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MONITORING OF AIR POLLUTION IN UZBEKISTAN

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ABOUT ARTICLE

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Abstract: The article presents the results of the analysis of data on air pollution in the cities of the Republic of Uzbekistan (RUz) in 2021 based on the reporting data of the Service for Monitoring Air Pollution, Surface Water and Soil of the Center for Hydrometeorological Service of the Republic of Uzbekistan. Analyzed data on the study of the concentration of the main pollutants: dust, sulfur dioxide, carbon monoxide, nitrogen dioxide and oxide, ozone, as well as specific impurities and heavy metals. The results showed that the average annual concentrations of all pollutants under consideration did not exceed the maximum allowable concentrations, only in the atmospheric air of some cities was an excess of the average daily maximum allowable concentrations (MPC) observed. Pollution index. The atmospheric air pollution index (API) in the cities was in the range of 1.38-4.85.

INTRODUCTION

According to the World Health Organization (WHO), outdoor air pollution causes more than 3 million premature deaths worldwide every year. Therefore, it is necessary to control pollutants in the atmospheric air in order to take urgent measures to reduce the level of pollution and create a favorable environment for public health [1].

Atmospheric air pollution is determined by the penetration of pollutants from natural and anthropogenic sources, as well as by the physical, geographical and climatic conditions of the territory. A significant part of Uzbekistan is a flat territory belonging to the Turan lowland, open to cold intrusions, which forms sharply continental climatic features. Western, northwestern intrusions of moist air from the temperate latitudes of the Atlantic Ocean are periodically observed, which also affects the formation of qualitative and quantitative characteristics of the atmosphere. The main natural pollutants of the flat area are natural sources of aerosol emissions into the atmosphere, such as the Karakum and Kyzylkum deserts with their frequent dust storms, as well as the Aral Sea region, from the surface of which large masses of salty dust rise and are transported from the surface to the west. Sources of pollutants of anthropogenic origin are transport and enterprises of the leading industries of the republic, in particular, oil and gas production and processing, energy, metallurgy, construction, chemistry, etc. [2].

The main sources of atmospheric air pollution in cities are industrial enterprises and vehicles. In large cities, vehicle emissions prevail over emissions from industrial enterprises [3]. Air pollution monitoring is a prerequisite for effective air quality management.

The purpose of the study: to assess the quality of atmospheric air in the cities of the Republic of Uzbekistan based on data received from monitoring stations for 2021. The study is aimed at determining the level of air pollution by various substances, such as: dust, sulfur dioxide, carbon monoxide, nitrogen dioxide and oxide, ozone, as well as specific impurities (ozone, phenol, ammonia) and heavy metals (cadmium, lead, copper, zinc).

Materials and methods. To conduct this study, data on the concentration of various pollutants in the air of the cities of the Republic of Uzbekistan for 2021 were used. The data were obtained using automatic air quality monitoring posts located in different parts of the cities of the Republic of Uzbekistan. Uzhydromet monitors air pollution in accordance with the Decree of the Cabinet of Ministers of the Republic of Uzbekistan No. 737 of 09/05/2019. "On improving the environmental monitoring system in the Republic of Uzbekistan" in 25 cities at 53 stationary observation points. In accordance with regulatory documents, depending on the population of cities, there are from 2 to 4 posts in them. There are 13 observation posts in Tashkent. Up to 12 pollutants are monitored in the atmospheric air at observation points. The city air quality monitoring program covers five main pollutants: dust (particulate matter), sulfur dioxide, carbon monoxide (carbon monoxide), nitrogen dioxide and nitrogen oxide. Other parameters are added to the measurement programs depending on the composition of industrial emissions and the characteristics of nearby enterprises and adjacent territories (ammonia, phenol, formaldehyde, ozone, chlorine, solid fluorides, hydrogen fluoride, heavy metals).

Atmospheric air monitoring is carried out daily with a frequency of 3 times a day (7:00; 13:00; 19:00 local time). Sampling at the observation points of Uzhydromet is carried out by the aspiration method. Atmospheric air samples are analyzed in the laboratories of Uzhydromet.

An indicator of the level of atmospheric air pollution is the Comprehensive Air Pollution Index (API), which is calculated mainly on five priority polluting ingredients (dust, carbon monoxide (carbon monoxide), nitrogen dioxide, sulfur dioxide and nitrogen oxide). API values less than 5 points correspond to a reduced level of pollution. The level of air pollution is considered low - at API 0-4, increased at API 5-6, high at API 7-13, very high at API > 14.

The indicator of the general dustiness of the atmosphere is monitored in 18 industrial cities of Uzbekistan. Increased air dust content is observed in large cities of Uzbekistan, where more than 41% of the urban population lives [4].

RESULTS

Atmospheric air pollution by nitrogen oxides. The most important air pollutants are nitrogen oxides, which enter the atmosphere with anthropogenic emissions from industry, power plants and transport. They are formed during the combustion of fossil fuels at high temperatures in the form of nitrogen oxide (NO) and nitrogen dioxide (NO2). In the air, nitric oxide (NO) is transformed into nitrogen dioxide (NO2). The average concentration of nitrogen oxides in the atmospheric air in the cities of the republic varied from 0.01 to 0.05 mg/m3. In 6 cities - Bekabad, Tashkent, Namangan, Ferghana, Margilan and Navoi, the content of nitrogen dioxide in the atmospheric air exceeded the MPC by 1.3 times.

