

SOCIO-ECONOMIC IMPACT OF DESERTIFICATION ON UZBEKISTAN

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Abstract. *This article examines the disruption of ecological systems, their impact on human health, agriculture, and socio-economic consequences.*

Keywords: *desertification, degradation, Aral Sea, natural and anthropogenic factors, Aralkum, population migration, premature death, disease, aviation, agriculture, dust storm, household costs, WAVES, PROGREN.*

INTRODUCTION

Desertification is a set of natural-geographical and anthropogenic processes that lead to the destruction of ecological systems in countries, the deterioration of all forms of organic life in them, and, as a result, the reduction of natural and economic opportunities. It is a type of land degradation in arid lands, where biological fertility is lost as a result of natural processes or human activities, and fertile areas become arid. This is further contributed by the spread of drylands due to various factors such as excessive land use as a result of climate change.

DISCUSSION

Every year, 12 million hectares of land around the world, and 23 hectares in 1 minute, become deserts. Now 75% of the Earth's surface is desert. If this threat continues, by 2050, 95 percent of the Earth's surface will become unusable, leaving more than 3 billion people with food shortages. 87% of desertified wetlands have become so in the last 300 years. Looking even more recently, 54 percent of desertification occurred in the last 100 years. This process is still ongoing in South-East Asia and Africa. Desertification processes are also relevant for the arid regions of Central Asia, which occupy an area of 210 million hectares. For example, in Uzbekistan, 9 square meters of territory is becoming desert every minute. In particular, the geographical distribution of desertification phenomena in the Kyzylkum Desert is unique compared to other arid regions, and the situation related to desertification in these regions is becoming more serious every year. The main reason for this is:

- the area of tree groves decreases from year to year;
- The rate of desertification in the area of the Aral Sea increases, sand and salt appear instead of sea water;
- increased water erosion of the land as a result of excessive water use.

In addition, desertification is influenced by natural and anthropogenic factors. Anthropogenic, i.e. human-caused, factors include improper irrigation, land pollution, industrial waste, mining of stone, sand, and minerals. Also, world population growth is one of the main causes of desertification. One. Because the increase in people increases the demand for food and material resources. This means that more crops should be harvested from the land. As a result, agricultural land is used without mercy. Taking into account that more than 70 percent of the territory of the Republic of Uzbekistan consists of deserts and semi-deserts, salinization, swamping, wind and water erosion in irrigated lands, and the rise of groundwater levels in pastures, especially in several depressions in the Kyzylkum desert, we can clearly see the consequences of desertification, that is, their (desertification) border is expanding more and more. Among them,

Aralkum, the youngest desert in recent years, was added. The island is now 60 years old, and it is no exaggeration to call it the youngest desert in the world. Due to the drying up of the water level of the Aral Sea, this desert occupies an area of almost 60,000 square kilometers in Uzbekistan, it is three times larger than the Ferghana Valley, and it is the most painful ecological problem of Central Asia. Every year, storms carry from 15 to 75 million tons of sand, dust and salt from the dry bottom of the Aral Sea to the latitudes of Central Asia. As a result, soil erosion and air pollution have a negative impact on people's health, living conditions and the environment, the productivity of agricultural crops in the near Aral region has decreased to about 40-45%, and food, fodder and industrial raw materials have become scarce - the production of goods in sufficient quantity is slowing down and the quality indicators of the produced products are also decreasing. As a result of this, population migration from these areas is observed, and it is seen as one of the main reasons for internal migration in recent years.

In addition to the above, desertification naturally causes several other unpleasant consequences. These include:

- decrease in soil fertility and loss of natural resistance of the earth;
- increase in floods in lower reaches of rivers, deterioration of water quality, siltation of sedimentary rocks in rivers and lakes, reservoirs and moving channels;
- deterioration of human health due to wind, dust, including eye, respiratory and allergic diseases and psychological stress;
- we can take as an example the spread of infectious diseases due to population migration.

If the measures against desertification are not implemented quickly, it is not out of the question that it will lead to alarming results. If we look back in history, we can see that the Paris Convention on Combating Desertification and Mitigating Drought was adopted by the Intergovernmental Committee of the United Nations on June 17, 1994. Taking into account the importance of combating the consequences of desertification and drought, the Republic of Uzbekistan joined this Convention in 1995. Even now, many projects are being implemented in our country with international organizations and partners to stabilize the ecological situation in areas at risk of desertification. "Exploitation of mountainous, semi-desert and desert regions, arid lands of Uzbekistan" carried out in cooperation with the UN Global Environmental Fund and the State Committees for Earth Resources, Geodesy and Cartography and State Cadastre. This includes the project on reducing the pressure on the use of natural resources. During the research, we tried to study the economic effects of dust. We considered it mainly in 5 stages. These are:

1. Early death.
2. Getting sick.
3. Aviation.
4. Agriculture
5. Other.

1) According to the results of the research conducted by the World Health Organization, exactly 22% of premature deaths in the countries of the world were caused by dust. This indicator shows that the number of premature deaths in Uzbekistan in 2022 will be 76,756 people, of which 15,351 people will die due to dust. According to the TIMES, Stanford economists Stefanos Zenios and colleagues have shown that the average value of a quality human life is about \$129,000.

