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Evaluating Geophysical Techniques for Detecting Anomalies in Earth Dams

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Introduction

Dams serve as vital infrastructure for water management and industrial waste containment, yet face structural deterioration through cracks, leaks, and internal erosion that compromise safety. Conventional inspections like core drilling, though effective, risk damaging the structures they assess. Geophysical methods provide a non-destructive solution through two key approaches: Seismic Methods analyzing wave propagation to detect structural flaws, and Electrical Methods measuring subsurface conductivity to identify seepage zones. This study evaluates professional perspectives on geophysical techniques for dam safety.

Method and/or Theory

The study evaluated geophysical methods for earth dam inspections through literature review and expert input. The main stage involved creating and digitally distributing a survey targeting professionals in Geology, Geophysics, Geotechnics, Civil Engineering, and related fields. The questionnaire collected data on the effectiveness of detection methods, field challenges, and respondents' practical experience. Responses were analyzed to assess the real-world viability of these techniques, identifying key trends and limitations in current dam inspection practices.

Results and Conclusions

Survey results show 96.6% of specialists consider geophysics essential for monitoring, yet only 27.6% have advanced expertise. Respondents were primarily geologists (48.3%), with over 60% having direct dam safety experience, underscoring the findings' practical relevance. Key implementation barriers include cost, technical resistance, and insufficient institutional support. Clear methodological preferences emerged: electrical techniques excelled at detecting water-related issues, while seismic methods better assessed structural integrity. These results highlight geophysics' underutilized potential for proactive dam maintenance, advocating its integration into standard inspection protocols to improve safety and operational efficiency.