



The Increase In Aerosols Released Into The Air And Its Geoecological Consequences

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Abstract. This article describes the negative effects of changes in the composition of atmospheric gases, chemical emissions in the air that is to aerosols. The increase in the quantity of aerosols in the air of the city of Namangan over the years was analyzed and the impact of such chemical waste in the air on human health was studied.

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Key words. Aerosols, carbon dioxide, dust, radioactive substances, plastic waste, bronchial asthma, air concentration, "Lime method".

1. Introduction

Man is nature's gourmand. However, in the last 50 years, it has shown how ruthless and greedy it is towards nature. This once again showed people that they need to use nature wisely and organize nature protection work in a consistent and orderly manner. Unfortunately, such problems also exist in our country. In recent years, special attention has been paid to nature protection in our country. According to the President's Decree No. PF-5024 dated April 21, 2017, the main tasks of the State Committee for Ecology and Environmental Protection are "... land, underground resources, water, forests, protected natural areas, establishment of state environmental control over the protection and use of animal and plant life, compliance with the legislation in the field of atmospheric air protection;" defined [1].

Under the influence of various space dusts, scientific and technical progress, especially the rapid increase in the number of cars, radioactive substances, etc., the atmospheric air, which is the source of life for all living creatures, is being polluted to the maximum extent. Such terrible events are happening in almost all countries of the world. Atmospheric air pollution is the presence of substances in the atmosphere that harm the health of people and other living beings, affect the climate, and cause changes in materials (material bodies).

There are several types of air pollutants, including various gases (ammonia, carbon monoxide, sulfur dioxide, nitrogen oxides, methane, etc.), particulate matter (both organic and inorganic), and biological molecules. It is known that air pollution can cause various diseases in humans, including respiratory infections, heart disease, stroke and lung

cancer, and even death. It has also been found to have a strong effect on other living organisms such as animals and agricultural crops. Therefore, continuous monitoring of atmospheric air pollution and strengthening of scientific research aimed at preventing and protecting atmospheric air pollution is one of the most important issues [2].

2. The main part

In the preparation of this article, aggregated statistical data on the composition and level of pollution of atmospheric air in Namangan region were obtained from the Departments of Ecology and Environmental Protection of Namangan Region and Hydrometeorology Departments of Namangan Region, and statistical analysis was carried out. Statistical indicators of changes in the amount of various chemical substances, dust particles, smoke, soot, and toxic gases in the air over the years were analyzed. Conclusions were made based on the results of the analysis, suggestions and recommendations were developed.

Pollution of the environment with radioactive and chemical waste, poisoning of people, livestock, poultry, fish and other animals in rivers and lakes, reservoirs and oceans, many cases of cow poisoning in European countries, causing protein diseases of calves, sheep and other animals. This, in turn, has a negative impact on human health [2, page 335].

Air pollution depends on the following factors:

- Reduction of forests;
- an increase in the number of cars;
- the increase of factories and factories;
- amount of toxic waste;
- change in wind speed and direction.

Atmospheric oxygen is changing. But living organisms are highly sensitive to climate change, and atmospheric pollution causes significant loss of important natural resources. Today, gaseous, liquid and solid wastes of various forms are released into the atmosphere from various industrial enterprises. This, in turn, causes environmental pollution. It is natural that any modern enterprise with the most perfect and modern technologies emits waste. Nowadays, humanity is faced with the problem of ensuring the ecological integrity of the waste separated in the production process, creating technologies that do not pose a threat to the environment.

