
Title: The Impact of Desertification Process on Natural Landscape

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Abstract

Relevance of the topic. The desertification process, which has become a global, socio-economic and political problem that has arisen as a result of the influence of natural and anthropogenic factors and has rapidly expanded in scale, has been studied in various directions in the last 50 years as a dangerous ecological problem in arid, semi-arid, semi-humid regions. In our republic, the study of the process in landscapes with arid climatic conditions that have a high desertification potential has begun in the last 20 years. However, the study of this process in the Kura Basin, which has an ancient history of settlement and agriculture, has not been carried out on the entire territory so far. It is from this perspective that the complex study of the desertification process in the landscapes of the Kura Basin attracts attention with its relevance. In the studied area, favorable climate, relief conditions, the presence of large rivers, and a number of desertification factors have also occurred, causing the natural landscapes to be mastered and transformed to varying degrees. Determining the factors causing desertification and the risk of desertification in the territory, and developing measures to combat them are one of the important issues of our time.

Keywords: Impact, Desertification Process, Natural Landscape

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Introduction

The subject of the study is to identify the factors that create the basis for desertification in the territory, group landscapes according to the degree of desertification, and develop measures to combat them. The goals and objectives of the study are to comprehensively study the desertification process in arid and semi-arid landscapes, map them using modern methods, and develop measures to combat the factors that cause desertification. To achieve this goal, the following tasks have been set:

- to study the differentiation and transformation of modern landscapes;
- to identify the main desertification factors in landscapes, the characteristics of the emergence and development of desertification foci;
- to group landscapes according to the degree of desertification and to compile a large-scale desertification map;
- to compile a desertification risk map based on NDVI analysis of space images and to provide the dynamics of the desertification threat;
- develop preventive measures to combat desertification

Characteristics of the natural landscape

Landscape is a widespread international term, one of the main concepts of landscape science. It is a German word by origin, meaning "the appearance of the earth" or "the shape of the place", "the landscape". In this sense, it first appeared in German geographical literature at the beginning of the 19th century (it was used by A. Gommeyer in 1805). This term is reflected in the works of L.S. Berg, G.F. Morozov, V.H. Sukachev, A.A. Grigoryev and others as a synonym for natural territorial complexes in Russian geography. There are a number of definitions of the concept of landscape in the literature (Falahatkar, H., & Aminzadeh, B. (2018). The first and relatively accurate definition of landscape among Russian scientists, the natural description of the plain part of Russia by geographical zones, was given by L.S. Berg. According to L.S. Berg, a geographical

landscape is "a set and grouping of objects and phenomena in which the relief, climate, water, soil - the characteristics of the flora and fauna, the degree of influence of human activity merge into a whole harmonic unit that is typically repeated within a certain zone of the Earth. Perceiving a landscape as a "whole harmonic unit" means denying the idea of landscape development. Harmonics deny the struggle of opposites between landscape components, or rather, the idea of self-development. The struggle of opposites, as the main premise of dialectical materialism, constitutes the basis of development, and there can be no development without opposites. A relatively complete definition of landscape is given by N.A. Solnisev: "A landscape is a genetically homogeneous natural territorial complex, having the same geological base, one type of relief, the same climate, and consisting of a set of primary and secondary boundaries that are dynamically related only to that landscape and that are regularly repeated within space." In the explanatory dictionary of landscape protection, the concept of landscape is defined as follows: "Landscape is a relatively homogeneous area of a geographical layer, distinguished by its development, separated from other areas by its structure, or rather, an area distinguished by the regular harmony of objects and phenomena, the nature of the interaction and mutual influence between the components of the geographical layer, and the characteristics of the relationships of the smallest territorial units (Askerova H., 2003).

