

Using the Vermont Travel Model to Determine Roadway Criticality for Flooding Hazards

PROJECT TITLE

Using the Vermont Travel Model to Determine Roadway Criticality for Flooding Hazards

STUDY TIMELINE

October 2019 – September 2020

INVESTIGATORS

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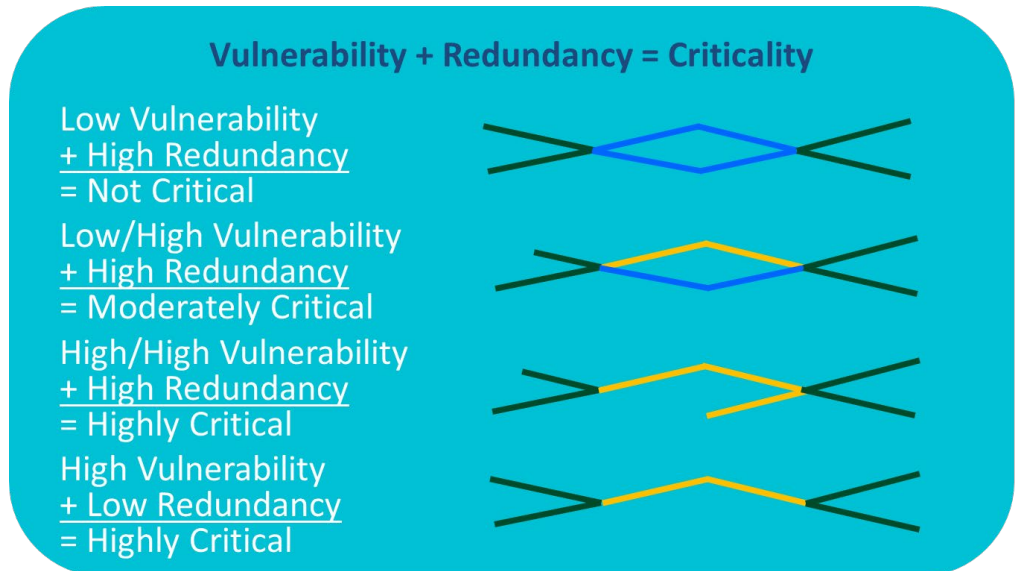
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Problem Statement

In 2019-2020, the Vermont Travel Model was used in cooperation with the Agency's consultant, Milone & MacBroom, Inc., to estimate a criticality index for each road segment in selected Vermont watersheds where flooding hazards exist and roadway damage is common. An innovative new approach was used to calculate the Network Criticality Index (NCI), which represents how vital a roadway is to regional travel and how vulnerable it is to flood-related damage.

Methodology

The NCI method measures the combined effects of redundancy and vulnerability on network criticality:



The calculation of the NCI uses the vulnerability probability, V , which is a translation of a vulnerability score to guide a set of N Monte Carlo simulations whereby each link α is disrupted n_α times:

$$n_\alpha = N \times V_\alpha$$

The NCI measures, for each link, the increase in total system-wide VHTs (c) over the set of N simulations:

$$NCI_\alpha = \frac{\sum_N c_\alpha}{n_\alpha} - \frac{\sum_N c}{n}$$

Where c_α is the VHTs with link α disrupted, n_α is the number of simulations with α disrupted, c is the VHTs with α intact, and n is the number of simulations with α intact ($N - n_\alpha$).

Next Steps

NCIs were calculated for selected watersheds in Vermont and provided to the relevant regional planning commissions so that they could take action in improving the resilience of the road network through future investment. NCIs will continue to be calculated for vulnerable watersheds as vulnerability scores become available.

More information about the VTrans Research Program, including additional Fact Sheets, can be found at:
<http://vtrans.vermont.gov/planning/research>