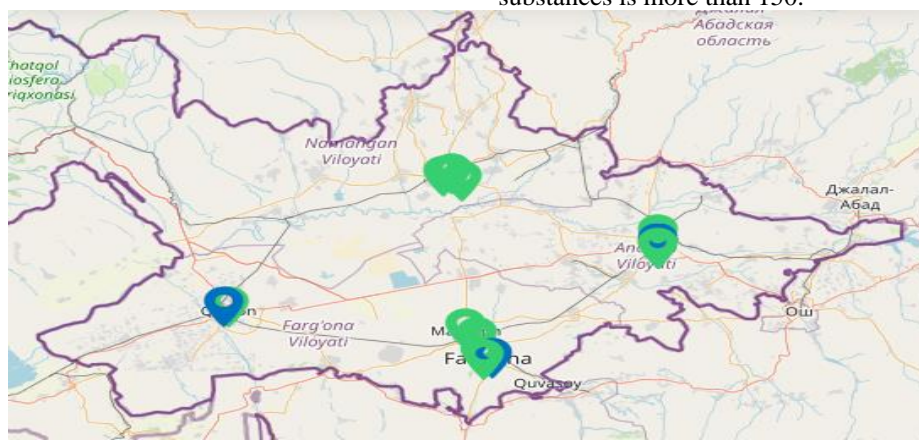
Because most of the waste is released into the environment without neutralization or cleaning. As a result of their negative impact, various unpleasant situations are occurring for the environment. In the spring and autumn, there are frequent cases of burning of khazans. Of course, at first glance, this method is convenient. We collect and burn all waste, along with waste and other waste, it has become a tradition to burn plastic bottles, polyethylene bags, various plastic residues from the roofs of buildings, greenhouse films, rubiroids, and the like. When 1 ton of waste is burned, more than 5,000 cubic meters of gaseous waste are released into the atmosphere. They contain a lot of toxic substances (for example, dioxins). This is harmful to human health.

It is known that an average of 12 liters of air passes through a person's lungs in 1 minute. 17,290 l of air passes in 1 day and night. This is 23 kg. So, a person consumes 4-5 times more air than food. Atmospheric air contains thousands of polluting gaseous substances, which have a negative effect on the environment and people. Currently, more than 10 million tons of such pollutants have accumulated on the earth. When a single jet plane flies from America to Europe in 8 hours, it burns up to 50-100 tons of oxygen, which is released by 100,000 hectares of forest in one

day, the ozone layer is depleted in a radius of 16 km for the launch of 1 spacecraft.

As a result of burning and even heating of products made with the addition of dioxin and plastic, not only exhaust gases and fumes, but also toxic gases, including dioxins, are formed from dangerous chemicals. One of the dangerous properties of dioxins is that they act at the cellular level. It kills all living creatures and many plants. The effects of such substances persist for several years [2]. The main negative pollutants of the air of our country are sulfur oxides, nitrogen, carbon, dust composition and solid suspended particles of different origins. 150 types of pollutants are released into the atmosphere in Uzbekistan.

Atmospheric air pollution in Uzbekistan occurs mostly in large industrial nodes. But the territorial location of industrial centers, i.e. they are located in foothills and mountain valleys with different natural conditions, has a great influence. Chirchik Tashkent Yangiyol in Chirchik Valley, Angren Ohangaron Nurabad Almalik Boka in Ohangaron Valley, Namangan Andijan Fergana Khojand Bekobod in Fergana Valley, Tursunzoda, Denov, Jargorgan, Termiz Shaval in Surkhandarya Oasis. There are different regions. These regions are the most affected by waste. In the Fergana valley, there is less pollution over the city of Namangan, because the wind pushes them in the direction of Andijan, Fergana, and Kokan. Atmospheric air pollution sometimes consists of local zones (according to the group of certain waste substances). They are related to the type of industrial enterprises or smoke emissions in this place. Wastes from chemical, oil and gas processing, microbiological industry, ferrous and non-ferrous metallurgy and other enterprises often form such zones. Their man-made emissions into the air contain lead, sulfur and chloride alkali, vanadium oxide, benz(a)nirene and many other highly reactive substances. The number of such substances is more than 150.



Picture-1. Map of the location of meteorological stations located in the Fergana Valley

The cities of our republic with many developed industrial enterprises include such cities as Almalik, Bekobod, Chirchik, Tashkent, Samarkand, Fergana, Navoi and Namangan. The above-mentioned problems are especially common in these cities. Bronchial asthma, lung diseases, chronic bronchitis, skin diseases, allergic diseases, etc. are observed in these cities [3].