2) According to the health care data of Uzbekistan, among the most common diseases in Uzbekistan in 2022, the cardiovascular system is in the front ranks with 60.6% and respiratory

system with 4.2%. The main cause of this disease is the decrease in air quality. According to the study, the estimated treatment costs due to the dust are \$9,318. For example, on November 4, 2021, when the strongest dust storm was observed, 687 requests for help due to problems with the respiratory system were received in 1 night in only Tashkent.

3) When it comes to aviation, the main costs are cancellations of airline flights due to dust, forced to change routes, number of delays and other costs that may arise due to dust problems. When we study the experience of the world, in the last twenty years, the problem of dust has been added to the list of the main problems of aviation. In the world experience, for example, in South Korea, 102 flights were canceled as a result of dust alone, as a result of which companies suffered losses in the amount of 578,000 US dollars. In Australia, it has been estimated that each flight delayed by dust causes an average of US\$15,000 to US\$68,000 in damage. In Kuwait, daily damage was estimated to reach 24,900 euros (9,725 KD). When it comes to Uzbekistan, there is very little information. As an example of the latest information, on September 9, 2022, the plane that flew to Termez could not land at the airport due to a strong dust storm. Due to this unfavorable weather, the plane that flew from Tashkent to Termez was diverted to the reserve airfield Bukhara, the report says. In May 2022, planes flying to Urganch were forced to land at other airports due to a strong dust storm. These situations were caused by unfavorable weather conditions at the Urganch airport - a strong dust storm. The flight delay was 4 hours and 30 minutes. After that, the planes continued to fly in their direction. Also, in 2023, many flights were delayed or canceled due to dust. For example, on March 8, the city of Termiz was left in the dust and many flights were canceled.

