



Caltrans Division of Research,
Innovation and System Information

Research



Results

Executive

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Project Title:

Statewide Risk Scale Across
Multiple Assets/Vulnerabilities

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Task Manager:

Lee Hicks
Senior Transportation Engineer
lee.hicks@dot.ca.gov

Statewide Risk Scale Across Multiple Assets/Vulnerabilities

Caltrans needs to establish a comprehensive risk scoring methodology to rank all statewide assets and asset vulnerabilities using a normalized risk score.

WHAT WAS THE NEED?

California Department of Transportation (Caltrans) faces significant challenges in optimizing strategies and programs for preserving and improving its vast transportation network. As part of its business strategy to enhance transportation asset management (TAM), Caltrans seeks to establish a comprehensive risk scoring methodology in order to rank all statewide assets and asset vulnerabilities using a normalized risk score. The risk score will be used in statewide prioritization, project selection, and investment planning.

WHAT WAS OUR GOAL?

With a comprehensive risk scoring methodology, Caltrans is able to rank all statewide assets and asset vulnerabilities using a normalized risk score. The risk score is expected to be used for statewide prioritization, project selection, and investment planning.

WHAT DID WE DO?

The research:

- Reviewed a subset of vulnerabilities to the State Highway System that are currently considered in Caltrans practices. These are: Bridge Seismic Hazards, Bridge Scour, Landslide and Rockfall Hazards, and Climate Change Vulnerability Assessments (focusing on Caltrans Districts 1 and 4).



Caltrans provides a safe, sustainable,
integrated and efficient transportation
system to enhance California's
economy and livability.

- Developed a statewide risk assessment scale for this subset of vulnerabilities so that Caltrans can compare and prioritize them in a single scaling system. The scaling system includes likelihood of occurrence, impact on the asset, and impact on the transportation system.
- Demonstrated how the proposed methodology works through an Excel spreadsheet analytical tool.
- Documented how the framework and methodology can be applied to any risk and vulnerability. Document challenges associated with bringing these risks together for Asset Management.
- Identified any limitations in existing vulnerability information and data provided by Caltrans for this study.

WHAT WAS THE OUTCOME?

The research demonstrates the approach for calculating a risk score that incorporates bridge seismic hazards, bridge scour, landslide and rockfall hazards, and climate change vulnerability. This risk score addresses the need to develop a methodology for incorporating risk in project prioritization and selection.

Once calculated, the risk scores can be used to support a variety of applications including:

- Identifying and comparing risks of a given type;
- Comparing locations considering multiple types of risks; and
- Prioritizing investments.

Additional research and refinement to the approach in the following areas could further improve the risk score in the future:

- Finding an appropriate balance between an approach that is technically accurate but requires more data; and one that is less accurate but is easier to implement and relies on readily available data;
- Addressing the scenarios or design events to use;
- Establishing assumptions regarding the effect of various treatments; and
- Responding to temporal changes in risk.

WHAT IS THE BENEFIT?

To maintain and improve the condition of assets and also mitigate their vulnerabilities, Caltrans uses different maintenance, rehabilitation, and replacement strategies on these assets. There are different ways to assess the condition and vulnerability of the assets and prioritize the maintenance, rehabilitation, and replacement work on these assets. Existing approaches to assess and prioritize work include: a seismic and scour vulnerability ranking system for bridges, quantification and prioritization of the vulnerabilities on geotechnical assets, and completion of climate change vulnerability studies in several districts.

The methodology to prioritize all risks across various assets and asset vulnerabilities in this research is a valuable contribution to the existing tools. The approach normalizes these different scores across different assets and asset vulnerabilities and combines them into a single risk scaling matrix, so that they can be compared and prioritized across the State Highway System. A uniform approach to scoring and prioritizing risks allows Caltrans to achieve a risk-based performance driven asset management plan.

IMAGE

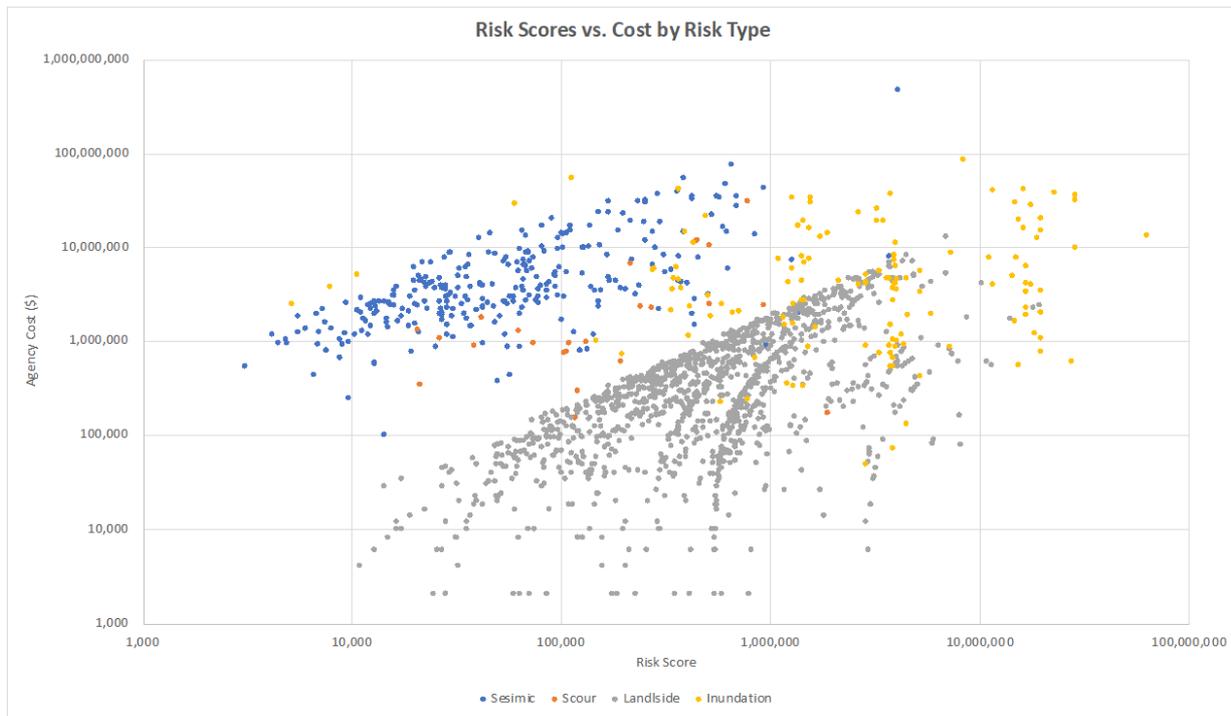


Image: Risk Score by Type of Risk and Cost

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