



## NEGATIVE IMPACT OF THE ECOLOGICAL SITUATION ON THE WORLD OF FLORA AND FAUNA IN UZBEKISTAN

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**Abstract:** *Uzbekistan is one of the ecologically vulnerable countries of Central Asia because its natural ecosystems are strongly influenced by arid climate, water scarcity, desertification, salinization, intensive agriculture, overgrazing, pollution, and the long-term consequences of the Aral Sea disaster. The country possesses rich biodiversity: its flora includes about 4,300 species of higher plants, around 10% of which are endemic, while vertebrate fauna includes 715 species, including 107 mammals, 467 birds, 61 reptiles, 77 fish, and 3 amphibians [1; 3]. However, the current ecological situation negatively affects the stability of plant communities, animal habitats, migration routes, reproductive processes, and genetic diversity. The Red Book of Uzbekistan includes hundreds of rare and endangered plant and animal species, which indicates that biodiversity degradation is not only a theoretical problem but also an urgent conservation issue [4; 5]. This article analyzes the theoretical foundations of ecological degradation and its impact on flora and fauna in Uzbekistan. It also examines the main anthropogenic and natural factors that worsen biodiversity conditions, including land degradation, climate change, pasture degradation, water ecosystem decline, and habitat fragmentation. The study concludes that the protection of flora and fauna requires an integrated approach based on scientific monitoring, ecological education, restoration of degraded landscapes, sustainable water management, and expansion of protected natural areas.*

**Keywords:** *Uzbekistan, ecology, biodiversity, flora, fauna, desertification, Aral Sea, land degradation, Red Book, climate change, habitat loss.*

### INTRODUCTION

The ecological situation in Uzbekistan is directly connected with the broader environmental crisis of Central Asia. The country is located in an arid and semi-arid region where natural

ecosystems are highly sensitive to changes in water availability, temperature, soil quality, and human pressure. In such conditions, even small disturbances in land use, irrigation, grazing, or industrial pollution can cause



deep changes in plant and animal communities [3; 6].

Uzbekistan's biodiversity has high scientific, ecological, and socio-economic importance. The country's flora includes wild relatives of cultivated plants such as wild almond, apple, onion, persimmon, aromatic and medicinal plants. These species are important not only for natural ecosystems but also for agriculture, breeding, food security, and traditional medicine [1; 2]. According to national environmental data, Uzbekistan has 4,300 species of higher plants, and the level of endemism among some groups, especially reptiles and fish, is very high. This makes the conservation of local flora and fauna a matter of national ecological security.

At the same time, ecological degradation has become one of the strongest threats to the living world. Intensive grazing causes soil and pasture degradation, forest decline, disappearance of rare plants, and reduction of wildlife habitats. Aquatic ecosystems have experienced especially strong anthropogenic pressure, and tugai forests in the Amu Darya delta now occupy only a small part of their original area [3; 6].

The Aral Sea disaster is one of the most dramatic examples of the negative impact of ecological imbalance on nature. The drying of the sea has changed regional climate, increased soil salinity, produced salt-dust storms, destroyed fish habitats, and caused the decline of delta ecosystems [7; 10]. In addition, climate change is increasing the number of hot

days, accelerating desertification, and strengthening pressure on mountain, desert, and wetland ecosystems [3; 9]. Uzbekistan's average annual temperature has increased by 1.6°C since the beginning of instrumental observations, and the Aral Sea region has experienced a particularly large increase in hot days.

Therefore, the study of the negative impact of the ecological situation on flora and fauna is important for science, environmental policy, education, and sustainable development. The issue requires a complex theoretical analysis because biodiversity loss is caused not by one factor but by the interaction of climate change, land degradation, water scarcity, overuse of biological resources, pollution, and weak ecological culture [6; 9].

## METHODOLOGY

This article is based on a theoretical and analytical methodology. The research uses comparative analysis, ecological-system analysis, and synthesis of scientific literature published between 2010 and 2025. The article relies on the works of Uzbek, CIS, and foreign scientists, as well as national and international environmental reports.