The concept, essence, causes and factors that create desertification

The mass destruction of vegetation and loss of productivity as a result of soil degradation is called desertification. The causes of desertification are erosion, mass destruction of vegetation, intensive use of bioresources, and other anthropogenic and natural phenomena. Among natural factors, prolonged drought in weather conditions plays an important role in the development of desertification, and the drought that occurs sometimes causes disasters due to its duration, nature of manifestation, scope, and consequences. That is why it was not by chance that D.A. Mabbut (1981) called drought the engine of desertification Falahatkar, H., &

Aminzadeh, B. (2018). The concept of desertification was introduced to science by A. Obrevel in 1949. This concept is explained in different ways by different scientists (Falahatkar, H., & Aminzadeh, B. (2018)). Being the result of the multifaceted intensive economic and life activities of human society, the desertification process currently covers more than 100 arid and semi-arid countries of the world, and the total area of the territory affected by this process on Earth is 1.5 billion hectares, and the population is more than 1 billion. Obrevel introduced the concept of desertification into science, and expressed the following attitude to this process. He viewed desertification as the destruction of fertile lands by external influences or a sharp decrease in productivity. According to calculations, the annual amount of total product that cannot be fully recovered (missed) from lands exposed to desertification is about 16 billion dollars. For many years, the results of the interaction of extreme anthropogenic pressure with unfavorable weather conditions have led to the intensification of the desertification process. Therefore, it is difficult to distinguish the degree of participation of man and nature in this process. The main reason for desertification is the decrease in the intensity of the continental water cycle as a result of the continuous reduction of forest areas. It is the land biota that provides 70-75% of the water cycle to the continents. In natural forests, 90% of solar radiation is absorbed by leaves and spent on transpiration, while in agrocenoses created by man on the site of the forest, only 40% of solar radiation is spent on transpiration. Excessive cattle grazing is also an important factor in the desertification process. As is known, most of the arid areas are poorly suited for agriculture and are used for cattle breeding. As a result of excessive livestock accumulation in such areas where vegetation cover is not sustainable, the condition of the pasture gradually deteriorates and its productivity decreases (Zhao, J., Wu, G., Zhao, Y., Shao, G., Kong, H., & Lu, Q. (2002)). When the biomass of the vegetation cover does not meet the needs of the livestock, the vegetation cover is destroyed, the soil is destroyed, and then the ground for the desertification process is created. When the land is not used properly, the desertification process occurs in regions with arid climates. Desertification in these regions is mainly related

to irrigation. Up to 30% of the world's irrigated lands have been subjected to salinization and salinization. Every year, 1.5 million ha of irrigated lands in the world are damaged by salinization. In North America, 28% of degraded irrigated lands, 16% in Europe, and 13% in Australia. The area of degraded irrigated lands in Russia is more than in developed countries and reaches 35%. Some scientists indicate that the main creator of desertification is man. With his activities, the soil deteriorates, as a result of its improper use and overexploitation, the area of ecosystems suitable for humans decreases, and under the influence of very dry climatic conditions, new and very diverse socio-economic problems arise (Museyibov M.2003).. The intensification of desertification processes and the expansion of the borders of deserts are associated with natural and anthropogenic factors. Some researchers see the causes of desertification processes in periodically observed and repeated droughts and new climatic conditions. According to these scientists, the desert is an ecologically weakened ecosystem that does not absorb (reflect) sunlight, weakens the intensity of air convection and, as a result, reduces the amount of precipitation. According to other researchers, although the development of desertification on a global scale is related to climate, there is still no solid evidence for this. In their opinion, the main reason for the rapid spread of desertification is human economic activity (Museyibov M.2003).

It has been determined that 87% of the 45 factors causing desertification are related to the unintended use of water, soil, plants, and minerals by humans, and 13% are related to natural processes. The causes of desertification are as follows:

- 1) destruction of vegetation cover and soil degradation as a result of industrial activity, municipal and irrigation works,
- 2) degradation of soil and vegetation cover due to the use of woody and shrub plants as firewood,
- 3) destruction of vegetation cover due to the use of woody and shrub plants as firewood,

4) reduction of soil productivity as a result of agricultural practices,

5) re-salination of soil and enlargement of natural salt marshes as a result of rising groundwater levels on the Caspian coast (due to its level rise) and in artificially cultivated areas.

