SCIENTIFIC COLLECTION «INTERCONF»

№ 1 (34)
November, 2020

THE ISSUE CONTAINS:

Proceedings of the 6th International Scientific and Practical Conference

INTERNATIONAL FORUM: PROBLEMS AND SCIENTIFIC SOLUTIONS

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InterConf
Scientific Publishing Center

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UDC 001.1

S 40 *Scientific Collection «InterConf»*, (34): with the Proceedings of the 6th International Scientific and Practical Conference «International Forum: Problems and Scientific Solutions» (November 6-8, 2020). Melbourne, Australia: CSIRO Publishing House, 2020. 818 p.

ISBN 978-0-643-12109-6

The recommended citation:
Surname N. (2020). Title of article or abstract. *Scientific Collection «InterConf»,* (34): with the Proceedings of the 6th International Scientific and Practical Conference «International Forum: Problems and Scientific Solutions» (November 6-8, 2020) in Melbourne, Australia; pp. 21-27. Available at: https://interconf.top/...

This issue of Scientific Collection «InterConf» contains the International Scientific and Practical Conference. The conference provides an interdisciplinary forum for researchers, practitioners and scholars to present and discuss the most recent innovations and developments in modern science. The aim of conference is to enable academics, researchers, practitioners and college students to publish their research findings, ideas, developments, and innovations.

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BIOLOGY AND BIOTECHNOLOGY

UDC 504.036

Kapshakbayeva Zarina Vladimirovna
doctor PhD, associate professor, associate professor of the department of biotechnology
Toraighyrov University, Republic of Kazakhstan

Marat Kamila
3rd year student
Toraighyrov University, Republic of Kazakhstan

ON THE ISSUE OF EMISSIONS OF POLLUTANTS INTO THE ATMOSPHERE FROM STATIONARY SOURCES *(ON THE EXAMPLE OF KAZAKHSTAN AND OTHER COUNTRIES)*

Abstract. *The article analyzes the problems of air pollution and provides a description of pollutants. Based on a comparative analysis, data on the state of atmospheric air pollution in different countries, and a more detailed one for Kazakhstan are presented.*

Keywords: *air pollution, anthropogenic factors, pollutants, atmospheric air, emissions, stationary sources*

Man has always used the environment mainly as a source of resources, but for a very long time his activities have not had a noticeable impact on the biosphere. In an effort to improve their living conditions, people are constantly increasing the pace of material production, without thinking about the consequences. With this approach, most of the resources taken from nature are returned to it in the form of waste, often toxic or unsuitable for disposal. This creates a threat to the existence of the biosphere and the human being.

The negative impact of anthropogenic factors on the environment is currently a problem that requires priority solutions. Protection of the atmosphere from harmful

effects resulting from the operation of motor transport, industrial enterprises and other facilities is extremely relevant, since the quality of atmospheric air is most dependent not only on human health, but also on the overall quality of life on the planet [1, P. 27].

Outdoor air pollution is a major environmental health problem that affects everyone in low, middle and high income countries.

In 2016, air pollution in urban and rural areas is estimated to have caused 4.2 million premature deaths worldwide; these deaths are caused by exposure to fine particulate matter with a diameter of 2.5 microns or less ($PM_{2.5}$), which leads to the development of cardiovascular, respiratory and cancer diseases.

The who air quality guidelines (2005) provide global guidance on thresholds and maximum permissible levels of major air pollutants that pose a health risk. The guidelines applied worldwide are based on an expert assessment of available scientific data on:

1. Particulate matter (PM);
2. Ozone (O_3);
3. Nitrogen dioxide (NO_2)
4. Sulfur dioxide (SO_2) in all who regions.

PM concentration is a frequently used indirect indicator of the level of air pollution. They have a negative impact on more people than any other air pollutant. The main components of PM are sulfates, nitrates, ammonia, sodium chloride, soot, mineral dust, and water. They consist of a complex mixture of solid and liquid organic and inorganic substances present in suspension in the air.

If the concentration level exceeds 200 $\mu g/m^3$ for a short time, nitrogen dioxide is a toxic gas that causes severe inflammation of the respiratory tract.

