# Seismic Resilience Assessment of Aging Highway Bridge Considering Climate Change Effects

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## Abstract

The impact of climate change due to increasing global warming may negatively influence the performance of reinforced concrete (RC) bridges. In addition to being continuously exposed to unfavorable climatic conditions, bridges in India are also prone to earthquake-induced damage. This study provides a methodology for time-dependent seismic resilience assessment of aging highway bridges considering climate change effects. Nonlinear time-history analyses are conducted to develop seismic fragility curves at different points in time. These results are utilized to estimate seismic losses that are combined with recovery models to estimate the functionality and resilience of aging highway bridge considering climate change effects. The results reveal a declining trend in the resilience of the bridge after taking climate change into account, underlining the significance of considering climate change when evaluating the lifetime seismic resilience of older bridges.

**Keywords:** Reinforced Concrete Highway Bridge; Climate Change; Time-dependent Corrosion Deterioration; Seismic Resilience.

## 1 Introduction

Critical civil infrastructure systems such as highway bridges play an essential role in sustained economic growth and social development of any country. Most highway bridges are constructed with antiquated seismic design standards and are also potentially exposed to the effects of extreme climate and weather, such as floods, increase in temperature, and relative humidity, among others [1]. A recent report published by the Intergovernmental Panel on Climate Change (IPCC) noticed that the temperature will be increasing continuously over the next few decades due to greenhouse emissions [2]. For the condition of extreme climate change scenarios, the mean temperature may rise up to 5°C by 2100 [3]. The change in temperature caused by climate change can have a major influence on the corrosion rate. For instance, Stewart et al. [4] revealed that for a temperature increment of 2°C, the corrosion rate is increased by 15%.



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