Desertification is a process that has occurred on Earth both in ancient and modern times. Its greatest impact on soil resources is divided into three periods:

1. 1000-3000 years ago, large areas of Europe, Asia and Africa were subjected to erosion, deflation and salinization; 2. As a result of the colonization of vast territories 100-150 years ago, soils were subjected to erosion and meadows to intensive grazing;

3. In the last 50 years, the strengthening of anthropogenic influence and the acceleration of the development of all types of desertification have been ensured.

In general, the desertification process should be viewed as a result of the widespread use of natural resources of the regions in agriculture and industry. Long-term unplanned use of pastures, irrigation of fields without a collector-drainage system, non-application of the next cropping system, unplanned operation of modern earth-moving and transport vehicles, etc. often disrupts the balance in ecological systems, anthropogenic pressure on the natural landscape exceeds the tolerance limits of natural complexes, and the used lands become unusable (soils become saline, swampy, sands are exposed and move, erosion and deflation processes intensify). The expansion of the border of deserts is mainly characteristic of regions in contact with deserts, where human influence is active. According to M.I. Budiko, Cherny, Pali and other researchers, the main reason for desertification is the increase in the number of herbivores during the wet years, the significant expansion of cultivated areas, and the dry wind coming from other areas (Zhao, J., Wu, G., Zhao, Y., Shao, G., Kong, H., & Lu, Q. (2002). According to B.G. Razanov, desertification is the process of soil and plant degradation and a decrease in their biological productivity. Desertification, in extreme cases, leads to the

complete destruction of the biosphere's potential and the transformation of the territory into a desert. In recent decades, interest in the desertification process and the problems it creates has increased significantly (Zhao, J., Wu, G., Zhao, Y., Shao, G., Kong, H., & Lu, Q. (2002).

Desertification is actually a natural process. Desertification in nature without human influence is the result of a natural-historical process. At the same time, desertification is accelerated as a result of large-scale human impacts on nature. Drought plays a more important role in the desertification process. For example, in 1968, as a result of a 20-year drought in the Sahel, the productivity of fields and pastures decreased, water wells dried up, river flows decreased, and the level of Lake Chad dropped. During the first wave of drought (1968-1973), more than 250,000 local people died of hunger, and 40% of livestock perished. In Mali and Mauritania, 90% of livestock was killed. In the mid-1980s, about 3 million people died as a result of drought in sub-Saharan Africa. Drought is a combination of a lack of precipitation and high evaporation, which, in the absence of the necessary level of agricultural technology, creates a mismatch between the moisture demand of plants and its removal from the soil, as a result of which the productivity of agricultural and pasture crops decreases. Drought is a long period of time in spring and summer when precipitation is much lower than normal, air temperature is significantly higher, and air humidity is significantly lower. During drought, the moisture reserves in the soil are depleted by evaporation and transpiration, conditions unfavorable for the normal development of plants are created, normal photosynthesis conditions are disrupted, as a result, the yield in fields, pastures and hayfields decreases or completely disappears. According to statistical data, 85% of the Earth's territory is subject to drought. Drought is of 3 types: soil drought, i.e., lack of moisture, a sharp decrease in the relative humidity of the air, and air dryness and soil dryness. All three types of drought cause great damage to agriculture and reduce plant productivity (Zhao, J., Wu, G., Zhao, Y., Shao, G., Kong, H., & Lu, Q. (2002).

1. Accumulation of greenhouse gases (CO₂ and others) causing heating of the lower layers of the troposphere. 2. Accumulation of aerogel (aerosol) substances in the troposphere. 3. Chemical pollution of soil and water. 4. Technogenic degradation of soils, pollution, etc. A.G. Babayev (1990) reported that similar factors cause desertification in Central Asia. The indicated factors cause aridification, degradation of vegetation and soil cover in the territories of the Republic, which creates favorable conditions for desertification (Del Valle, H. F., Elissalde, N. O., Gagliardini, D. A., & Milovich, J. (1998).

