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The role of dams and reservoirs in transforming desiccating endorheic basins

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Water storage infrastructures such as dams and reservoirs are crucial for meeting local water demands, especially in arid and semi-arid regions with varying rainfall patterns and frequent droughts. Notwithstanding the role of human-made reservoirs in stabilizing water supply for agricultural, municipal, and industrial demands (e.g., irrigation, hydropower), identifying their impact on the water balance in endorheic basins, particularly those with shrinking lakes, remains a challenge. Dams and reservoirs disrupt natural inflows thus accelerating lake shrinkage and altering hydrological processes with associated adverse impacts on ecosystem functioning in the basin. We combined satellite remote sensing, bathymetric information, and land and climatic data to quantify the influence of water storage infrastructures on groundwater dynamics and storage variation of shrinking endorheic lakes. Our preliminary findings reveal that among 134 endorheic lakes (>10 km²) worldwide that have experienced a reduction in surface area over the past two decades, nearly one-third have been significantly influenced by the expansion of storage capacity within their basins. We thus quantified the correlations between the expansion of storage capacity and local irrigation and livestock water demands with changes in groundwater levels and lake volume in these basins. These results highlight the need for a more comprehensive understanding of the interplay between water storage infrastructures and the long-term sustainability of endorheic basins.