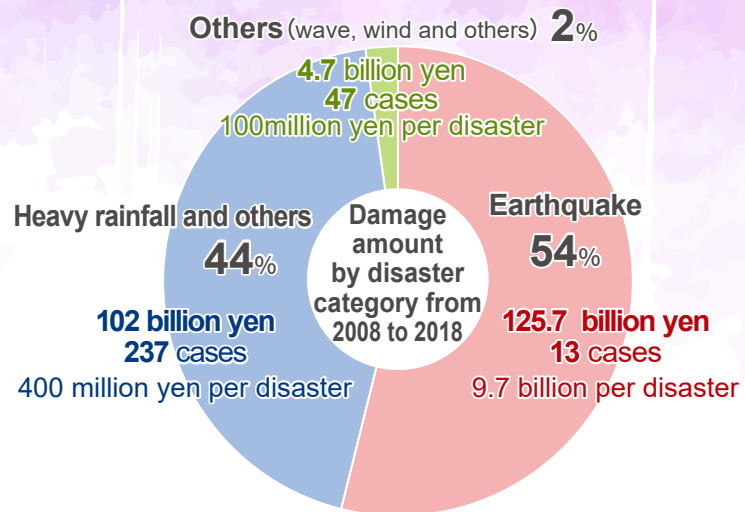


## Introduction

Over the past decade, railway facilities have suffered severe damages due to earthquakes such as the Tohoku Earthquake in 2011, Kumamoto Earthquake in 2016, Northern Osaka Earthquake in 2018 and Hokkaido Eastern Iburi Earthquake in 2018. Although railway disasters caused by earthquakes are fewer in number than those caused by rain, they account for more than half of the total damage to railway facilities in the past 10 years, i.e., 233.2 billion yen (*Cost of damages to railway facilities by natural disasters*). The severity of damage certainly influences recovery time. However, according to surveys by the Ministry of Land, Infrastructure, Transport and Tourism (hereafter referred to as MLIT), completely repairing railway embankments and slopes may require a few months, whereas repairing railway bridges and elevated tracks can take up to a few years<sup>1)</sup>.



Cost of damages to railway facilities by natural disasters<sup>1)</sup>

The 2011 Tohoku Earthquake off the Pacific coast was ocean trench quake with an unprecedented magnitude of 9.0. As piers of elevated structures had been reinforced to ensure the structural integrity of structures such as bridges in the aftermath of the Great Earthquake of Hanshin in 1995, most railway structures remained standing. However,

it still caused tremendous damage that was specific to large-scale earthquakes. Utility line poles and bridge piers were broken and damaged over vast areas, and additional damage was repeatedly caused by a series of aftershocks. The ground was liquefied in metropolitan areas, and the Tohoku coastal region sustained



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## Message from Managing Editor Dr. Toru MIYAUCHI

Under the main theme “Technology to enhance the safety of railway structures during earthquakes”, this issue introduces technologies to support seismic safety, seismic assessment, and seismic strengthening of railway structures.

It also looks back at the World Congress on Railway Research held in June 2022 in Birmingham, UK (WCRR2022). I attended the conference as a member of the

Executive Committee, and I would like to report that it was a great success although held still under COVID-19 concerns. Presentations and discussions took place with 757 participants from 21 countries. I really appreciate the support and contributions to WCRR2022 by all the participants, sponsors, and organizers.

Your continued interest in Ascent is highly appreciated.