Technogenic factors of desertification

Desertification is considered a tragic event for millions of people on our planet. Thus, desertification means the degradation of soil and vegetation, a decrease or complete loss of their biological and economic productivity. During desertification, productivity drops catastrophically, livestock die, water sources dry up, agricultural areas become saline, sand dunes “move” towards residential areas, which results in poverty, hunger and disease. Desertification refers to the reduction or destruction of the biological potential of the land, the depletion of terrestrial ecosystems as a result of anthropogenic activity and climate change. The UN Convention to Combat Desertification of September 12, 1994 defines desertification as: “Desertification is the degradation of land in arid, semi-arid and low-humidity areas caused by various factors, including climate change and anthropogenic activities.” UN experts assess desertification processes and their spread as a deterioration of ecological situations, noting that as a result of this process, the productivity of arid and semi-arid areas decreases to desert levels. This process is mainly gradual. Thus, desertification is more of a natural process, causing irreversible changes in soil and vegetation cover in arid areas towards aridification (Grant, G., & Pollard, N. (2021).

Over the past 40-45 years, especially in the 1980s-2010s, as a result of the significant intensification of the aridization process in a number of semi-arid regions of our planet, the area of deserts and semi-deserts has been expanding, which leads to a decrease in the biological productivity of these areas or their

complete destruction. For the first time, the problem of desertification began to attract the world community after the tragic events that occurred in the Great Desert in 1968-1973. Since the beginning of the 21st century, 10 thousand hectares of land in the world have lost their fertility and economic importance as a result of desertification and salinization per day, 28 thousand hectares, and according to the latest data, 50 thousand hectares (10 times more than newly established forest areas) of tropical forests, which are considered one of the most valuable natural systems in the world and are called the “lungs” of our planet, are being destroyed, and more than 40 thousand children are dying. According to official data, in our republic alone, 40.8% of the land has been subjected to wind and water erosion and has become unsuitable for agriculture. Desertification is both a socio-economic and natural process, endangering approximately 3.6 billion hectares of land, covering areas inhabited by more than 700 million people. This is three times the area of Europe or a quarter of the Earth's land area. A more dangerous situation has arisen in the transitional bioclimatic zone (up to 400 km wide) of the Sahel zone of Africa (Senegal, Nigeria, Burkina Faso, Mali, etc.), between the Sahara in the north and the Savannas in the south. The desertification process has covered 110 countries of the world with a population of more than 1 billion. Desertification occupies especially large areas in Africa (Del Valle, H. F., Elissalde, N. O., Gagliardini, D. A., & Milovich, J. (1998). For example: The area of the Great Sahara is currently increasing southward at a rate of 1 km per year. The total increase in deserts in the world is 50 thousand km² per year. For example: The drought that occurred in 1968-1973 covered the Great Sahara and the Senegal and Upper Niger river basins, more than 250 thousand people and 70% of livestock died due to lack of water. The destroyed vegetation cover and excessive soil compaction create conditions for intensive absorption of the topsoil (deflation). According to UN data, 25 million hectares of the world's forests are cut down and destroyed every year. Deforestation leads to a decrease in the sustainability of the biosphere and oxygen in the atmosphere, the formation of drought, soil erosion, deflation and landslides, accelerated desertification, floods, heavy rains, hurricanes,

soil and water erosion, sharp changes in climate and relief, etc.

According to modern map materials, absolute deserts account for 8-10% of the land. The total area subjected to desertification to one degree or another accounts for 36-40% of the continents. Drought events are observed in 70-75 countries. 50% of desert and steppe areas are sandy deserts consisting of moving dunes and barrens. Deserts and desertified areas are unevenly distributed on the continents of the planet. In Australia, $\approx 80\%$ of the earth's surface; in Africa, $\approx 50\%$ of the earth's surface; in Asia, $\approx 45\%$ of the earth's surface; in South and North America, and Europe, $\approx 20\text{-}30\%$. Deserts, which depend on climate, occupy 30% of the Earth's territory. According to UNEP, the total volume of desertified areas is about 40%. The intensification of desertification processes and the expansion of desert borders are due to 2 main factors. Some researchers see the causes of desertification processes in periodically observed and repeated droughts, new climatic conditions. According to these scientists, the desert is an ecologically weakened ecosystem, which does not absorb (reflects) sunlight, weakens the intensity of air convection and, as a result, reduces the amount of precipitation. As a result of the rise in groundwater levels on the coasts of various seas and in artificially cultivated areas, the soil is re-salinized and natural salt marshes enlarge, and vast sandy, stony, clayey and saline deserts that do not produce crops have formed under the influence of natural factors (Guo, B., Yang, F., Li, J., & Lu, Y. (2022).

