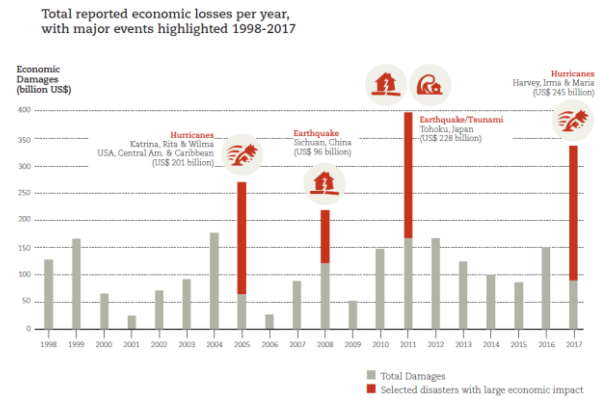
Modeling Spatial and Economic Impacts of Natural Disasters for a Safer Region

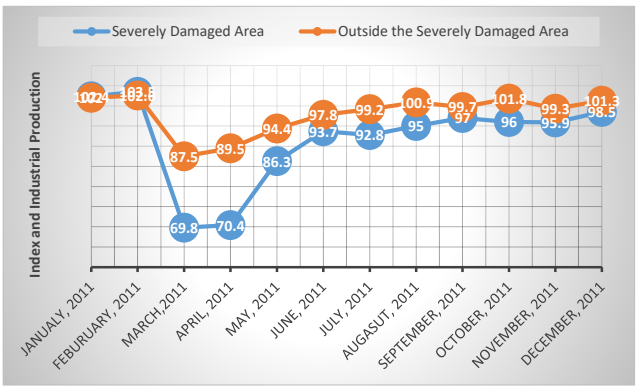
Yoshio Kajitani
Professor, Faculty of Engineering and Design, Program of Disaster and Crisis Management

Background

Economic Losses from 1998 to 2017 due to natural disasters (stock losses) were estimated as 300 trillion dollars (U.N.), doubled from the losses in previous 20 years. However, this estimate excludes flow losses (e.g. income, GDP).



Economic Losses (stock losses) from 1998 to 2017

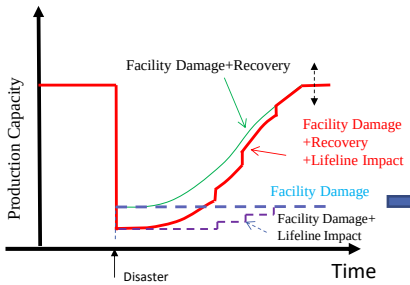


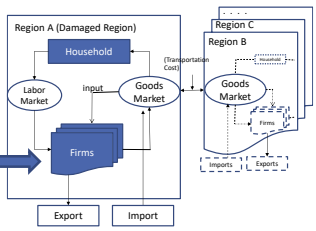
Impacts on industrial production after the 2011 Tohoku Earthquake (a part of flow losses)

Model

(Cited from Earthquake Spectra, 2009 Economic Systems Research, 2014,2018)

Hazard (Ground motion, Tsunami) → Production Capacity Losses (supply shock) → Interregional and intersectoral impacts (incl. supply-chain damages)





・(modeling) damages To infrastructures and Industrial facilities
・Impacts of Infrastructure damages To industrial activities
・Interregional and Interindustry impacts (general equilibrium model for disaster conditions)

Applicability (validation of the 2011 Tohoku Earthquake)

・the estimates well agree with the observation
⇒Risk assessment for other Natural disasters, cost-benefit analysis is a Promising application.