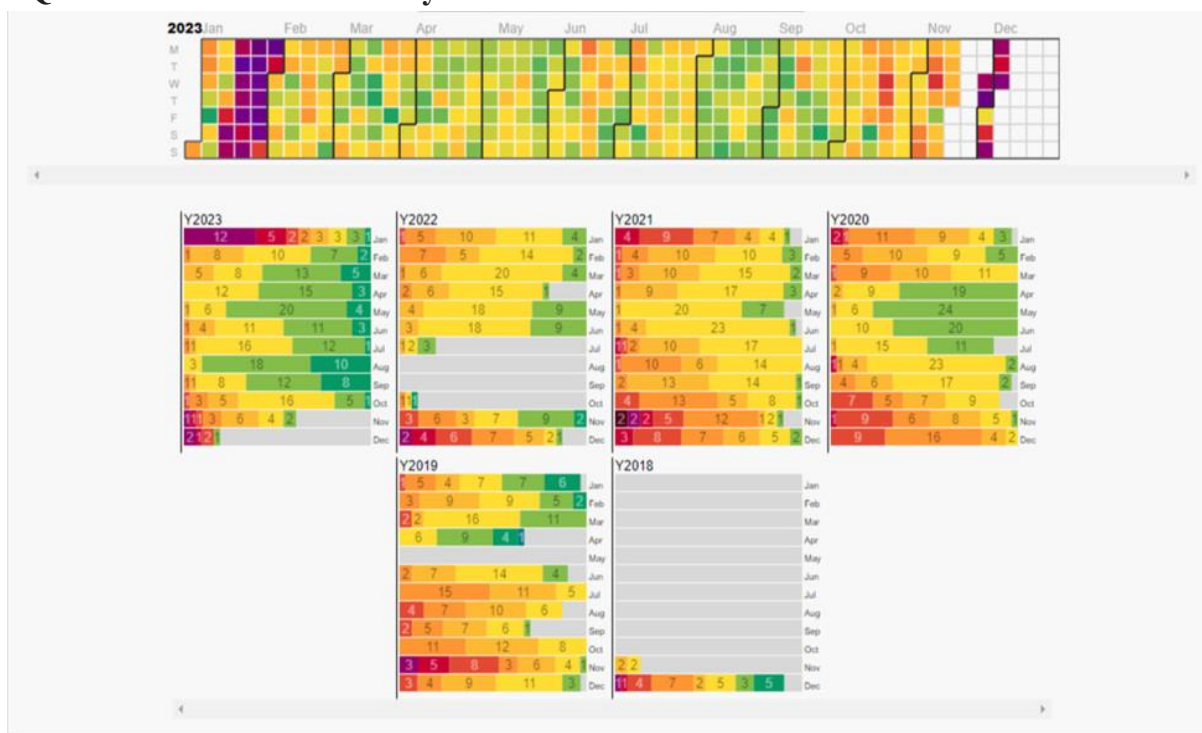


Picture 1

4) Agriculture is the main economic sector in Uzbekistan. It accounts for about 27% of the GDP, provides employment for more than 30% of the total population of the country, and contributes to reducing poverty. According to UN data, more than 20% of the territory of Central Asia or 80 million hectares of land has become unusable today. That means about 4 Kyrgyzstans.

In Central Asia, Uzbekistan ranks 1st in terms of land degradation. Today, 26% of Uzbekistan has become unusable. According to the World Bank, the Fergana Valley, the Gulistan-Jizzakh corridor, Nukus, the northern parts of Namangan and the cultivated areas around Tashkent are seriously degraded. In this alarming situation, the World Bank says that Uzbekistan, where 95% of its harvest is based on irrigated agriculture, may face a very serious impact of climate change if it does not reform water distribution. An increase in the frequency of sand and dust storms reduces agricultural productivity by 1.5% to 24%, depending on the crop. Because regional pollutants that cause acidification and eutrophication are deposited in the dust that rises into the air under the influence of the wind, reduces the photosynthesis ability of plants, and as a result, productivity decreases.

***AQI. Air index of Tashkent city**



Picture 2

It can be seen from this table that, except for the 2020s, when there was a pandemic, the air quality in Uzbekistan worsened.

5) Other expenses mainly include small household expenses. These are: cleaning (clothing, car, house), communal (cleaning of electricity supply lines). According to studies, the socio-economic cost of dust is estimated at 29.51 US dollars per person per year. There is a decrease in comfort, 2nd-level dust-related products (wet wipes, shoe polish, etc.)

Taking into account that premature death causes an economic loss of \$129,000 per person to the state, the number of premature deaths due to dust in 2022 was 15,351, which in turn caused a loss of \$1,980,279,000, that is: $129,000 \times 15,351 = 1,980,279,000$

On average, it costs \$9,318 per person to treat diseases caused by dust, and considering that 1 in 13 people will suffer from cardiovascular disease, the population of our country as of January 1, 2023 Losses in the case of 36,024,000 people amounted to \$25,820,895,486:

$$36,024,000 \times 1/13 \approx 2,771,077 \text{ people}$$

$$2,771,077 \times 9,318 = 25,820,895,486$$

Table 1

Early death (per person, \$)	Incidence (per capita, \$)	Aviation (per 1 flight, \$)	Agriculture (per year, \$)	Other (per capita, per year, \$)	Losses per year
129 000	9,318	10 000	515 992, 032	29,51	3 069 704 127, 518 (3.8% of GDP)

There are 2 days of dusty weather in the territory of Uzbekistan per year, and airlines suffer losses of at least \$20,000:

$$2 \times 10,000 = 20,000$$

Taking into account the degree of desertification in Uzbekistan and the share of agriculture in the GDP, it can be said that the losses in 1 year amount to \$515,992,032:

$$80,800,000,000 : 100 \times 27 = \$21,816,000,000 \text{ (value created by agriculture in 2022)}$$

$$9 \times 525,600 \text{ (minutes in 1 year)} : 10,000 = 473.04 \text{ hectares (area of desertification per year)}$$

$$21\,816\,000\,000 : 20\,000\,000 = 1090.8 \text{ (value created by 1 hectare of land)}$$

$$473.04 \times 1090.8 = 515,992,032$$

The greater the amount of dust in the air, the higher the costs of the population, if the average cost of each person is \$ 29.51, the cost of the population of our country last year was \$ 1,063,068,240:

$$29.51 \times 36,024,000 = 1,063,068,240$$

Costs incurred as a result of dust in the Republic of Uzbekistan in 2022 amounted to \$3,069,704,127,518, i.e.:

$$1,980,279,000 + 25,820,895,486 + 20,000 + 515,992,032 + 1,063,068,240 = 3069704127,518$$

This, in turn, is equal to almost 3.8% of GDP.

