2D and 3D Slope Stability Analysis of Fundão Dam

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ABSTRACT: The failure of the Fundão Dam, the largest disaster of its kind in the world, was studied by Morgenstern et al. (2016) using two-dimensional approaches. The carried out investigation did not point to mechanisms of slope instability as the causes of the disaster. However, the complex shape of the dam and its concave and convex regions were not originally considered due to limitations of the analysis tools employed. This paper presents two-dimensional (2D) and three-dimensional (3D) analyses that are more rigorous and well suited for the Fundão dam geometry. Slope stability analyses were accomplished using the General Limit Equilibrium Method of Slices and Columns (GLE) using the SVSLOPE software. Critical slip surfaces were searched in 2D and 3D, across the entire dam face. Drained shear strength parameters led to Factors of Safety that would indicate fairly stable conditions, with a lowest Factor of Safety of 1.744. Values close to 1.0 were obtained considering undrained conditions of the tailings, which are supposedly less representative of field conditions. The 3D factors of safety were very close to the 2D values, but with noticeably higher variations near the concave and convex regions. This leads to the conclusion that the dam shape near the setback region requires closer examination by means of 3D analyses that enable the identification of critical zones.