Identifying optimal adaptation of buildings threatened by hurricanes, climate change

Created by Professor Dan M. Frangopol and his former PhD student You Dong from Lehigh University, the computational procedure was applied to a group of single-family residential buildings located in Miami-Dade County, Florida

The need for adaptation strategies to reduce the threat of hurricanes to society is of critical importance, as evidenced by the recent damage to coastal regions in the U.S. and the Caribbean this past year. The fact that the number of residential buildings in coastal areas has increased significantly combined with the impacts of climate change means that the increase in hurricane intensity and frequency is likely to continue.

According to **Dan M. Frangopol**, the Fazlur R. Khan Endowed Chair of Structural Engineering and Architecture at Lehigh University and **You Dong**, Assistant Professor of Structural Engineering at The Hong Kong Polytechnic University, the majority of previous studies have focused on structural performance and loss assessment under hurricanes.

In a **paper**, recently published in the *ASCE Journal of Performance of Constructed Facilities*, Frangopol and Dong propose a framework to aid the optimal adaptation of residential buildings considering climate change effects in a life-cycle context. Life-cycle engineering, of which Frangopol is a recognized pioneer, is an approach to assess the environmental impacts in conjunction with economic impacts that includes a structure's life-cycle from its production to its use and its end.

In their paper, called "Adaptation Optimization of Residential Buildings under Hurricane Threat Considering Climate Change in a Lifecycle Context," Frangopol and Dong present a systematic framework for the optimal adaptation of residential buildings at a large scale under various scenarios of impending climate change during a long-term interval. Different adaptation strategies are investigated to ensure adequate structural performance and to mitigate the damage loss and adverse consequences to society. A genetic algorithm-based optimization process is adopted to determine the optimal adaptation types associated with buildings within an investigated region. The framework considers the probabilistic occurrence models of hurricanes, structural vulnerability of typical residential buildings, possible climate change scenarios, and optimization of various climate adaptation strategies in a lifecycle context.

They applied their approach to a real-life case study: a group of single-family residential buildings located in Miami-Dade County, Florida.

Read the full release at **EurekAlert!**.

*-**Lori Friedman** is Director of Media Relations with Lehigh University's Office of Communications and Public Affairs.*

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Related Links

- ***ASCE Journal of Performance of Constructed Facilities*: "Adaptation Optimization of Residential Buildings under Hurricane Threat Considering Climate Change in a Lifecycle Context"**

- Alumni: You Dong, Assistant Professor of Structural Engineering, Hong Kong Polytechnic University
- Faculty Profile: Daniel Frangopol
- Department of Civil and Environmental Engineering

Media Coverage

- EurekAlert: "Identifying optimal adaptation of buildings threatened by hurricanes, climate change"

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