THE DEVELOPMENT OF THE SCIENTIFIC AND TECHNICAL REVOLUTION AND ITS ECOLOGICAL CONSEQUENCES ON THE ENVIRONMENT

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Abstract: This article provides detailed information about the scientific and technical revolution, its impact on the environment today, and its ecological consequences.

Keywords: natural resource, intensive, industry, agriculture, dust, soot, smoke, industrialization, urbanization, atmosphere, soil, anthropogenic factor, river, canal.

Annotatsiya: Mazkur maqolada fan-texnika inqilobi va uning hozirgi kunda atrof-muhitga ta'siri hamda uning ekologik oqibatlar to'g'risida batafsil ma'lumot berib o'tilgan.

Kalit so'zlar: tabiiy resurs, intensiv, sanoat, qishloq xo'jaligi, chang, qurum, tutun, industriya, urbanizatsiya, atmosfera, tuproq, antropogen omil, daryo, kanal.

Аннотация: В данной статье подробно описывается научно-техническая революция и ее влияние на окружающую среду в настоящее время, а также ее экологические последствия.

Ключевые слова: природный ресурс, интенсивный, промышленность, сельское хозяйство, пыль, сажа, дым, индустрия, урбанизация, атмосфера, почва, антропогенный фактор, река, канал.

The current stage of environmental protection has reached a global scale due to human influence on nature. Since approximately the 1950s of the 20th century, with the rapid growth of productive forces known as the "Scientific and Technical

Revolution," the interaction between humans and nature has reached an unprecedented scale and, in many respects, has taken on new forms.

During the period of the scientific and technical revolution and the development of technology, the desire of private property owners to obtain maximum profit from natural resources and means of production led to the intensive and, at the same time, ruthless exploitation of all the riches of nature. In the 18th and 19th centuries, due to industrial development, many natural resources began to be used more extensively—such as underground minerals, agricultural lands, fish stocks, water and land animals, and plant life—while forest areas sharply decreased [4].

In the second half of the 19th century and the beginning of the 20th century, the development of the chemical industry, the construction of railways, the appearance of ships on seas and rivers, and especially the increasing use of mineral resources became widespread. For example, worldwide pig iron production rose from 4.2 million tons in 1860 to 38 million tons in 1900. By that time, the widespread use of internal combustion engines in industry and other sectors of the economy brought significant changes in technological development. The introduction of new complex machinery and tools, along with the growth of cities and industrial centers, led to a sharp increase in the amount of fuel consumed. As a result, non-recyclable waste, industrial residues, slags, dust, soot, and smoke began to accumulate, causing significant changes and pollution in the natural environment. Despite the continuous rise in environmental pollution, insufficient attention has been paid to maintain the balance of nature. Moreover, industrial waste, residues, and garbage collected from cities are being discharged into clean water bodies—mainly rivers. Nevertheless, nature still retains its self-purifying ability and the potential to restore renewable biological resources [5].

Due to powerful technology, humans in the 20th century directly influenced the processes of material and energy exchange within the geographical shell, even disturbing the balance of nature in many places. This impact of human activity is

rapidly increasing. Consequently, as a result of scientific and technological progress, the anthropogenic factor, as mentioned earlier, has become comparable to natural geographical and geological factors on a planetary scale. Certain areas of human economic activity—such as the use of rocks, extraction of mineral resources, canal construction, regulation of river flows, and the building of reservoirs—have led to the ruthless exploitation of nature. The negative environmental consequences of human economic activities vary across different regions of the Earth. Initially, such harmful impacts were observed primarily in areas undergoing industrialization and. The Western countries that embarked on the path of urbanization (the United Kingdom, France, Belgium, the Netherlands, and others) encountered these challenges.

Thus, the aforementioned stages of industrial development gradually reduced the efficiency of natural resource use, and the irreversible negative changes in the geographical environment ceased to be local — they reached a regional scale, encompassing vast areas. However, nature, throughout its long evolution, has retained the ability to restore disrupted natural processes and balance.

In addition to the depletion of natural resources, the development of industry gave rise to a new problem — environmental pollution. It is known that water bodies, the atmosphere, and soils have been heavily contaminated with industrial waste. Today, these factors pose a serious threat to plant and animal life, as well as to human health. Gradually, this negative phenomenon began to extend its influence across the entire globe.

