



# Risk Management Methodology on Road Infrastructure (GRDR). Application on Mountain Tunnels and Bridges, Valparaíso Region, Chile

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## Abstract

After the extreme weather events of 2015 and 2017 in the north of Chile involving heavy rain and debris flood, the Ministry of Public Works launched a Risk assessment program on road infrastructure in order to reduce the risk and provide a list of structures in the national network that could be affected by natural hazards. From 2015 to 2019, GRDR methodology was proposed considering the identification of the damage index (vulnerability) and the frequent natural and made-man hazard (debris flood, flood, fire, among other) applied on tunnels, bridges and other road structures. The GRDR was applied as complement of the current inspections and studies of probabilistic method to identify the hazards. From 2019 a collaboration between MOP and Pontificia Universidad Católica de Valparaíso updated the GRDR methodology including automatization of the acquisition data, review of the algorithm of weight and the study of specific natural hazards. Within this framework, it was determined that the Valparaíso Region of Chile would be the pilot plan in order to apply and calibrate the updated GRDR. This paper presents the results of the application and calibration of the GRDR on two critical roads of Valparaíso Region. An analysis of the inspection using UAV, Thermal camera, GRDR platform among other is carried out. The results of the methodology implemented on Las Palmas Tunnel, Pudehue Bridge (Road Bridge converted from railway structure) and structures in Quebrada Alvarado (gorges) are presented. Also, final comments to improve the GRDR are carried out.

**Keywords:** bridge; tunnels; inspection; climate change.

## 1 Introduction

At present, there are around 7,000 bridges in Chile and over 85,000 km of routes providing continuity to the roadway network. Due to the geography of the country, any collapse in the road network

connectivity results in a critical situation affecting the commercial system, the social and human development if towns become cut off.

Hence, a system monitoring the actual condition of the structures is of the essence to provide an early response (maintenance), and also to be aware of