Table 1

The amount of aerosols in the atmosphere of Namangan city

| Years | Dust | Sulfur dioxide | Carbonate anhydride | Nitrogen dioxide |
|-------|-------|----------------|---------------------|------------------|
| 2012 | 0,08 | 0,002 | 1,128 | 0,021 |
| 2013 | 0,075 | 0,003 | 1,525 | 0,027 |
| 2014 | 0,089 | 0,003 | 1,65 | 0,03 |
| 2015 | 0,095 | 0,004 | 1,66 | 0,035 |
| 2016 | 0,146 | 0,006 | 2,083 | 0,044 |
| 2017 | 0,128 | 0,009 | 2,28 | 0,04 |
| 2018 | 0,145 | 0,01 | 2,875 | 0,04 |
| 2019 | 0,175 | 0,02 | 3,24 | 0,05 |
| 2020 | 0,162 | 0,021 | 3,13 | 0,04 |

Source: Information from the hydrometeorological department of Namangan region (post 3).

According to the data in Table 1, based on the analysis, it can be said that the constant and changing amount of chemical particles emitted into the atmosphere and the appearance of secondary pollutants in the air are the reason for the intensity of solar radiation in the city, the washing of impurities from the atmosphere. Depending on the amount and duration of seasonal rains and orographic (relief) conditions, it creates various unfavorable conditions. The amount of aerosols in the atmospheric air of Namangan city has slightly increased compared to 2012. For example, the amount of carbon dioxide (CO₂) has increased

significantly, from 1.128 mg/m³ in 2012 to 3.13 mg/m³ in 2020. It is known that the maximum norm set for carbon monoxide exceeded 2.28 mg/m³. This, in turn, has a negative impact on human health and also causes an increase in air temperature. Because the relationship between the amount of CO and air temperature is high. Sulfur dioxide is one of the dangerously increasing toxic gases in the atmosphere of Namangan city. Because its amount increased from 0.002 mg/m³ in 2012 to 0.021 mg/m³ by 2020, i.e. 10 times. Also, the amount of dust and sulfur oxides has doubled [4].

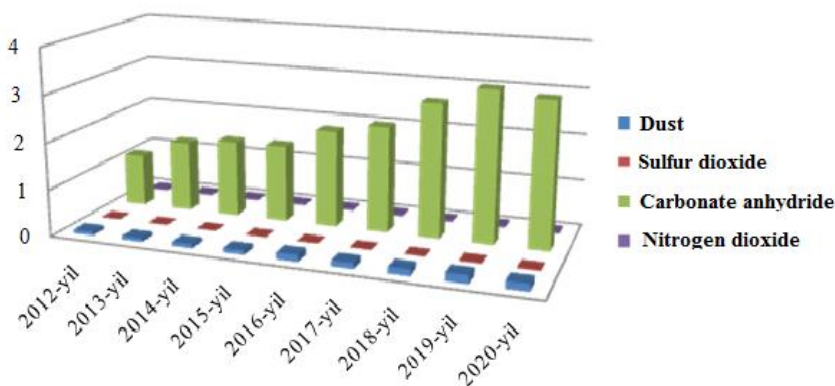


Figure 1. The amount of aerosols in the atmosphere of Namangan city

Monitoring of the level of atmospheric air pollution in the city is regularly carried out at 3

stationary posts belonging to the hydrometeorological service of Namangan region. The following pollutants

are under control: sulfur dioxide, carbon monoxide, nitrogen oxide and dioxide, solid compounds such as dust and others are being monitored. We can see that the amount of aerosols in the city atmosphere is quite stable in the winter months, and increases with positive climatic factors. The amount of dust varies from 0.07 mg/m³ in winter to 0.24 mg/m³ in summer, and the amount of carbon dioxide varies from 1.33 mg/m³ to 2.19 mg/m³, respectively. The result of this is also reflected in the annual fluctuation of air temperature [5].