The theoretical basis includes studies on the flora of Uzbekistan by K.Sh. Tojibaev, N.Yu. Beshko, A.N. Sennikov and other researchers who studied plant diversity, endemism, important plant areas, and the creation of modern databases of Uzbekistan's flora [1; 2; 13]. Their works show that the flora of Uzbekistan is still being actively



studied, and new records and rare species continue to be identified. The Flora of Uzbekistan Project, for example, aims to provide a modern taxonomic treatment of vascular plants with distribution data and identification keys.

The article also uses national legal and strategic documents, especially the Strategy for the Conservation of Biological Diversity in the Republic of Uzbekistan for 2019–2028. This strategy identifies the need to expand protected areas, create a unified biodiversity monitoring system, develop GIS-based biodiversity databases, and reduce degradation of natural ecosystems [5].

In addition, recent international studies on land degradation, vegetation dynamics, Aral Sea ecosystems, and biodiversity threats are analyzed. The article uses the IPBES global biodiversity approach, according to which the main direct drivers of biodiversity loss are land-use change, direct exploitation of organisms, climate change, pollution, and invasive species [9]. These drivers are applicable to Uzbekistan because they are clearly visible in desert, mountain, agricultural, wetland, and river ecosystems.

## RESULTS

The analysis shows that the ecological situation in Uzbekistan affects flora and fauna through several major mechanisms.

First, land degradation and desertification reduce the productivity and biological stability of ecosystems. Recent studies identify soil salinization,

reduced fertility, erosion, compaction, and dehumification as major forms of land degradation in Uzbekistan [6]. These processes weaken vegetation cover, reduce pasture quality, destroy habitats of small mammals and reptiles, and limit food resources for birds and ungulates. A 2025 review notes that water scarcity, biodiversity loss, greenhouse gas emissions, and climate change have become critical issues for the functioning of Uzbekistan's agricultural and natural systems.

Second, overgrazing has a strong negative influence on plant communities. In desert, foothill, and mountain areas, excessive livestock pressure damages young shoots, prevents natural regeneration of shrubs and trees, and leads to the disappearance of rare plants. It also changes the composition of vegetation: valuable forage species decrease, while resistant or unpalatable species may expand [6; 8]. This affects fauna as well, because many wild animals depend on natural vegetation for food, shelter, and reproduction.

Third, water ecosystem degradation is one of the most serious ecological problems. The decline of the Aral Sea, reduced river flow, salinization of water bodies, and pollution of irrigation-drainage systems have caused the loss of fish habitats and wetland biodiversity [3; 7; 10]. Aquatic ecosystems are among the most vulnerable because they depend on stable water quantity and quality. The disappearance or degradation of wetlands



affects fish, amphibians, water birds, insects, and tugai vegetation.

Fourth, climate change intensifies existing ecological problems. Higher temperatures, more frequent heat waves, glacial retreat, dust storms, and desertification create additional stress for plants and animals. Species adapted to narrow ecological niches may lose suitable habitats. Mountain species, including the snow leopard and high-altitude plant communities, are especially sensitive to warming and habitat fragmentation [3; 9].

Fifth, the number of rare and endangered species is increasing. The fifth edition of the Red Book of Uzbekistan includes 314 plant and 206 animal species, and these species have legal protection in the country [4]. ([Green University][5]) This shows that biodiversity loss is not abstract; it is reflected in the official conservation status of many species.

## **ANALYZE**

From a theoretical ecological point of view, the negative impact of environmental degradation on flora and fauna in Uzbekistan can be explained through the concept of ecosystem imbalance. Each ecosystem functions as an interconnected system: soil, water, vegetation, animals, microorganisms, and climate interact with one another. When one component is damaged, the whole system becomes unstable [6; 9].

