



THE CURRENT ECOLOGICAL STATE OF UZBEKISTAN'S MOUNTAIN GLACIERS

A. Matnazarov

Associate Professor, PhD, Department of Geography and Fundamentals of Economic Knowledge, Nizami National Pedagogical University of Uzbekistan.

N. Sultanova

Associate Professor, PhD, Department of Geography and Fundamentals of Economic Knowledge, Nizami National Pedagogical University of Uzbekistan.

D. Iskandarova

Master's student in the specialty "Methods of Teaching Exact and Natural Sciences (Geography)", Nizami National Pedagogical University of Uzbekistan.

D. Suyunov

Student of the educational program "Geography and Fundamentals of Economic Knowledge", Nizami National Pedagogical University of Uzbekistan.

Q. Saydbagambetov

Student of the educational program "Geography and Fundamentals of Economic Knowledge", Nizami National Pedagogical University of Uzbekistan.

Abstract: This article provides a detailed description of the current ecological state of Uzbekistan's mountain glaciers, the natural geographical processes occurring within them, and changes in the morphometric parameters of glaciers, namely degradation processes.

Keywords: glaciologist, Zarafshan, Hissar Range, Kashkadarya Basin, Tekeshsay Glacier, valley, trough, glacier, mountain glaciers, progressive and regressive stages.

Introduction. Many scientific sources contain information indicating that mountain glaciers in Central Asia, including those located within the territory of Uzbekistan, are retreating, while some have completely melted away.

Main part. Researchers who have studied the evolutionary development of glaciers emphasize that, like continental polar ice sheets, glaciers have alternately expanded and retreated during different periods. One of the most prominent ideas in this regard is associated with the American glaciologist W. H. Hobbs. He developed the concept of the gradual development of glaciers and studied these periods by dividing them into progressive and regressive stages.

During the progressive stage, glaciers expand across a given territory and occupy adjacent areas as well. Mountain glaciers descend to the lower parts of valleys and



branch out. Their upper parts merge with one another at certain peaks, and the entire mountain relief becomes constrained by glaciers. Only some very high and steep rocks remain protruding above the ice.

During the regressive stage, however, glaciers begin to thin and shrink due to the aridization of the climate, a certain increase in air temperature, the influence of internal terrestrial heat on the Earth's surface, and other factors. As a result, continuous mountain glaciers break up into several separate parts, decrease in size, and their tongue sections retreat upward. Thus, during the progressive stage, indicators opposite to those of the regressive stage are observed. In this way, glaciers begin to disappear. This process occurs differently depending on climatic and other geographical conditions: a glacier may begin melting from its margins or may split into separate ice masses. At the same time, in the process of glacier retreat, the forms that appeared during the expansion of the glacial area are reproduced only in reverse order.

Under climatic conditions unfavorable for glaciation, a glacier cannot shrink all at once, because its ability to preserve its size depends on the altitude of the mountains, the orientation of mountain ranges and other geomorphological factors, as well as on the size and continuity of the ice field. The preservation capacity of a glacier allows it to continue existing even under conditions in which it would not be able to form.

According to scientific research carried out by glaciologists and the authors' field observations, the mountain glaciers of Uzbekistan are currently passing through a regressive stage. Therefore, some of them are shrinking rapidly, while others are retreating gradually. This is evidenced by moraine deposits of various sizes and compositions left by the Seversov and Botirboy glaciers in the lower parts of valleys, as well as by traces left by glaciers on the side slopes of trough valleys as a result of exaration, including striated and polished rock surfaces.

The rate of glacier retreat may vary even within one and the same region. For example, according to the data of the glaciologist A. A. Ni, under the natural geographical conditions of Central Asia, the Zarafshan Glacier is retreating faster than the Fedchenko Glacier. This situation is also observed among the glaciers located within the territory of Uzbekistan. Even in our period, which is considered a regressive stage, some mountain glaciers have not retreated but have shown signs of growth. For instance, according to investigations carried out in 1960 by A. S. Shchetinnikov and L. D. Podkopaeva, the steep part of the Botirboy Glacier shifted 11 meters downward along the valley compared with its previous position. Its thickness increased, and the total area of the glacier expanded by 1,480 m².

The data presented above indicate that although the mountain glaciers of Uzbekistan are currently passing through a regressive stage, that is, a stage of retreat, their reduction does not proceed continuously at the same rate. Rather, during different



periods they alternately shrink and sometimes enter a phase of growth. Nevertheless, overall the glaciers are gradually retreating. There are no precise scientific data indicating when the retreat period of Uzbekistan's mountain glaciers began.

The retreat of glaciers under Central Asian conditions was first noticed by Russian geographers who carried out early studies across the region. One of these researchers was A. N. Severtsov.

