



Visualizing Risk Pathways: Event Tree Analysis for Dam and Levee Safety

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In recent years, federal dam owners have increasingly adopted risk-informed decision making (RIDM) practices to characterize, evaluate, and mitigate dam and levee safety risks. Likewise, many state and private dam owners are following suit, recognizing the importance of these methodologies. The U.S. Army Corps of Engineers (USACE), in collaboration with other federal agencies and industry partners, has developed and refined methods for evaluating these risks, establishing industry standards for risk assessment practices. USACE employs Semi-Quantitative Risk Analysis (SQRA) and Quantitative Risk Analysis (QRA) to assess Potential Failure Modes (PFMs), assigning likelihoods and consequences to guide risk prioritization. These methodologies have become foundational in dam and levee safety, ensuring comprehensive risk evaluations. One of the most effective tools in this process is event tree analysis—a graphical technique used to trace the sequence of events leading to dam or levee failure. Event trees provide visual models to decompose PFMs through systematic progression, starting from an initiating event (e.g., flood or earthquake loading), and mapping the potential pathways to failure or non-failure. This approach applies a Boolean logic to visualize complex risk scenarios, assessing both success and failure outcomes. Event tree analysis is especially effective in evaluating interdependent failure modes and understanding the progression of failure to support informed, data-driven decision-making in high-risk systems. This presentation will introduce best practices for dam and levee safety professionals involved in risk assessments, providing valuable insights into event tree analysis and updated tools such as the USACE Risk Management Center’s Event Tree Toolbox and Database. Attendees will gain essential knowledge to effectively contribute to team-based risk analyses and enhance their decision-making capabilities for improved safety management.