

Currently, the capital of Tajikistan - the city of Dushanbe is in the twenty worst cities in the Asia-Pacific region for its air quality. Tajik ecologist Muazzama Burkhonova believes that a package of measures will be needed to improve the atmosphere.

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According to the World Health Organization (WHO), air pollution in cities and rural areas in 2016, has led to 4.2 million cases of premature death worldwide.[\[1\]](#)

The burden of air pollution is disproportionately high for the populations of low- and middle-income countries. Of the 4.2 million cases of premature death, 91% are in these countries. The data of the Organization for Economic Cooperation and Development (OECD) shows[\[2\]](#) that air pollution cost the world economy 0.3% of GDP in 2015, and the cost on social support due to this fact was another 6% of global GDP.

Emissions of pollutants into the atmosphere of Dushanbe from stationary sources

The main industrial stationary sources of emission of chemical pollutants into the atmosphere of Dushanbe at the beginning of 2019 are the TPP-2, Dushanbe cement plant, other industrial enterprises of the city, boiler houses, as well as small workshops that process and burn various types of waste.

Many metropolitan enterprises use coal as raw materials for energy production. For example, there are 24 enterprises in the city that generate heat by burning coal fuel. The largest of them is Dushanbe TPP 2, which is managed by the state energy company Open Joint-Stock Holding Company "Barki Tojik", which produced[\[3\]](#) in 2018 - 671.2 Gcal of heat or 82% of the total heat production in the republic.

In addition, coal is used by 434 manufacturing enterprises.

Relative to other regions of the country, there is an accelerated development of the furniture industry in Dushanbe, which releases harmful substances into the atmosphere of the city: solvents, formaldehyde, carbon monoxide, ammonia, etc.

The main air pollutant in Dushanbe is particulate matter - PM,[\[4\]](#) which accounted for 93%

of the total volume of harmful emissions from stationary sources of the capital.

PM concentration is a commonly used indicator of air pollution. PMs consist of a complex mixture of solid and liquid organic and inorganic substances present in suspension in air. Air quality is usually assessed at daily or annual PM 10 concentrations in one cubic meter of air.

The amount of pollutants emanating from stationary sources for the period 1991-2018, on average in Tajikistan decreased by almost 200 thousand tons. But in Dushanbe over the same period, the volume of harmful emissions increased, amounting to 86% of the total emissions in the republic in 2018.

The amount of pollutants emanating from stationary sources (thousand tons / year) CHART

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The amount of dirty emissions into the atmosphere of Dushanbe in 2018 exceeded the volume of emissions in the city in comparison with 1991, when Dushanbe was one of the ten dirty cities in the USSR.

The volumes of emission of pollutants in Dushanbe are growing at an accelerated pace in comparison with other cities of the Republic of Tajikistan. In just one year (2017-2018), the amount of pollutant emissions into the atmosphere of the city increased by 2.6 times, compared to 2016. - 55 times, 2015 - 88 times.

The amount of harmful emissions from stationary sources in Dushanbe in 2018 exceeds the amount of emissions in such large industrial zones of Tajikistan as RRS and Sughd region.

Emission of harmful substances into the atmosphere from stationary sources (thousand tons / year) CHART

An increase in the volume of harmful emissions into the atmosphere of Dushanbe has been observed since 2015, which coincides in time with a set of capacity at the Dushanbe TPP 2 near one of the city's micro districts. The second phase of the 300 MW TPP 2 was commissioned in September 2014, the contractor of the station is the Chinese company TBEA. The station's total capacity of 400 mW of electricity was reached in December 2016. For the production of these types of energy, TPP 2 used 831 thousand tons of coal (coal from the Fan-Yagnob and Ziddy deposits).

In the coming years, the country plans to increase coal mining by the underground method, which accordingly will lead to higher costs for coal mining. The cost of imported fuels and lubricants for coal transportation by road will increase, which will lead to an increase in the cost of energy production at thermal power plants and lower expenses on environmental purposes.



