the potential development of future generations.

This requires a complex of activities and actions to improve environmental conditions and health.

In Romania, environmental issues are urgent because of local pollution produced in oil exploitation and mining sectors, industries and wood processing and pulp, metallurgy, ferrous metallurgy, electrical industry and machine building, cement industry, transports, communal and agriculture household.

In the field of industrial pollution aims to improve the prevention system, more efficient pollution control through an integrated approach of permitting system of socio-economic activities with significant environmental impact.

The commitments assumed by Romania in the field of industrial pollution and risk management control aimed at developing the legislative framework on strengthening and improving institutional mechanisms both at the national and the industrial operators. Improving tasks of the environmental authority aims to increase its capacity in establishing effective policies and implementation strategies.

A particular importance in environmental policy is to combat all phenomena of accidental pollution and those of the contravention nature by implementing precautionary measures, namely the establishment of the Environmental Guard.

Air pollution, by adding harmful substances to atmosphere, environmental damage and worse human health and quality of life. Air pollution sick people, causing trouble breathing, creates conditions for the development of cancer, damage plants, animals and ecosystems.

Pollutants which return on soil as acid rain and snow, corrode buildings, damaging plants and forests, pollutes rivers, lakes and killing fish and other plants and animals.

Air Pollution changes the Earth's atmosphere because let to penetrate harmful radiation from the sun. At the same time, the polluted atmosphere becomes an insulator, preventing the heat to go back into space and increasing global temperatures.

Transposition and implementation of the acquis communautaire in the environmental issues raised questions because of implications related to this field over the entire Romanian industry, alignment to European quality standards involves considerable costs and structural changes throughout the economy.

In air quality domain, was asked the transitional period until 2010. By that time must be planned for adopting legislation on protection of the atmosphere namely emissions control of volatile organic compounds resulting from petrol storage, gasoline distribution from terminals to service stations.

Full implementation of Community measures taken on the air quality in the Romanian legislation has created the National System of Integrated Monitoring of Air Quality. It is mandated to monitor air quality and to indicate if the maximum allowable limits were exceeded.

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