According to the 2019 data of the Namangan Regional Department of Ecology and Environmental Protection, the total number of production enterprises and organizations that affect atmospheric air pollution in Namangan Region is 760. Of these, there are 23 oil and gas enterprises, 3 energy enterprises, 6 machine-building enterprises, 2 metallurgical enterprises, 63

food enterprises, 10 enterprises belonging to the cotton industry, 68 enterprises belonging to the light industry, transport enterprises are 241, the number of enterprises in the highway system is 14, and the number of other types of enterprises is 284.

It was determined that 55.5% of the pollutants released into the atmosphere in Namangan region are solid particles, 15.8% are carbon oxides, 13.05% are hydrocarbons, and 0.0009% are volatile organic compounds[6]. Air pollution in Namangan region is caused by various chemical wastes and toxic gases coming from factories, household enterprises and vehicles. In addition, a large amount of toxic fumes coming out of the heating stoves of people's houses, as well as from the mindless burning of plant stems and piles of leaves left in the crop fields is one of the factors that lead to air pollution (Table 2) [8].

Table 2

The amount of harmful substances released into the atmosphere is on the scale of cities and districts (thousand tons)

| T/r | Name of city and districts | 2018 year | | | 2019 year | | |
|--------------|----------------------------|---------------|--------------|---------------|---------------|--------------|---------------|
| | | Transport | Industry | Total | Transport | Industry | Total |
| 1 | Namangan city | 18,200 | 1,025 | 19,225 | 16,390 | 1,013 | 17,403 |
| 2 | Kosonsoy | 3,915 | 0,121 | 4,036 | 2,917 | 0,117 | 3,034 |
| 3 | Mingbulok | 1,615 | 0,080 | 1,695 | 2,739 | 0,078 | 2,817 |
| 4 | Namangan | 6,385 | 0,118 | 6,503 | 3,842 | 0,109 | 3,951 |
| 5 | Pop | 7,356 | 0,144 | 7,500 | 4,466 | 0,117 | 4,583 |
| 6 | Norin | 3,546 | 0,020 | 3,569 | 3,866 | 0,016 | 3,882 |
| 7 | Toragorgon | 5,419 | 0,056 | 5,475 | 5,593 | 0,029 | 5,622 |
| 8 | Uychi | 4,196 | 0,060 | 4,256 | 3,649 | 0,060 | 3,709 |
| 9 | Uchkurgan | 4,215 | 0,298 | 4,513 | 4,95 | 0,255 | 5,205 |
| 10 | Chortok | 2,951 | 0,110 | 3,061 | 2,717 | 0,107 | 2,824 |
| 11 | Chust | 8,152 | 0,201 | 8,353 | 4,252 | 0,156 | 4,408 |
| 12 | Yangikurgan | 2,010 | 0,045 | 2,055 | 1,634 | 0,047 | 1,681 |
| Total | | 67,963 | 2,278 | 70,241 | 57,015 | 2,104 | 59,119 |

Note: this table was compiled based on the data of the Department of Ecology and Environmental Protection of Namangan Region.

Air pollution has a negative effect on the human body, causing their health to deteriorate. In particular, sulfur oxides, carbon monoxide, carbon sulfide, hydrogen sulfide, fluorine compounds, nitrogen oxides, various industrial wastes, radioactive substances, and agricultural pesticides cause various diseases in the human body. If sulfur oxide accumulates in the air, it causes bronchitis, gastritis and lung diseases in people. Due to the increase of carbon dioxide in the air, hemoglobin decreases in the human body, disturbances occur in the heart and blood-

vascular systems, atherosclerosis develops, dizziness, pain, rapid heartbeat, sleep disturbances, and a person becomes restless.

As a result of an excessive amount of hydrogen sulfide gas, a person has a headache, vomiting, fainting, and even the sense of smell is weakened. Under the influence of fluorine compounds, the nose bleeds, the flu appears, and a person coughs. Nitrogen oxides cause lung disease, blood pressure drops, and as a result, dizziness, fainting, vomiting, and suffocation. Dust particles damage human skin,

especially mucous membranes, and accelerate eye diseases. In addition, dust particles enter a person's body together with air and accelerate the emergence of various diseases from them. Dust containing arsenic, mercury, lead, asbestos and other substances paralyzes human nerves, causes inflammation of the brain, weakens the liver and kidneys, and delays the physical development of children.