TPP Dushanbe-2 Photo: viproliki.net

One of the key indicators of air purity is the increase in carbon dioxide (CO₂) in the air, which accompanies the combustion of coal in the process of generating electricity and heat alongside with generating industrial products. Among the most hazardous atmospheric emissions are suspended particulate matter, sulfur dioxide, nitrogen oxides, carbon monoxide, mercury, arsenic, inorganic dust, and soot. Some of these pollutants interact in the atmosphere, forming ozone and fine suspended particles. The effect of sulfur oxide on human health can be expressed both in the direct effect of this gas on the body, and through the interaction of CO₂ with the smallest particles of dust PM_{2.5}. Coal burning is accompanied by emissions of benzopyrene, which is a substance of the 1st hazard class, which tends to accumulate in soil and water. This pollutant is not measured by automatic air monitoring systems in Dushanbe.

In addition to the Dushanbe TPP 2, a major air pollutant (carbon dioxide, smog, etc.) is the

Dushanbe cement plant, built on the main street of Dushanbe in 1941. The cement plant, which was using natural gas as a fuel, was converted to burning coal in 2013. In the coming years, in the Ismoili Somoni district of Dushanbe, a new enterprise will be commissioned, CJSC Tojikcement with a production capacity of 3300 tons of cement per day, 1.2 million tons of cement per year (4 times more cement production at the Dushanbe cement plant in 2018). Coal fuel will remain the raw material for energy production with the possible replacement of it with gas.

The situation with air quality in Dushanbe is worsened by the low ability of the city's atmosphere to self-clean due to the fact that the capital is surrounded by mountain ranges from the north, east and south with the only exit to the west in the Gissar valley. The wind streamline has the main north-south direction along the Varzob river valley. The state of wind immobility according to the Agency for Hydrometeorology of the Republic of Tatarstan is about 38%. For these reasons, the degree of dispersion of toxic substances in the atmosphere of Dushanbe is low, most of them settle in the city. Even with small emissions, harmful substances can accumulate in atmospheric air to high concentrations.

In addition to large air pollutants (TPPs, a plant) in Dushanbe, there are more than 20 coal-fired boiler houses, 6 small private enterprises utilizing plastic, 1 small enterprise utilizing tires. It is impossible to say unequivocally whether they have official licenses or permissions to conduct a polluted business. Most often, these enterprises, which are sources of harmful emissions, are poorly exposed to constant environmental monitoring by authorized structures.

Air pollution by vehicles in Dushanbe

Dushanbe takes [\[5\]](#) the first place in the republic (44.1%) in terms of the number of passengers transported by road (public, departmental, individual).

Total emissions of harmful substances from road transport in 2018 in general, in Tajikistan amounted to 561 thousand tons, of which the largest volume was CO₂ emissions -

380.4 thousand tons and nitrogen oxide emissions - 108.6 thousand tons. The main source of these emissions (90% and 97%, respectively) is passenger cars.

In mid-March 2019 authorities in Dushanbe intended to consider a decision banning the use of cars (taxis) produced before 2014 as technically less serviceable. However, this decision was subsequently quashed. Catalysts for purification of harmful emissions are installed only on new machines.

The Law “On ensuring the environmental safety of road transport” adopted in 2015 provides for a wide range of measures to mitigate the environmental impact of road transport. However, the mechanism for the implementation of this law between various government bodies has not been implemented.

One of the causes of air pollution in Dushanbe from vehicles is the fact of poor environmental control of harmful emissions by the traffic police.

Air pollution in Dushanbe by household and industrial waste

Waste contains emissions of methane and nitrous oxide (greenhouse gases) in the following categories: collection, disposal and placement of municipal solid waste in landfills, treatment and discharge of municipal and industrial wastewater.

Dushanbe does not have a waste recycling system. Methane generated in landfills is not disposed of and is completely released into the atmosphere. Waste, in addition to environmental degradation, contributes to emissions of methane and nitrous oxide due to:

- Anaerobic decay of the organic fraction of landfills of solid urban (household) waste;
- Treatment and discharge of domestic wastewater to the city’s centralized sewage treatment facilities;
- Treatment and discharge of industrial wastewater

Of the total amount of harmful substances received at the wastewater treatment plants in Tajikistan in 2018, the vast majority (90%) are emissions received at the wastewater treatment plant in Dushanbe. These are mainly particulate matter (98% of total emissions) and carbon monoxide.

