UNIVERSITY TRANSPORTATION CENTER

RESEARCH BRIEF

# The Long-Term Effect of Earthquakes: Using Geospatial Solutions to Evaluate Heightened Rockfall Activity on Critical Lifelines

Margaret Darrow, PhD, Ben Leshchinsky, PhD, Michael Olsen, PhD, Joseph Wartman, PhD

## Background

Rockfall is a chronic slope hazard along transportation corridors throughout North America, where millions of dollars are spent annually on rock slope maintenance and mitigation work. The problem is particularly acute throughout much of the Pacific Northwest (PNW), where topographic relief, high precipitation rates, and elevated seismicity combine to create widespread and pervasive rockfall. Rockfall hazards result in frequent road closures and lane restrictions, damage to infrastructure, and loss-of-life and injuries to motorists, cyclists, and pedestrians. Thus, rockfall directly impacts driver safety, mobility, and accessibility for many critical lifelines across the PNW. These impacts are amplified by moderate- to large-magnitude seismic events – both during and long after shaking. The magnitude 7.1 November 2018 Anchorage, Alaska earthquake produced rockfalls that resulted in significant traffic delays as debris and damaged vehicles were removed. These events pose life-safety concerns during and immediately after an earthquake, and impede recovery following shaking. For example, stalled motorists may be trapped adjacent to precarious rock slopes while aftershocks continue after the main event. Rockfall hazards, however, do not end after an earthquake. Increased rockfall rates may negatively impact mobility and safety long after strong shaking and associated aftershocks end. Further complexity is added when an earthquake occurs during or after periods of increased levels and intensity of precipitation.

## Research Project

Understanding increases in rockfall activity is critical for transportation agencies to plan for and allocate resources optimally to address maintenance needs for rock debris removal and slope mitigation. In cases where rockfall occurs in mountainous terrain along highways, road closure means delay as motorists must take longer alternate routes given the limited options. The project team will analyze a unique time series of ground-based LiDAR datasets collected for several years before and at several intervals after the 2018 Anchorage Earthquake to develop practice-oriented seismic rockfall stability guidelines and predictive tools for transportation agencies. A better understanding of rock slope response enables an improved mobility approach, safety, and commerce. In particular, we will continue to provide data-driven solutions in transportation, given that we are using advanced sensing technologies and developing robust tools to analyze these data to support cost-effective transportation decision making.

### ABOUT THE AUTHORS

The research team consisted of Margaret Darrow of the University of Alaska, Ben Leshchinsky and Michael Olsen of Oregon State University, and Joseph Wartman of the University of Washington.

### ABOUT THE FUNDERS

This research was funded by the Pacific Northwest Transportation Consortium, with additional support from the Oregon Department of Transportation, University of Alaska, and University of Washington.

### EXPECTED DATE OF COMPLETION

August 2022

### FOR MORE INFORMATION

http://depts.washington.edu/pactrans/research/projects/the-long-term-effect-of-earthquakes-using-geospatial-solutions-to-evaluate-heightened-rockfall-activity-on-critical-lifelines/