Asbestos dust causes lung diseases. Radioactive substances found in dusty form in the atmosphere are also dangerous for the human body. A small amount of radioactive substances affects the normal functioning of a person's nervous system, gastrointestinal tract, adrenal gland, reproductive glands, thyroid gland; it changes the shape elements of the blood and the activity of the cardiovascular system, as a result, it shortens the life of a person. Clean air is defined as a state in which the amount of toxic gases and dust, which negatively affect the life of a person and other organisms, and their living conditions, is not exceeded. For this reason, hygienists came to the conclusion that clean air is defined as the concentration of air that contains various concentrations of harmful substances, but does not harm human health, his ability to work, and the normal life of plants and animals.

The following precautions should be taken depending on the degree of air pollution. Pollution degree:

➤ **Low from 0 to 5** - It is possible to be in fresh air as usual. Visiting and walking in parks and recreation areas is not limited.

➤ **Increased-5 to 7** - Children, the elderly, and susceptible people who experience respiratory discomfort should reduce outdoor exposure, as well as reduce prolonged and vigorous outdoor exercise.

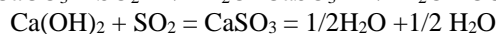
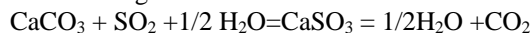
➤ **High- 7 to 14** - Children, the elderly, and susceptible people who experience respiratory discomfort should reduce outdoor exposure and avoid prolonged and vigorous outdoor exercise. Disadvantages: Anyone with sore eyes, sore throat, or cough should reduce outdoor activity.

➤ **Very high-above 14** - Children, the elderly and susceptible people who feel discomfort in breathing should not go out in the open air, do not do heavy physical work. People with asthma should use inhalers to relieve their condition. Residents should generally reduce their outdoor activities and wear a mask when going out.

3. Conclusion

Considering the above, it is necessary to take measures to reduce the amount of aerosols in the atmosphere. For this, first of all, it is necessary to identify the main pollutants and what methods or measures can be applied. In order not to exceed the amount of sulfur (double) oxide, which is one of the

aerosols in the air, it is possible to use the "lime method" in factories and enterprises whose waste contains sulfur (double) oxide. "Lime method" refers to several types of wet cleaning of smoke gases using lime (Ca(OH) or CaCO₃). These processes are based on the following chemical reactions:



Due to the fact that 99 % of the amount of sulfur compounds in flue gases is SO₂ (the rest is SO₃), the calculation is carried out with respect to this compound. In both processes, products of the reaction, consisting of fly ash particles and unreacted elements, are discharged into the digester. If the amount of sulfur in the fuel is 3.5-4.0 %, the quality of removal of sulfur compounds is equal to 85-95 %. The reliability of this type of devices approaches 100 % [7].

In order to prevent an increase in the amount of aerosols in the air and to protect the atmosphere, it is necessary to implement the following important measures:

➤ Introduction of mandatory environmental monitoring of areas emitting waste into the atmosphere;

➤ Installation of modern smart filter devices in plants and factories;

➤ Step-by-step implementation of waste-free technologies in the field of production;

➤ Increasing the types and network of environmentally friendly transport (metro, tram, trolleybus, electric car, etc.);

➤ Encouraging people to use bicycles and electric scooters more;

➤ Increasing strict requirements for building standards for heating new houses and public buildings with a small amount of fuel;

➤ Accelerating the transition to alternative energy sources (Sun, wind);

➤ Reducing the use of toxic chemical agents in agriculture, expanding the use of biological agents;

➤ Creation of eco-forests, small forests, water bodies, etc., around settlements.

With the implementation of these measures, air pollution can be reduced by several times. As a result, the negative impact on human health will be reduced and the ecological condition will improve.

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