While studying the western parts of Turkestan, A. N. Severtsov provided the earliest information on the retreat of Central Asian mountain glaciers based on the condition of ancient moraines, and he linked this process to the humid climatic conditions of ancient geological periods and their subsequent tendency toward increasing aridity. Later, in 1868, A. P. Fedchenko and O. A. Fedchenko developed this idea further by discovering and studying traces of ancient glaciers in the upper parts of the Zarafshan Valley.

In 1870–1875, while studying the geological structure of Central Asia, I. V. Mushketov emphasized, as N. A. Severtsov, A. P. Fedchenko, and O. A. Fedchenko had also noted, that glaciers developed in stages within the region, existed in ancient geological periods, and alternately contracted and expanded over time. He also stated that by the 1870s, due to the aridization of the climate, the glaciers had entered a stage of retreat (A. A. Ni, p. 3).

By 1906, Richter stated that two episodes of glaciation had occurred in Central Asia. He referred to the older one as the Zarafshan glaciation, during which glacier tongues descended to an absolute altitude of 1,500 m, and the later one as the Panif glaciation, during which glaciers descended to an altitude of 2,300 m (A. A. Ni et al., p. 4).

According to the results of research conducted in the Hissar Range in 1965–1967 by A. S. Shchetinnikov and L. D. Podkopaeva, the lower boundary of the existing mountain glaciers in the Kashkadarya Basin lies between 3,270 and 3,840 m above sea level, with an average altitude of 3,760 m. In the Surkhandarya Basin, the lowest boundary of glaciers descends to 3,150 m in the Shatrut River basin.

In the mountainous areas of Uzbekistan, the tongue sections of glaciers are increasingly retreating upward. As a result, their reduction, fragmentation, and, ultimately, the disappearance of some of them as glaciers are being observed.

The valley glacier in Tekeshsay is undergoing a stage of retreat. In the 1960s, its length was 3.2 km. According to data obtained in the 1990s by O. S. Savoskul through radiocarbon, palynological, and lichenometric methods, the Tekeshsay glaciers, although once continuous in ancient times, began to fragment into separate parts one to two thousand years ago (Kh. P. Toygiyev, A. A. Ni et al., 2009). During the last 30 years, this glacier has shortened by 1.3 km; therefore, its tongue has retreated by approximately 3.9 m each year. In particular, the Right Bariran, Left Bariran, and Middle Bariran glaciers located in the upper part of the Bariran River were originally a single large glacier.



Conclusion. In subsequent periods, their intensive melting caused all three glaciers to break apart into separate fragments. Six hundred and fifty years ago, the tongue of the glacier was located about 100 meters lower above sea level than its current position. Certainly, this condition is one of the factors contributing to the current shrinkage of glaciers.

References

1. Matnazarov, A., Sultonova, N., Janzakov, A., & Karakulov, N. Morphological Types of Uzbekistan Mountain Glaciers and Their Present Condition. *Journal of Pharmaceutical Negative Results*. DOI: 10.47750/pnr.2022.13.S08.315.
2. Matnazarov, A. Dissertation written for the degree of Doctor of Philosophy (PhD) in Geographical Sciences on the topic “Natural Geographical Distribution Patterns and Ecotourism Role of Uzbekistan’s Mountain Glaciers.” 2021, 120 p.
3. Matnazarov, A., Safarov, U., & Hasanova, N. The State of International Relationship Between the Formation and Activity of Mountain Glaciers of Uzbekistan. *Current Research Journal of Pedagogics*, 2(12), 22–25, December 2021.
4. Baratov, P. *Natural Geography of Uzbekistan*. Tashkent: O‘qituvchi, 1996.
5. Baratov, P., & Xolmatov, K. *The Economic Importance of Central Asian Rivers*. Tashkent: O‘zbekiston, 1981.
6. Nizomov, A., Nugmanova, A., & Matnazarov, A. *Mountain Glaciers of Uzbekistan*. Tashkent: Fan va texnologiyalar, 2016, 98 p.
7. Nizomov, A., & Matnazarov, A. R. *Glaciotourism in Uzbekistan*. Tashkent: Bookmany Print, 2022, 173 p.
8. Sultonova, N., Matnazarov, A., Karakulov, N., & Janzakov, A. Characteristics of Development in Internationally Related to Climate Elements of Mountain Glaciers in Uzbekistan. *Turkish Journal of Physiotherapy and Rehabilitation*, December 6, 2021.
9. Shchetinnikov, A. S. *Glaciers of the Piskom River Basin*. Leningrad: Gidrometizdat, 1976, 120 p.
10. Shchetinnikov, A. S., & Podkopaeva, L. D. *Catalog of Glaciers of the USSR*. Vol. 14. Central Asia. Issue I: The Basin of the Syrdarya River. Part I: Pskem River. Leningrad: Gidrometeoizdat, 1968.