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Approach for determining environmental change in Central Asia using proxy data

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To clarify the environmental changes in Central Asia during the past 1000 years, we summarized various types of proxy data, including data from ice cores, tree rings, and old maps, and data showing changes in lake level, lake area, and glaciers. Ice-core data from mountain glaciers in Central Asia are important proxies for environmental change in the highland area over the last 10,000 years. These data include information on dust storms, cold/warm climate phases, snow accumulation, and vegetation conditions. In lowland areas, lake-level changes can be used to reconstruct environmental change. Old maps and lacustrine terraces indicate lake-level changes. Tree-ring data substitute for summer temperature and precipitation data. Changes in glaciers reflect the climatic condition, and old documents and maps record historical changes in human activity and lifestyle.

To reconstruct past environmental changes, we should synthetically interpret several types of proxy data rather than relying on a single type. For example, the shrinking of the Aral Sea since the 1960s is a current environmental problem. Some reports suggest that the lake area of the Aral Sea in the 13th century would have been similar to the current lake area. Changes in lake level have also been reported for other Central Asian lakes during the past 1000 years. For example, Issyk-Kul Lake expanded between the late 17th and early 19th centuries, when old maps show that the Chu River connected to the lake. The results highlight the significant environmental changes that have occurred in the past millennium in Central Asia.