Atmospheric air pollution with sulfur dioxide. The main source of sulfur dioxide in the air of cities are power plants, boiler houses and metallurgy enterprises. Sulfur dioxide enters the atmosphere during the combustion of fuel containing sulfur, as well as during the processing of sulfide ores.

The average concentration of sulfur dioxide in the atmospheric air of cities in 2021 was in the range from 0.001 to 0.057 mg/m3. In all cities, there are no cases when the concentration exceeded the MPC values, except for the city of Almalyk, where MPCs. amounted to 1.1 MPC.

Atmospheric air pollution with carbon monoxide (CO). Carbon monoxide enters the atmosphere from industrial enterprises as a result of incomplete combustion of fuel. Carbon monoxide is found in large quantities in the emissions of metallurgy and petrochemical enterprises, but the main source of carbon monoxide is road transport.

The average concentration of carbon monoxide in the atmospheric air of cities in 2021 was observed in the range from 1 to 4 mg/m3. In the cities of Angren and Namangan the concentration of carbon monoxide exceeded the MPC by 1.3 times.

Atmospheric air pollution with suspended solids (dust). Suspended solids include dust, ash, soot, cement, sulphates, nitrates and other suspended solids that result from the combustion of all fuels and industrial processes. Suspended solids enter the atmosphere from anthropogenic and natural sources. Anthropogenic suspended solids - industrial dust and solid particles from various enterprises, solid particles in vehicle emissions, etc. Natural suspended solids are formed as a result of the wind lifting

soil particles into the air. Currently, huge construction projects of residential buildings have covered all major cities. From the activities of builders, the atmosphere receives polluted air in the form of many small and large flows of suspended solids that occur during earthworks. Cement dust, emissions from incinerated construction debris and many gaseous impurities emitted by various construction units enter the atmosphere. As a result, in large cities, the average concentrations of suspended solids in the atmospheric air are higher than the maximum allowable concentrations.

The content of dust in the atmospheric air of cities was observed in the range from 0.10 to 0.25 mg/m3. Exceeding the MPC by 1.3 times was recorded in the cities of Tashkent, Namangan, Bukhara, Samarkand and Nukus. Since March 2021, continuous monitoring of fine particles PM10 and PM2.5 in Tashkent by automatic atmospheric air monitoring stations has begun. These particles usually make up 40–70% of the total number of suspended particles.

In Uzbekistan, SanPiN 0293-11 is currently in force, in which standards are adopted only for suspended particles PM10, standards for the content of fine particles PM2.5 in the atmospheric air have not yet been developed. Due to the dust storm in November 2021, the average monthly MPC for suspended particles PM 10 was exceeded by 2.3 times.

Air pollution by ozone. Ozone is formed in a polluted atmosphere as a result of photochemical reactions occurring in the atmosphere under the influence of intense solar radiation. The ozone content in the cities of the republic was observed in the range from 0.010 to 0.083 mg/m3. Exceedances of MPC were noted in the cities of Angren (1.2 MPC), Tashkent (1.9 MPC), Fergana (2.8 MPC). In 2021, extremely high and high air pollution was observed in the cities of Almalyk in January and March for sulfur dioxide - from 8.9 to 13.7 MPCds, Tashkent in July and October for dust - 9.3 and 6.0 MPCds, respectively, Chirchik in August and November for ammonia - 7.0 and 6.0 MPCds, respectively.

Air pollution index. In Uzbekistan, for a comprehensive assessment of the state of atmospheric air, the Atmospheric Pollution Index (API) is used, which is calculated for 5 substances with the highest concentrations.

According to monitoring data from Uzhydromet, in 2021, a stable situation with air pollution remained on the territory of Uzbekistan (Andijan - IZA-3.52, Almalyk -4.85, Angren -4.41, Bukhara -4.34, Kokand -2, 83, Margilan -1.51, Sariasia -1.38, Tashkent -4.67, Navoi -4.03, Nukus -3.37, Urgench -1.95, Chirchik - 3.56, Samarkand -3.13) .

CONCLUSIONS

In general, based on the monitoring data, it can be concluded that the air quality in the cities of the Republic of Uzbekistan is satisfactory and is in line with the established MACs.

Basically, air pollution in the cities of the Republic of Uzbekistan is associated with emissions of nitrogen oxides, sulfur and carbon, as well as dust and smoke. In addition to emissions from industrial enterprises and vehicles, there are other sources of air pollution. For example, during dust storms that occur from autumn to spring, the concentration of dust in the atmosphere increases significantly. In addition, landfill burning is also a significant source of air pollution, especially in summer.

To improve the situation with air pollution, it is necessary to take a number of measures aimed at reducing emissions of pollutants into the atmosphere. For example, it is necessary to develop environmentally friendly modes of transport, such as electric vehicles, as well as to modernize equipment in industrial enterprises to reduce emissions into the atmosphere. In addition, it is necessary to develop a garbage disposal system and take measures to reduce the dust load in the city.

Thus, despite the positive results, air pollution is a serious problem that has a negative impact on public health. To improve the situation, it is necessary to take measures aimed at reducing emissions of pollutants into the atmosphere, as well as carry out work to clean the air and reduce dust load.

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