Identifying the best fit probability distributions for tailings dam breach parameters

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# ABSTRACT (250 – 300 words)

Adequacy of tailings dam failure impact assessments are significantly affected by the accuracy of the predicted breach runout hydrograph used when modelling the failure. This often results in overly optimistic or pessimistic inundation maps. The state of practice for tailings dam breach assessment (TDBA) is thus evolving into a risk-based approach, which considers the potential magnitude of the breach hydrograph, based on a sensitivity of the key input parameters, to confirm the credibility of the dam breach model.

The physical process of tailings dam breaches is multifaceted, depending both on the dam failure scenario and the failure modes. This study focuses on the failure modes that may lead to a loss of containment due to a physical breach of the tailings dam, namely collapse and overtopping. The Canadian Dam Association has defined four cases of TDBA, based on the flow of the supernatant pond and the flow of tailings due to liquefaction. Both the failure mode and TDBA case should be considered in a risk-based approach.

The main objective of this study is to identify the best-fit probability distribution of tailings dam breach parameters using a combination of tailings dam failure and earthen embankment dam failure databases. Five parameters were selected for evaluation: (i) side slope of trapezoidal breach, (ii) height of breach, (iii) bottom width of breach, (iv) slope of resulting failure and (v) formation time. To identify the best-fit distributions, a correlation and comparative analysis is undertaken for various combinations of TDBA Cases and failure modes.

The output from this study can be used to perform a probabilistic dam breach analysis, using software which can perform a Monte Carlo simulation to randomly sample various breach parameters about the best-fit distribution. This will contribute to the development of probabilistic dam breach inundation maps instead of deterministic mapping.