Monitoring air quality in Dushanbe

Monitoring of air quality is carried out in Dushanbe according to the indicators of two permanent stationary posts operating in automatic mode and two mobile laboratories. Automated air quality stations operate around the clock, measuring the volumes of the most important pollutants (carbon monoxide, nitrogen oxides, sulfur dioxide, formaldehyde, suspended solids). The Agency for Hydrometeorology measures daily meteorological data (free access on the website), prepares environmental bulletins (paid services).

One of the mobile laboratories operated by the Agency for Hydrometeorology conducts route monitoring and leaves upon request, the second one, which is at the disposal of the Committee for Environmental Protection under the Government of the Republic of Tajikistan, leaves in accordance with the developed exit plan. Departures require additional financial resources, which is not always possible to implement.

The air quality indicator in Dushanbe can be observed in the public domain according to the air monitor installed by the US Embassy in 2018. The monitor is designed to measure particulate matter in the air at the US Embassy territory, which is located in the Zarafshon district of Dushanbe.

An air quality monitor measures the number of particles with a diameter of less than 2.5 micrometers (PM 2.5). This indicator is considered the most hazardous to health, and therefore it is an air quality standard recognized by the US Environmental Protection Agency (EPA). Real-time publication of air quality data is available on the specialized website on air, airnow.gov, which is a partner with the US Environmental Protection Agency.

The U.S. Environmental Protection Agency has developed a formula for converting PM 2.5 values into an Air Quality Index (AQI) value that can help to make decisions that are connected with health. For example, an AQI value of 50 represents good air quality, 50-100 represents acceptable air quality, which can be a moderate health problem for people most sensitive to air pollution (people with heart, lung, children, elderly people), 101-150 - unfavorable for sensitive groups, 200-300 - harmful to health.

AQI values in excess of 300 represent [\[6\]](#) a hazardous air quality. All these air quality values are indicated in different colors to facilitate perception.

The data from the US Embassy air monitor showed that in Dushanbe during May 17 - June 16, 2019, when there was no heating season, the air quality was mostly moderate (50-100 AQI). During this period, a moderate health problem was observed for a small number of people sensitive to air pollution. At the same time, during this period favorable for air quality, the AQI for several days showed more than 150 units (unhealthy for sensitive groups). For two days, May 23-24, 2019, mainly at night, there was a sharp deterioration in air quality to 300 AQI - hazardous to health. Monitor data show that air quality in Dushanbe deteriorates sharply in the autumn-winter period of the year (November-February months). So, for example, May 29, 2019. at 4 a.m. - 131 AQI, February 14, 2019 at 10 pm - 262 AQI.

The average daily maximum permissible concentration of PM 2.5 emissions in Russia is [\[7\]](#) 35 µg / m³, the maximum one-time - 160 µg / m³. In Tajikistan, the same maximum allowable concentration (MAC) of PM 2.5 standards has been adopted.

According to the Environmental Bulletins issued by the Agency for Hydrometeorology of the Republic of Tatarstan, [\[8\]](#) the average daily concentration of PM 2.5 in the atmosphere of Dushanbe for March-April-May is 2020 did not exceed the number of cases above the MAC, amounting to 0.003-0.28 MAC during this period. While according to the data of the monitor of the US Embassy in Dushanbe, the air in Dushanbe in real time on 05/05/2020 in terms of AQI was 137 (unhealthy for sensitive groups). By the value of this indicator, on 05/05/2020, Tajikistan occupied [\[9\]](#) the first place among the countries of the CIS and Central Asia.

Air pollution and health

One of the environmental health risks is the air pollution. A serious health risk is not only exposure to PM, but also exposure to ozone, nitrogen dioxide and sulfur dioxide. Ozone is produced by reacting with sunlight such pollutants as nitric oxide emitted into the air by vehicles and industrial plants, and volatile organic compounds emitted by vehicles and industry. The highest levels of air pollution with ozone are observed in sunny weather.