Drought plays a more important role in the desertification process. For example, in 1968, as a result of a 20-year drought in the Sahel, the productivity of fields and pastures decreased, water wells dried up, river flows decreased, and the level of Lake Chad dropped. During the first wave of drought (1968-1973), more than 250,000 local people died of hunger, 40% of livestock was destroyed. In Mali and Mauritania, 90% of livestock was killed. In the mid-1980s, about 3 million people died as a result of drought in sub-Saharan Africa. Drought is a combination of a lack of precipitation and high evaporation that, in the absence of the appropriate level of agricultural technology, creates a mismatch between the moisture

demand of plants and its removal from the soil, as a result of which the productivity of agricultural and pasture crops decreases. Drought is a long period of much lower than normal precipitation in spring and summer, significantly higher air temperature, and significantly lower air humidity. During drought, the moisture reserves in the soil are depleted by evaporation and transpiration, creating conditions that are unfavorable for the normal development of plants, disrupting normal photosynthesis, as a result of which the yield in fields, pastures, and hayfields decreases or is completely destroyed. Drought and wind erosion occupy a special place among the main natural phenomena. Approximately 750 million people (12.5%) of the world's population live in arid areas, and 90 million in areas subject to severe desertification. 60% of the population in Azerbaijan lives in the Kur-Araz depression, which is also mainly classified as arid and semi-arid (Guo, B., Yang, F., Li, J., & Lu, Y. (2022).

The division of the factors causing desertification into two parts, natural and anthropogenic, is very controversial among researchers. A group of scientists B.V. Vinogradov (1976); M.K. Tolba (1977); B.G. Razanov, I.S. Zonn (1981); N.S. Orlovsky (1981); B.K. Kovda (1984); A.A. Rafikov (1988) and others evaluate desertification as a different result of natural and anthropogenic factors, noting that the development of this process depends not only on the human factor, but also on the natural characteristics of the territory. The extensive development of the desertification process in arid and semi-arid countries under the influence of active economic activity of people has made it one of the ecological problems, and in such countries, consistent research has recently been conducted to preserve the ecological balance and prevent the desertification process. The causes of desertification are erosion, mass destruction of vegetation, intensive use of bioresources, and other anthropogenic natural phenomena. Desertification in Central Asia, North America, Mesopotamia, Iran, India, the Arabian Peninsula and Australia is the result of anthropogenic influences. The lack of sufficient fodder for extensive livestock farming and the rapid increase in livestock numbers, excessive grazing of existing pastures and areas subject to irrigation, failure of hydraulic engineering

facilities, the gradual reduction of arable land, chemical pollution, salinization, the gradual acceleration of the erosion process and the increase in flood waters are some of the factors causing desertification. The main factors causing this process are, as a result of the following, the degradation of soil and vegetation due to the use of vegetation as firewood, the destruction of vegetation due to the use of tree and shrub plants as firewood, the decrease in soil productivity due to overloading, the re-salinization of the soil as a result of the rise of groundwater on the Caspian coast (due to its rise) and in artificially cultivated areas, the expansion of the area of natural salt marshes, etc. Currently, desertification has become a serious problem of the country due to the privatization of land plots and the expected global changes in the region. The increasing number of anthropogenic factors at the end of the second millennium and the need for serious protection from their undesirable impact on the environment are the most urgent problems of the modern era. Thus, the potential opportunities of human society are increasing and they are provided by the pace of development of modern science and technology. Human economic activity is constantly increasing. Currently, the interaction between nature and society is taking place on such a large scale that it is considered a human problem of the modern era and is assessed as a global ecological problem. This problem is associated with the weakening of the quality of the natural environment surrounding people, industrialization and the expansion of cities (Hajiyeve D.V., Hidayatova Y.Kh. 1994). It is associated with the depletion of energy and raw materials, the increase in the demographic "burden" on nature, the disruption of the natural ecological balance, the pollution of nature with waste from human economic activity, etc. The impact of humans on the biosphere has a very ancient history. Once upon a time, there were so few people on Earth, and the Earth was so large, that it was considered unusual for them to think about their natural resources, about their own destiny. Over time, the number of people on the planet increased. Industrialization required the consumption of a huge amount of natural resources. The plowing of large areas of land (up to 10-12%), their use as pastures (17%), deforestation, the construction of canals and dams, irrigation systems, mining, soil erosion,

