

Abstract

This paper introduces a new modeling framework to understand and improve regional natural disaster risk management in the USA, including the interactions among key stakeholders and between the two important risk management mechanisms of insurance and retrofit. The framework includes a stochastic programming optimization to represent insurer decisions, which interacts with a utility-based model of individual homeowners' decisions to insure and/or retrofit. Reinsurer and government roles are represented as inputs, and the decision models are integrated with a detailed regional catastrophe loss estimation model. This modeling framework is applied to a full-scale, realistic case study for hurricane risk to residential buildings in Eastern North Carolina. Several alternative system configurations are considered that affect the incentives for adoption of alternative risk management methods. They include providing a government subsidy for insured homeowners to encourage retrofit, providing both a government subsidy and insurance rebate to reduce retrofit costs, and mandating insurance purchase with a cap on insurance premiums. For each configuration, outcomes are presented from the perspectives of all key stakeholders—primary insurer, homeowners (insured and uninsured, in high- and low-risk areas), reinsurers, and the government. Results suggest that it is possible to design policies in which all stakeholders can be better off simultaneously. Retrofit incentives for insured homeowners can be effective in linking and strengthening the benefits of retrofit and insurance. Mandatory insurance coupled with capped profit loading factors and possibly retrofit rebates from the insurer to the homeowner can also reduce overall system risk.

Citation

Peng J., X. G. Shan, Y. Kesete, Y. Gao, R. Davidson, L. K. Nozick, and J. Kruse. "Modeling the Integrated Roles of Insurance and Retrofit in Managing Natural Disaster Risk: A Multi-stakeholder Perspective", *Natural Hazards*, 74(2): 1043-1068, 2014.