The average annual level of nitrogen dioxide is 40 $\mu g/m^3$. The main sources of anthropogenic NO_2 formation are combustion processes.

SO_2 is a colorless gas with a pungent smell. It is produced from the burning of fossil fuels (coal and oil) and the smelting of mineral ores that contain sulfur. The average daily level of sulfur dioxide is 20 $\mu g/m^3$ [2].

Industrial emissions are the main source of air pollution. According to the national report on the state of the environment and the use of natural resources of the Republic of Kazakhstan, in 2018, emissions of pollutants into the air from stationary sources amounted to 2,446.7 thousand tons and their level increased by 3.8 % compared to 2017. In this article, we will try to analyze the situation on emissions of pollutants in the regions of Kazakhstan, where heavy industry enterprises are concentrated. The main volumes of pollutants were formed in Pavlodar (709.3 thousand tons), Karaganda (587.5 thousand tons), Atyrau (172.3 thousand tons), Aktobe (158.1 thousand tons) and East Kazakhstan (130.7 thousand tons) regions. This is due to the high concentration of industrial enterprises in these regions (Table 1).

Table 1

Emissions of pollutants into the atmosphere from stationary sources (thousand tons)

Administrative unit	2014	2015	2016	2017	2018
Republic of Kazakhstan	2256,7	2180,0	2271,6	2357,8	2446,7
Karaganda region	603,6	596,4	593,0	598,7	587,5
Pavlodar region	610,2	552,9	542,7	609,8	709,3
Atyrau region	109,1	110,7	167,1	177,0	172,3
Aktobe region	121,8	134,3	155,6	169,5	158,1
East Kazakhstan region	129,6	127,1	128,7	129,3	130,7
Kostanay region	103,8	91,6	98,7	114,8	124
Akmola region	84,6	85,6	94,5	86,9	84,5
North Kazakhstan region	72,0	74,9	77,7	76,4	75,5
South Kazakhstan region	59,9	69,0	72,0	68,2	-
Turkestan region	-	-	-	-	30,1
Mangystau region	88,3	72,5	65,8	62,6	65,5
Zhambyl region	38,2	41,9	52,4	51,9	52,1
Almaty region	51,6	55,0	50,3	43,4	50,2
West Kazakhstan region	44,7	42,4	42,5	41,5	48,2
Kyzylorda region	30,8	30,1	30,1	27,5	26,0
Nur-Sultan city	65,1	56,3	61,7	59,2	56,4
Almaty city	43,5	39,1	38,8	41,2	43,0
Shymkent city	-	-	-	-	33,4

In 2018, enterprises and individual entrepreneurs of the Republic neutralized 93 % of the total amount of pollutants coming from all stationary sources of pollution.

Of the total amount of pollutants released into the atmosphere, 79.2 % were gaseous and liquid substances, and 20.8 % were solid substances.

The main air pollutants in the Republic of Kazakhstan are solid particles (dust and ash), sulfur dioxide, nitrogen oxides, carbon oxides, VOCs, ammonia, and hydrogen sulfide (fig. 1) [3, P. 11].

