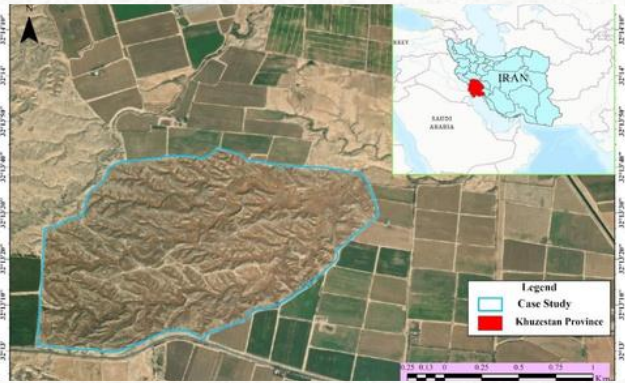
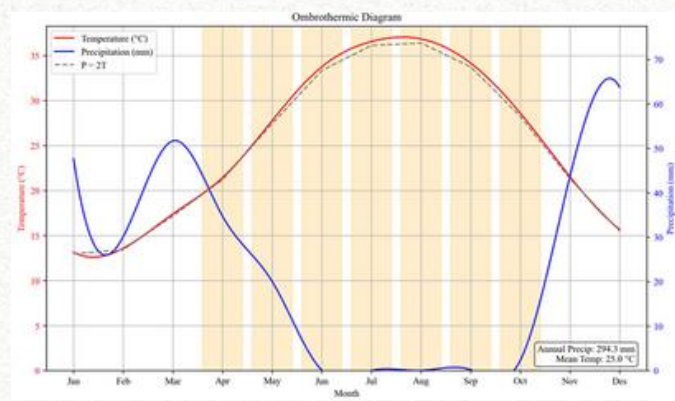


Vegetation dynamics under long-term protection in arid and Semi-Arid ecosystems



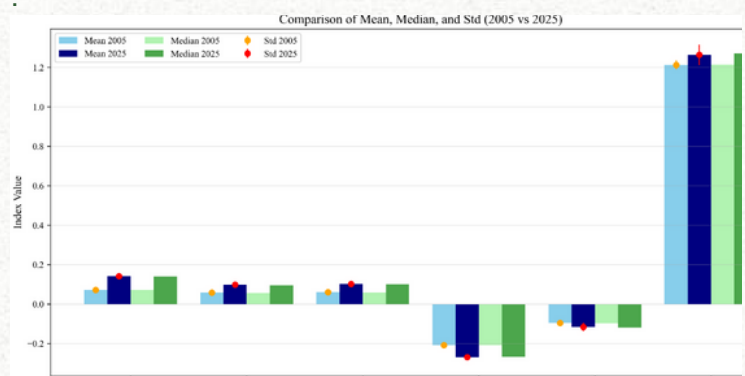
Climate

According to the Amberge method, the region's climate is classified as hot mid-desert

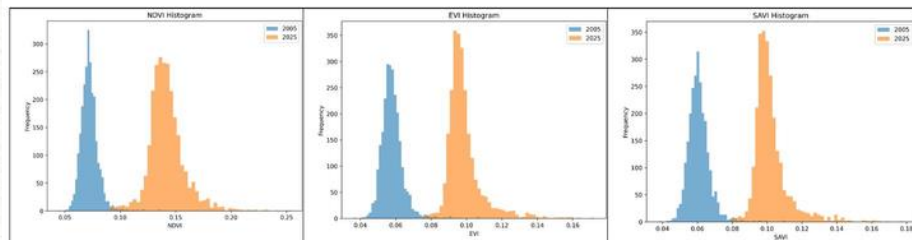


THE NATURAL LANDSCAPE

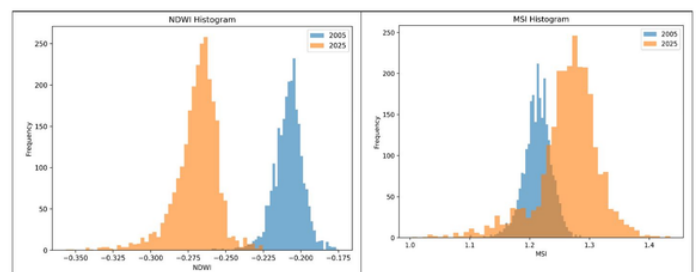
- This Watershed Nature Reserve is located in the Saharo-Sindian phytogeographical region.
- The natural landscape of the area consists of low hills, and the soils are characterized by a loamy texture within an extensive plain. The vegetation is predominantly short-steppe species, including annual grasses and scattered xerophytic shrubs.
- Occasional trees and shrubs of the genus *Ziziphus* (*Z. spina-christi*, *Z. nummularia*) are also present.



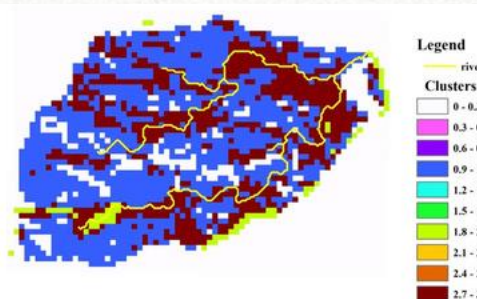
Vegetation indices (NDVI, EVI, SAVI)



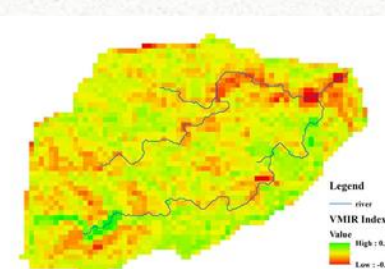
Moisture-related indices (NDWI, MSI)



Ecological Clusters (K-means on Change Indices)



Vegetation-Moisture Resilience Index (VMRI)



long-term protection in arid rangelands can effectively increase floristic diversity and richness.

Long-term protection plays a key role in soil formation and erosion control.

Higher VMRI values near rivers highlight the importance of sustainable hydrological interactions for maintaining resilience in arid ecosystems.

Long-term protection of dryland ecosystems enhances the restoration of the soil seed bank and supports plant establishment.

The high proportion of annual species indicates the harsh environmental conditions of the region.