

# TOWARDS RESILIENT WATER NETWORKS: A QUANTITATIVE METHOD TO EVALUATE RECOVERY STRATEGIES

*Beatrice Cassottana*<sup>1</sup>

*Nazli Yonca Aydin*<sup>2</sup>

*Loon Ching Tang*<sup>1</sup>

<sup>1)</sup> *National University of Singapore, Singapore*

<sup>2)</sup> *ETH Zurich, Switzerland*

## **Abstract**

The evaluation of recovery strategies aimed at enhancing resilience are very difficult tasks for water networks as the relationships between the hydraulic variables and the design parameters are non-linear. A systematic way of looking into recovery processes can provide insight for improving resilience, enabling system operators to compare various recovery strategies and the consequences of past actions. In this paper, we propose a simulation-based resilience assessment approach for a water network subject to leaks. The steps of this evaluation involve (1) selecting a measure of performance, (2) identifying the critical nodes of the network, (3) simulating different recovery strategies to avoid performance loss, and (4) finally comparing those strategies using the proposed resilience assessment method. The developed resilience assessment is innovative as it is based on time varying recovery functions, which provide accurate insight into the behaviour of the system during the entire duration of the disruption. This analysis considers both causes and remedies for system disruptions as well as the trade-offs between the resilience and the resources of those remedies. The information obtained here is an essential support tool for the decision-making process when the goal is to enhance the resilience of a water distribution system.

**Keywords:** resilience assessment, recovery, performance function, water network, simulation