The main reason for this is that while human economic activity had a local or regional character up to the early 20th century, it has now acquired a planetary, that is, global scale. This trend became especially evident beginning in the 1940s and 1950s.

At present, the ways and forms of the impact of scientific and technological progress on nature are extremely diverse. As a result of this

influence, not only quantitative but also qualitative changes are occurring in nature. The main characteristics of the impact of the scientific and technological revolution on the environment can be summarized as follows: The consumption of natural resources has increased, and pollution of the environment with industrial and consumer waste has intensified. In the second half of the 20th century, due to the scientific and technological revolution, the possibilities for intensive use of natural resources to meet society's material and spiritual needs and to further develop production have expanded immensely [4].

As the First President of the Republic of Uzbekistan, I.A. Karimov, emphasized in his work "Uzbekistan at the Threshold of the 21st Century: Threats to Security, Conditions for Stability, and Guarantees of Development", today's rapid global scientific and technological progress has led to an increasing use of natural resources for economic purposes.

Moreover, as the world's population continues to grow year by year, there is an increasing demand for the production of larger quantities of food, fuel, clothing, and other goods. This, in turn, has led to a rapid reduction of forested areas, the expansion of deserts, soil degradation, impacts on the ozone layer in the upper atmosphere, a rise in the Earth's average air temperature, and other negative consequences [1].

It has also been emphasized that the ongoing arms race and the production, storage, and testing of nuclear, chemical, and other weapons of mass destruction pose a serious threat to the environment in which humanity lives. Scientific and technological progress, while improving tools of labor, simultaneously intensifies industrial impacts on the natural environment and increases pollution. The "demographic explosion," that is, the sharp rise in the world's population, also exerts a negative influence on nature. Anthropogenic pressures have begun to affect the functioning of the global ecological system — the biosphere — and are creating a real risk of a planetary-scale ecological catastrophe.

In particular, the countries of Central Asia are considered a complex and unique region from the viewpoint of ecological issues. This region has an arid climate, and environmental problems are worsening due to water scarcity, industrial and agricultural activities, population growth, and the improper use of natural resources. In the second half of the 20th century, the large-scale diversion of the Amu Darya and Syr Darya rivers for cotton cultivation caused the Aral Sea to dry up. This led to climate changes, health problems (such as dust storms and the spread of salt and pesticides), and the collapse of the local economy [2].

During the Soviet period, the Republic of Uzbekistan was one of the agrarian republics within the union. As it was turned into a raw-material production base, the republic began expanding agricultural lands for cultivation. As a result, the rate of water usage has increased. This has led to a decrease in the amount of water flowing into the Aral Sea, and in the following period, it may stop flowing entirely.

Desertification processes include the reduction in the types and quantities of natural vegetation, soil erosion, soil salinization, and a decline in soil fertility. As a result of desertification, the area of deserts expands, and desert-like landscapes emerge. Nearly 48.5 million km² of the Earth's surface consists of deserts and semi-deserts, of which approximately 10 million km² have formed under the influence of human activity. In arid regions, the process of desertification is mainly linked to the growing population in these areas and the increasing impact of human economic activities—agriculture, industry, and rapid exploitation of natural resources—on desert landscapes. Addressing ecological problems in these regions requires not only local but also regional and global approaches. Human well-being depends on living in harmony with nature. Therefore, the responsibility of every citizen and organization for environmental protection is of great importance.

In conclusion, it should be emphasized that the scientific and technological revolution has created significant opportunities for humanity to use

natural resources wisely and improve the environment. However, at the same time, it has often led to considerable environmental pollution and the degradation of natural conditions. Environmental pollution involves the release of harmful substances and compounds into nature, which causes adverse changes in the physical, chemical, and biological properties of air, soil, and water. Naturally, this can increasingly negatively affect plants, animals, human life, industrial and agricultural production, and the state of natural resources in the future.

Thus, in the context of the scientific and technological revolution, the increase in the consumption of natural resources is accompanied by the intensification of industrial production and the growth of humanity's energy consumption.

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