The effect of harmful emissions into the air on diseases (WHO data):

Asthma, lung diseases - sulfur dioxide, suspended particles, ozone

Heart disease - carbon monoxide, contaminated particles,

Elderly people and children - ozone, contaminated particles

By the number of patients per 100 thousand population, consisting in 2018 and registered in medical institutions of Tajikistan, the city of Dushanbe exceeds [\[10\]](#) this figure by 2.4 times. The most common diseases of the population in Tajikistan are diseases of the circulatory system and neoplasms (about 60% of all types of diseases).

The usage of coal affects not only air quality, but also quality of life. There is a known connection between the decline in the human development index (HDI - an integral indicator that includes life expectancy, literacy, education, population income) in regions and cities with the highest use of coal. In terms of the human development index, Tajikistan takes [\[11\]](#) the last place among the CIS countries (0.656 in 2019), ranking 125 out of 189 in the world.

According to such an indicator as air condition, the capital of Tajikistan – Dushanbe, was included^[12] in the twenty worst cities in the Asia-Pacific region.

Recommendations

In our opinion, improvement in the air quality of the capital of Tajikistan can be achieved through a series of measures:

- The introduction of carbon and fuel taxes from Dushanbe enterprises, stationary and mobile sources of air pollution in the city, as a measure to combat CO₂ emissions. Improvement of technical inspection of vehicles.
- Transfer of Dushanbe TPP 2 and the cement plant to gaseous fuel. Using gas will reduce pollutant emissions compared to coal.
- The gradual transition of enterprises to the use of electricity produced by hydroelectric power plants in Tajikistan. Transition to energy-saving technologies.
- Transfer of administrative and residential buildings of the city to receive energy from renewable energy sources, in particular to environmentally friendly solar energy, the cost of which is constantly reducing. The introduction of thermal insulation and energy efficiency in city buildings.
- Policies and investments in support of cleaner transport, import of hybrid and electric powered cars (electric cars). Stimulating the use of clean transport by reducing customs duties.
- Paying priority attention to high-speed city transport, pedestrian and bicycle networks. Reduced congestion, improved access to public transport, trolleybuses.
- Reforming vehicle taxation (taxes on acquisition, registration, and annual road tax) so that taxes are based on specific CO₂ emissions.
- Introduction of advanced methods for the utilization and recycling of municipal waste, including capturing (trapping) of methane emitted at waste disposal sites
- Development of an open and accessible map of pollutant emissions in Dushanbe, and public monitoring of air quality.
- The Republic of Tajikistan should become a Party to the Convention on Long-range

Transboundary Air Pollution and its protocols. Tajikistan's participation in the Convention will provide the country with wider access to the necessary information to develop a monitoring strategy for air pollution, a reliable emission inventory system and an air quality management strategy.

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[1] "Air Quality Guidelines – Global Update 2005", World Health Organization website, https://www.who.int/phe/health_topics/outdoorair_aqg/en/

[2] "Due to polluted air, Russia annually loses billions of rubles", "Vedomosti"

<https://www.vedomosti.ru/economics/articles/2019/12/20/819225-zagryaznennogo-vozduha>

[3] Industry of the Republic of Tajikistan (2019). Agency for Statistics under the President of the Republic of Tajikistan.

[4] Environmental Protection in the Republic of Tajikistan (2019). Agency for Statistics under the President of the Republic of Tajikistan.

[5] Transportation (2019). Agency for Statistics under the President of the Republic of Tajikistan.

[6] "Press release on air quality control at the US Embassy in Dushanbe." U.S. Embassy <https://tj.usembassy.gov/ru/pr-06202019.ru/>

[7] "Press release on air quality control at the US Embassy in Dushanbe." U.S. Embassy <https://tj.usembassy.gov/ru/pr-06202019.ru/>

[8] Environmental Bulletins. Agency for Hydrometeorology of the Republic of Tajikistan www.meteo.tj

[9] World Air Pollution: A real-time air quality index. Draft World Air Quality Index <https://waqi.info/ru/>

[10] Healthcare in the Republic of Tajikistan (2019). Agency for Statistics under the President of the Republic of Tajikistan.

[11] Report on the development of mankind. United Nations Development Program. <http://hdr.undp.org/sites/default/files/hdr2019.pdf>

[12] How air pollution lowered the rating of Dushanbe. Online eco-magazine Liven. Living asia <https://livingasia.online/2017/03/29/air-in-dushande/>



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