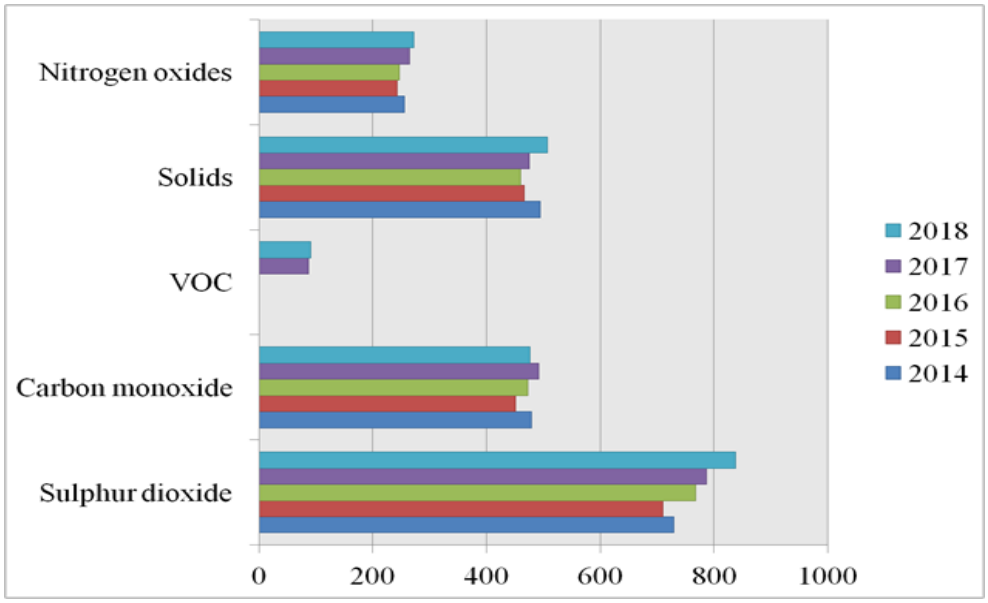

Fig. 1. Emissions of pollutants into the air from stationary sources in the Republic of Kazakhstan

In order to assess the situation with emissions in Kazakhstan in a comparative aspect with other countries, we selected indicators for emissions in the Russian Federation and Canada.

First, we analyzed emissions in the Russian Federation. The total volume of pollutants emitted from stationary sources in 2018, according to the state report of the Ministry of nature of the Russian Federation for 2018, amounted to 17,068 thousand tons, including solid substances – 1,519 thousand tons, gaseous and liquid substances – 15,559 thousand tons (fig. 2) [4, P. 61].

We conducted a similar comparative analysis of emissions using the example of Canada. From the graph, we can see that in 2017, the 5 main air pollutants such as sulfur dioxide, carbon monoxide, nitrogen oxides, VOCS, ammonia, and solid particles ($PM_{2.5}$) range from 69 % to 15 % lower than in 1990 (fig. 3) [5, P. 7].

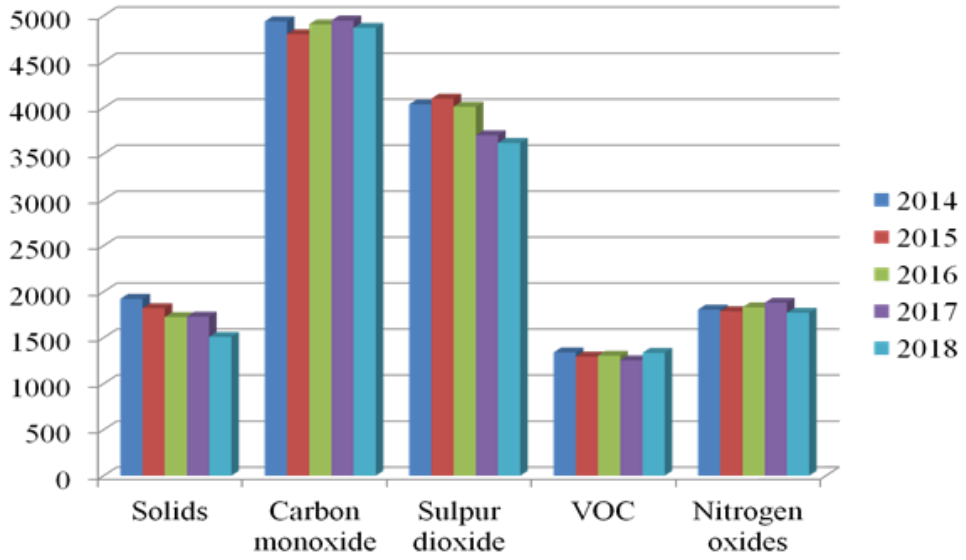

Fig. 2. Emissions of pollutants into the atmosphere of the Russian Federation for 2014-2018 (thousand tons)