In the joint study of the World Bank and the State Forestry Committee of the Republic of Uzbekistan "The importance of landscape restoration in Uzbekistan to reduce sand and dust storms rising from the bottom of the Aral Sea", regional and global benefits were assessed. The research was carried out within the framework of RESILAND, a regional project to ensure the sustainability of landscapes for the countries of Central Asia, implemented with the support of the World Bank's "Welfare Accounting and Evaluation of Ecosystem Services" (WAVES) program and PROGREEN. Sand and dust storms rising from the bottom of the Aral Sea cause economic damage of more than 44 million US dollars per year. A large part of the dry bottom of the Aral Sea in Uzbekistan can be restored by planting native trees, shrubs and grasses that are resistant to drought and saline soil, using their optimal combination. When properly planned, the process of restoring the bottom landscape of the Aral Sea can be economically justified and lead to a significant reduction of air pollution in the distance of 100-200 km from the former coast of the Aral Sea. The result will be improved health and well-being of the local population. Restoring the Aral Seabed could provide an additional \$28-44 million in additional benefits annually and help mitigate

climate change by preventing soil carbon release and sequestering carbon dioxide from the atmosphere.

CONCLUSION

Dust covers all socio-economic spheres of Uzbekistan today. As a result of rapid economic growth in recent years, the number of enterprises and the volume of construction have reached unprecedented levels. Today it can be felt in every corner of Uzbekistan. Calculating the economic and social costs of dust is a complex process. The main problem was the lack of information. According to the conclusion of the article, annual losses due to the impact of dust made up 3.8% of GDP.

REFERENCES

1. Ashurmahmatov S.I, Sayfiddinov S. Sh, The process of desertification in Uzbekistan and its consequences, International Conference “Problems of Desertification: Dynamics, Assessment, Solutions”, Samarkand, December 13-14, 2019.
2. Gannet Hallar, Galina Chirokova, Ian McCubbin, Thomas H. Painter, Christine Wiedinmyer, and Craig Dodson, Atmospheric bioaerosols transported via dust storms in the western United States, Geophysical research letters, VOL. 38, L17801, doi:10.1029/2011GL048166, 2011.
3. Baxriddin E. Nishonov, Baxtiyor M. Xolmatjonov, Lev D. Labzovskiy, Temur Khujanazarov, Dmitriy A. Belikov, Kristina N.Toderic, Natella Rahmatova, Lyudmila Shardakova, Abdulaxatov E. I, Yarashev D. U, Study of the strongest dust storm occurred in Uzbekistan in November 2021, <https://doi.org/10.1038/s41598-023-42256-1> , (2023) 13:20042.
4. Ali Al-Hemoud, Mane Al-Sudairawi, Subramanian Neelamanai, Adel Naseeb & Weam Behbehani, Socioeconomic effect of dust storms in Kuwait, Arabian Journal of Geosciences, DOI 10.1007/s12517-016-2816-9.
5. P. Tozer and J. Leys, Dust storms – what do they really cost?, The Rangeland Journal <http://dx.doi.org/10.1071/RJ12085>
6. Dai-Yeun Jeong, Socio-Economic Costs from Yellow Dust Damages in South Korea, Korean Social Science Journal, XXXV No. 2(2008): 1~29.
7. Timothy Foreman, The Effects of Dust Storms on Economic Development, June 19, 2020
8. Feruza I. Salomova, Nigora O. Ahmadaliev, Khosiyat A. Sadullaeva, Guzal F. Sherkuzieva, Nargiza F. Yarmukhamedova, Bakhriddin Q. Nurmatov, DUST STORM AND ATMOSPHERE AIR POLLUTION IN UZBEKISTAN, 2022
9. Louis Kumi, Jaewook Jeong, Jaemin Jeong, Jaehyun Lee, Empirical Analysis of Dust Health Impacts on Construction Workers Considering Work Types , Buildings 2022, 12, 1137. <https://doi.org/10.3390/buildings12081137>
10. <https://oz.sputniknews.uz/20191024/zbekistonda-aoli-limining-eng-asosiy-sabablari-ochilandi-12674208.html>
11. <https://ourworldindata.org/data-review-air-pollution-deaths>
12. <https://kun.uz/uz/news/2022/07/16/qishloq-xojaligi-ozbekiston-iqtisodiyoti-uchun-osish-nuqtasidir>
13. <https://aniq.uz/uz/yangiliklar/uzbekistonda-2022-yilda-ulimlar-soni-kamaydi>
14. <https://yandex.ru/search/?text=erta+o%5C%27limlar+soni&clid=2306704-1&lr=10335&noreask=1&nomisspell=1>
15. <https://stat.uz/uz/rasmiy-statistika/demography-2>

16. <https://kun.uz/uz/news/2021/01/18/2020-yili-ozbekiston-aholisi-orasida-kuzatilgan-olim-va-uning-sabablari-malum-qilindi>
17. <https://earthobservatory.nasa.gov/images/151100/how-dust-affects-the-worlds-health>
18. <https://www.iqair.com/ru/>
19. <https://www.iqair.com/air-quality-monitors>
20. <https://timforeman.net/duststorms.pdf>