the expansion of nomadic life, the draining of swamps, the extermination of various animals, the pollution of air, soil, water, and many other human activities create very large changes in nature, thus disrupting the systems and relationships that have arisen in the biosphere (Hajiyeve D.V., Hidayatova Y.Kh. 1994).

These changes are often negative and, especially for future generations, irreversible. For example, over the past century, humans have destroyed more than 50% of all forests, and in recent decades, a significant area of the upper reaches of water bodies has been covered with oil products. Both processes lead to a decrease in the amount of oxygen in the atmosphere, the same result occurs as a result of excessive burning of fuel in power plants, in furnaces, etc. Therefore, it is necessary to calculate and compile an oxygen balance on a global scale. For example, we need to know how many forests and clean ocean surfaces are required so that the oxygen balance does not shift in the opposite direction. In addition, it is necessary to know how much wood forests should produce, their hydrological, anti-erosion role, health-giving, feedback function, aesthetic importance, as well as the general circulation of the atmosphere. As can be seen, a person interested in constantly increasing the production of material goods not only destroys and depletes individual renewable resources of nature, but also destroys the vital connections between individual components of that biosphere. For example, intensive pollution of the world's oceans poses a threat of extinction of phytoplankton. It is known that the existence of human society is impossible without it (Hajiyeve D.V., Hidayatova Y.Kh. 1994).

One of the main problems currently included in the list of important environmental issues awaiting solution in the world is desertification. Experts from the Ministry of Ecology and Natural Resources (MENR) believe that the problem of desertification is extremely relevant for Azerbaijan, which is located in a dry climate. According to the Ministry, currently 3.7 million hectares of land in our country are subject to erosion, and up to 1.2 million hectares to salinization. Approximately 300 sq. km of land has become unusable due to the impact of flood waters, and 30 thousand hectares of land have become unusable as a result of the exploitation

of minerals. The reason for this is the extensive use of land, the lack of sufficient fodder for livestock, and the rapid increase in livestock, which leads to desertification due to overgrazing of existing pastures and forest areas. In addition, improper compliance with the irrigation regime, failure of hydrotechnical facilities, chemical pollution, salinization, acceleration of erosion processes, and increased impact of flood waters are also among the main factors causing desertification. The opinion of the ministry's experts is that one of the main factors of land degradation is their exposure to chemical pollution. Ecologists, who have long understood that the problem of desertification will take on a global character, have been forced to demand the implementation of urgent measures to save humanity from future disasters. Therefore, Azerbaijan, taking into account the improvement of the country's ecological situation, the efficient and harmless use of natural resources, and, in particular, national interests, has joined the International Convention on Combating Desertification. The Convention to Combat Desertification was adopted in Paris on June 17, 1994 and entered into force in 1996. The Republic of Azerbaijan signed the Convention in 1998 and it entered into force by the Decree of the President of the Republic dated April 24, 1998. As for the work to combat the problem, relevant state programs have been developed in our country to prevent desertification. The "State Program on the Effective Use of Summer and Winter Pastures and Hayfields in the Republic of Azerbaijan and the Prevention of Desertification", the "National Programs on the Increase and Restoration of Forests" and the "Ecologically Sustainable Socio-Economic Development" have been approved. In general, more than 10 thousand hectares of forest restoration work are carried out in the country every year under these programs. Work is also ongoing to investigate the current state of summer and winter pastures, clarify and map areas subject to severe erosion and salinization, as well as to establish a land cadastre and registration system. In order to preserve the natural cover of our country in its original state and to strengthen the fight against desertification, special attention is paid to the expansion of specially protected natural areas in order to reduce anthropogenic impacts. Thus, by the relevant decrees of the head of state, the total