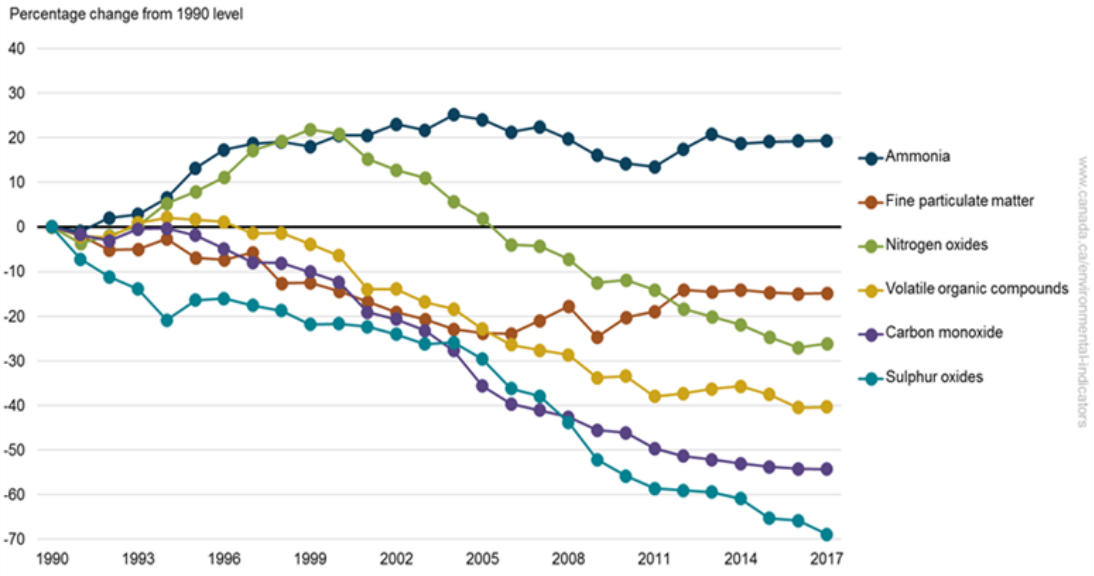

Fig. 3. Emissions of polluting substances in the atmosphere of Canada for 1990-2017 year

So, after conducting comparative analyses, we came to interesting conclusions:

First, the VOC index for 2014–2016 in Kazakhstan is zero, while in Russia it is many times higher.

Second, the sulphur dioxide index in Canada declined sharply from 1990 to 2017, while it is growing rapidly in Kazakhstan and Russia.

Third, the carbon monoxide index in Russia occupies the largest part of all indicators, reaching almost 5,000 thousand tons, while in Kazakhstan it remains stable.

Fourth, nitrogen oxides in Canada grew rapidly from 1990 to 1999, with the main decline starting in 2002 and continuing to fall to this day.

In Russia and Kazakhstan, the nitric oxide index remains stable during 2014–2018. Finally, the solid content index in Russia is gradually falling, while in Kazakhstan it has increased by 14 thousand tons since 2014.

Based on the graphs, Canada has the highest rates of atmospheric emissions among all the countries represented in the comparative analysis. Kazakhstan has the highest rate of VOCs, while Russia has the highest rate of solids.

Thus, Kazakhstan is characterized by an increase in air emissions, which generally affects climate change. The high concentration of pollutants in the atmosphere causes great damage to public health, agriculture and forestry, industry, residential buildings and technical structures, historical monuments and other works of art. Direct and indirect exposure to polluted air leads to reduced labor productivity, increased morbidity and even mortality among the population.

At this stage of its development, humanity is increasingly thinking about the negative impact of its activities on the atmospheric air, and on nature as a whole. Already made the first steps towards solving problems: more and more industries are switching to natural gas, wider use fuels with low emissions and renewable energy strategies for reducing waste, sorting waste, recycling, reuse, or recycling. But all of the above measures are extremely small for a visible result, so people will have to rethink their attitude to nature and the planet and find new ways to solve problems that have already arisen in the course of human activity, and prevent their negative impact in the future.

A responsible attitude to this problem will not only reduce the risk of global warming, but also eliminate a number of side effects, in particular, many social and economic problems.

References:

1. Sher E. Handbook of Air Pollution from Internal Combustion Engines, 1st edition: Academic Press, 1998. – 27–41 p.
2. WHO Ambient (outdoor) air pollution

3. National report on the state of the environment on the use of natural resources of the Republic of Kazakhstan for 2018. – 11–12 p.
4. State report «On the state and environmental protection of the Russian Federation in 2018», 2019. – 61 p.
5. Canadian Environmental Sustainability Indicators: Air pollutant emissions, 2019. – 7 p.