For example, salinization does not affect only soil chemistry. It changes plant species composition, reduces

vegetation density, limits seed germination, and decreases the availability of food for herbivorous animals. As a result, predators also suffer because their prey base decreases. In this way, one ecological factor creates a chain reaction across the entire food web [6; 7].

The Aral Sea region demonstrates this mechanism very clearly. Unsustainable water management led to sea desiccation, which produced saline desert landscapes. Recent research on the exposed Aral Sea bed shows that vegetation development there depends strongly on soil mechanical composition, salinity, and groundwater depth; plant communities form fragmented and uneven succession patterns [7]. In a 35-year investigation, researchers identified five ecosystem types and showed that higher vegetation activity was associated with sandy soils and lower salinity.

The decline of tugai forests is another important example. Tugai ecosystems support many birds, mammals, insects, and plant species. When river flow decreases and groundwater becomes unstable, tugai forests shrink. National environmental data indicate that tugai forests now cover about 38,000 hectares, mainly in Karakalpakstan, which is only about 10% of their original area in the Amu Darya delta. This means that many species have lost their natural habitats.

The problem of genetic diversity is also important. If populations become small and isolated, their genetic variability decreases. This makes them



less able to adapt to climate change, disease, and new environmental conditions. Studies of wild walnut populations in Central Asia, including Uzbekistan, show that overgrazing and overexploitation are major threats to genetic resources [8]. Researchers found severe threat levels for some priority walnut populations in Uzbekistan and recommended in situ conservation and assisted natural regeneration.

Thus, biodiversity degradation in Uzbekistan should be analyzed not only as a reduction in the number of species but also as a weakening of ecosystem functions: pollination, soil formation, water regulation, climate regulation, genetic resource preservation, and natural regeneration.

## DISCUSSION

The negative impact of the ecological situation on Uzbekistan's flora and fauna is complex because it combines natural aridity with anthropogenic pressure. Uzbekistan cannot change its geographical position or continental climate, but it can reduce human-made pressures on ecosystems. The most important task is to move from a resource-consuming model of nature use to a sustainable ecological management model [5; 6].

The Strategy for the Conservation of Biological Diversity for 2019–2028 is an important policy framework. It aims to expand protected areas, create biodiversity monitoring systems, reduce pressure on biodiversity, integrate biodiversity issues into economic sectors,

and implement science-based decisions [5]. However, practical implementation requires continuous funding, modern scientific monitoring, qualified specialists, and public ecological awareness.

One of the key directions should be restoration of degraded landscapes. In the Aral Sea region, afforestation of the dried seabed with drought- and salt-resistant species such as saxaul can reduce dust storms, stabilize soil, and create new habitats for desert fauna [7; 10]. At the same time, restoration should be based on scientific understanding of soil salinity, groundwater level, and local plant succession.

Another important direction is the protection of water ecosystems. Sustainable water management, reduction of pollution, modernization of irrigation systems, and restoration of wetlands are essential for fish, amphibians, birds, and tugai vegetation. Without stable water resources, it is impossible to preserve aquatic and riparian biodiversity [3; 6].

Pasture management is also necessary. Rotational grazing, temporary exclusion of livestock from degraded areas, restoration of native vegetation, and community-based pasture management can reduce pressure on natural ecosystems. These measures are especially important in mountain and foothill regions where rare plants and wild animals compete with livestock for limited resources [6; 8].

Finally, ecological education must become a long-term conservation tool.



People often damage biodiversity not because they consciously want to destroy nature, but because they do not understand the consequences of illegal plant collection, poaching, overgrazing, pollution, and careless land use. Therefore, schools, universities, mahallas, media, and local communities should participate in ecological culture formation [5; 13].

In conclusion, Uzbekistan's flora and fauna are under serious pressure from

land degradation, water scarcity, climate change, overgrazing, pollution, and habitat fragmentation. The protection of biodiversity requires an integrated approach: scientific research, legal protection, restoration of degraded ecosystems, rational use of natural resources, and ecological education. If these measures are implemented systematically, Uzbekistan can preserve its unique natural heritage for future generations.

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