area of specially protected natural areas in the country was increased from 4.5 percent, i.e. from 478 thousand hectares to 778 thousand 464.7 hectares in a short period of time in 2003-2009. This constitutes approximately 9 percent of the country's territory. The "Capacity Building for Joint and Sustainable Land Use" project has also been implemented since 2006 with the technical assistance of the UNDP Azerbaijan Office and the Global Environmental Fund. This, in turn, has given impetus to the revival of work on solving desertification problems in Azerbaijan.

Within the framework of the project, the condition of winter and summer pastures in the Kurdamir and Goygol regions was studied, and specifically, 200 hectares of winter pastures were restored in the Goygol region. Specialists of the Ministry of Ecology and Natural Resources say that they are implementing measures within the framework of State Programs and cooperation with foreign donors to prevent desertification of lands. But for some reason, the hectares of lands that have become unusable from year to year remain unchanged. It seems that specialists are not busy eliminating the cause, but the result. That is, since there is no fodder base for livestock breeding, cattle continue to graze in forest areas. It is no secret that changing the irrigation system also requires millions. Thus, our lands are becoming unusable. The desertification process in Azerbaijan occurs mainly in the foothills, plains and lowlands as a result of the influence of natural, especially anthropogenic factors. The average annual amount of precipitation in these areas fluctuates between 150-400 mm, and surface evaporation is 3-4 times higher than the amount of precipitation. The climate belongs to the semi-desert and dry steppe subtype. The desertification process is more typical for the Kur-Araz lowland. Here, in recent years, the population growth, the settlement of refugees and displaced persons in the area, the increase in demand for agriculture, including livestock, as well as the extensive use of land and vegetation cover has intensified the anthropogenic desertification process. In the Kur-Araz lowland, the desertification process is more intense than in the Shirvan plain. The studies we conducted here show that the reasons for the direction and intensity of desertification (or degradation) of

vegetation and soil cover are related to the ecological conditions of the area (relief, vegetation, soil) and the diversity of anthropogenic factors (Hajiyev D.V., Hidayatova Y.Kh. 1994). From this point of view, the area can be divided into the following areas:

1. The process of degradation of tugai forests along the Kura River occurred due to the destruction of forests there, excessive cattle grazing and the use of forest lands for agriculture. Desertification in this area is leading to belting, swamping, and sometimes salinization. The main reasons for the desertification process in the irrigated areas of the lowland part of the region are related to the creation of a drainage-collector network and irrigation works there. The desertification process in this area is leading to salinization, salinization, and swamping of the soil. In the foothills of the region, the desertification process is related to the destruction and destruction of vegetation, excessive grazing of livestock, and non-compliance with agrotechnical rules. The desertification process in this area is leading to vegetation degradation, surface and ravine erosion, and in irrigated areas, irrigation erosion, sometimes salinization and landslides.

2. Desertification also occurs mainly in the Absheron Peninsula due to soil pollution with oil and oil waste. The discharge of oil products and large amounts of well water to the surface also causes a rise in the level of groundwater and re-salinity of the soil. Improper use of oil fields in Absheron for 10 years without observing elementary rules for environmental protection Oil extraction, discharge of oil, gas, chemicals, highly mineralized and radioactive contaminated water to the surface of the earth have led to pollution and degradation of individual natural and anthropogenic landscape areas of the Absheron Peninsula.

