WHAT'S WRONG WITH THE CRITICAL FUNCTIONALITY CURVE FOR RESILIENCE?

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Abstract
The critical functionality curve (CFC) is a visual representation of resilience that maps the function of an infrastructure system (e.g., water provision) over time to show loss and recovery of services during disruptive events. In the last decade, the CFC has become one of the most popular models for infrastructure resilience because it corresponds to well-established definitions of risk and emergency management practices. The CFC is also the basis for many quantitative measures of resilience by measuring the difference between service provision during normal and disrupted operations. Despite its popularity, the CFC is rarely used to map the events of real infrastructure crises and is only used to explain resilience concepts or to measure the output of theoretical models. This means the CFC remains unvalidated in practice and associated quantitative measures of resilience may not provide expected decision support. In this work, we overview events in 2017 when the tallest dam in the United States, the Oroville dam, nearly collapsed and produce a variety of CFCs for the event. We find quantitative measures of resilience are sensitive to the choice of critical function (e.g., water storage vs. water release) and timescale of the event, confounding resilience assessment. More importantly, we find any insight gained from the CFC relies on outdated assumptions about dam infrastructure that do not represent the adaptive actions that saved the dam. Taken together, we conclude that the CFC is an inappropriate model for resilience by encouraging the wrong interpretation of the events at Oroville and masking understandings that may promote adaptive capacity to future crises.

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