

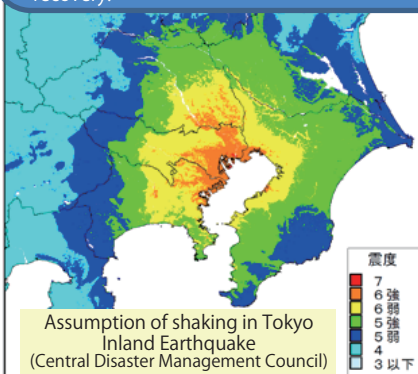
(4) Development of seismic technology for strengthening earthquake resilience of infrastructure facilities

Research Summary

Research period: FY 2016 - 2021
Program leader: Executive Director for Earthquake Engineering

Research background · Needs

- ◆ Imminent occurrence of large-scale earthquakes such as massive earthquake in the Nankai Trough and Tokyo Inland earthquake are pointed out.
- ◆ Based on the lessons learned from the 2011 Great East Japan Earthquake, it is necessary to develop structural and non-structural countermeasures aiming to protecting human life, maintaining essential functions, minimizing damages, and quick recovery.



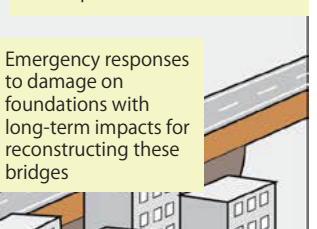
Research contents

- ◆ Development of seismic technology to strengthen earthquake resilience of infrastructure facilities (technologies for minimizing damage and quick recovery, performance evaluation and countermeasures)
- ◆ Targeted structures: roads and river structures (bridges and embankments)
- ◆ Hazards to be taken into account: shaking, tsunami, flood, liquefaction

Emergency responses to large-scale damage of river embankments and floods



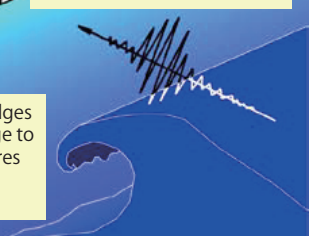
Enormous impacts on traffic due to collapse of embankments



Emergency responses to damage on foundations with long-term impacts for reconstructing these bridges



Enormous impacts on traffic due to liquefaction in wide-areas



Loss of bridges and damage to substructures caused by tsunami



In the Great East Japan Earthquake of 2011, the wide areas of Pacific Ocean coast from Hokkaido to Kanto suffered the extensive damage by the strong shaking and huge tsunami. Currently, imminent disasters such as massive earthquake in the Nankai Trough and Tokyo Inland Earthquake are pointed out. For such earthquakes, pressing issues are to prevent and minimize the earthquake damage, and to improve the earthquake resilience (strong and resilient against earthquakes) of infrastructure facilities including; road facilities which play a key role for emergency/life-saving activities and transportation of emergency goods; river facilities to prepare for the tsunami or flood occurred in a complex way after earthquakes. This research consists of the following three segments for the purpose of development of the countermeasure technology to prepare for large-scale earthquakes and complex disasters after the earthquake that exceeds the past experience.

(1) Development of technology for minimizing damage of

structures against earthquakes and recovering the damage quickly

(2) Development of seismic design technology consistently applicable for ground, underground, and aboveground structures.

(3) Development of liquefaction evaluation method for soil layers considering the effect on structural responses

We develop and improve the evaluation method of seismic performance and seismic measures for road bridges, road soil structures, soft ground, and river structures.

With proposing practical application of developing technology and the reflection to the technical standards and manuals, we aim to contribute to the realization of earthquake resilient society by minimizing damage of infrastructures and recovering functions quickly at the time of disasters for future large-scale earthquakes.