In 1977, the UN International Conference held in Nairobi, the capital of Kenya, adopted the "Combat Desertification" plan. At the International Conference held in Rio de Janeiro (1992), the issue of "Combating Desertification and Drought in the 21st Century" was included in the Agenda, identifying it as an important

issue for all mankind. Governments should do the following to combat desertification:

1. Adopt a national plan for efficient land use;
2. Accelerate the implementation of afforestation programs using fast-growing local and other drought-resistant tree species;

3. Limit the use of firewood as fuel.

Desertification is a global environmental and socio-economic problem. In this regard, the Convention to Combat Desertification, signed by 170 states since 1994, is in force. The "World Day to Combat Drought and Desertification", celebrated on June 17, was proclaimed by the UN General Assembly in 1994. In the same year, the United Nations adopted the Convention to Combat Desertification. The Convention recommends that states cooperate internationally to combat desertification, including raising awareness about it. The Action Plan to Combat Desertification - a comprehensive global program to combat desertification by the year 2000 - was adopted at the UN Conference to Combat Desertification and approved in 1977 at the 32nd session of the UN General Assembly. The action plan to combat desertification consists of the guiding principles of a long-term policy. The immediate objective of the plan is to prevent and halt the desertification process and, where possible, restore the productivity of desertified lands. The ultimate goal is "to protect and develop arid, semi-arid and water-deficient areas, which are vulnerable to desertification, within the limits of environmental possibilities, in order to improve the living standards of the population". The main objective of the plan is to immediately assimilate and apply existing knowledge and technologies in decision-making and to implement measures to combat desertification in practice, and to improve land use, which is the basis for successful combat against desertification. The plan includes 28 recommendations grouped into the following groups: Assessment of desertification and improvement of land use. Coordination of industrialization and urbanization with the development of agriculture and their impact on the ecology of arid areas. Correct measures to combat desertification. Socio-economic aspects.

Insurance against drought risks and their consequences. Strengthening national scientific and technical potential. Integration of desertification control programs into general development plans. Recommendations in international cooperation relations. Recommendations in relation to urgent priority actions. The action plan is of a recommendatory nature and should be considered as a basis for the preparation of specific national and regional programs to combat desertification in the future. In general, it is necessary to start preventing the problem of desertification from awareness. Environmental awareness measures among the population should be further expanded. The press, NGOs, the education system, and each individual citizen should join this propaganda process. However, such educational information, whether in writing, in the press, or on television screens, is very rare. However, desertification can leave its yellow and sad mark on the lives of each of us. Comprehensive measures taken against desertification should be carried out taking into account the regional characteristics of each area. In this case, it is important to maintain vegetation cover, regulate the use of natural pastures, establish soil protection strips, and carry out other measures. For example, The establishment of the so-called "green belt" of forests in the north of the Great Sahara, which is being implemented by Algeria from Tunisia to Morocco, is of great importance. This forest belt, 10-15 km wide and 1,500 km long, will protect the desert from dry winds. Two water hubs are being built in the south of the Great Sahara (on the Senegal River), so that these water hubs will be able to irrigate 1.2 million hectares of land.

Conclusion

1. The semi-deserts of the central plains of the studied area are characterized by the predominance of anthropogenic, lowland, foothill semi-desert, and dry-steppe landscapes by natural desertification factors. Among the anthropogenic factors causing desertification in the landscapes of the region, the impact of livestock farming and anthropogenic changes in groundwater levels play a major role, while among the natural factors, climatic features and the dynamics of geomorphological processes play a major role.

2. Based on the analysis of satellite images of the studied area, personal field research and ArcGis software, desertification rates were determined for the total area and 10 separate geographical regions, electronic desertification maps at a scale of 1:100,000 21 were compiled, and the area of landscapes subject to desertification was determined.

3. Based on the analysis of the desertification map we compiled, we determined that 43.9% of the total landscapes in the studied area have been subject to desertification to varying degrees. Including 56.1% of them are conditionally non-desertified, 9.1% are weakly desertified, 15.4% are moderately desertified, and 19.4% are severely desertified. Landscapes subject to varying degrees of desertification account for 20.5% of the territory of our republic.

4. Desertification risk maps were compiled based on the analysis of NDVI indicators of space images of the region (Landsat 5, 1993 and Landsat 8, 2017) using ArcGis software, and the dynamics of desertification threat were determined based on comparative analysis. Currently, 21% of the region's modern landscapes have a weak desertification risk, 29% have a medium risk, and 19% have a high risk. The total area of landscapes without a desertification risk is 31%.

5. Preventive measures and proposals have been put forward to combat the factors causing desertification and to restore landscapes that have been subjected to desertification.

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