ABSTRACT

Dams are essential for managing water resources, supporting irrigation, flood control, power generation, and drinking water supply. As key infrastructure assets, their safety and functionality are critical. However, many dams, especially in India, have exceeded their design life and now face age-related issues such as seepage, material weakening, seismic risks, and poor drainage. If not addressed, these can lead to serious safety concerns.

Musi Dam, located in Telangana, India, is a masonry and earth-fill dam over 62 years old, showing signs of structural and hydraulic deterioration. To assess its condition, a comprehensive multi-disciplinary evaluation was undertaken, combining advanced field investigations, geotechnical testing, geophysical methods, and numerical modeling. The study focused on four borehole locations three on the left flank and one on the right covering key zones of the homogeneous and zoned embankments and the Non-Overflow (NOF) masonry section. The nine-phase methodology included data review, visual inspection, SPT-based soil profiling, and geophysical methods like MASW, GPR, and ERT, followed by seepage and stability modeling using GeoStudio.

Geophysical anomalies were cross-validated with borehole and SPT data to ensure reliable interpretation. The NOF section was further analyzed using HVSR microtremor and resistivity data, identifying potential resonance issues and signs of mid-depth degradation.

Findings revealed crest erosion at BH-1 and BH-2, active seepage zones near BH-3 and BH-4, and seismic vulnerability in the masonry section. Suggested interventions included crest recompaction, toe drain construction, selective grouting, and enhanced instrumentation (e.g., piezometers, and time-lapse surveys).

This integrated assessment approach highlights the importance of combining geophysical tools, geotechnical data, and numerical models for aging dam evaluation, offering a replicable framework for similar structures across India