Outsmarting nature during disasters

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The dramatic images of natural disasters in recent years, including hurricanes Katrina and Sandy and the Tohoku, Japan, earthquake and tsunami, show that nature, not the people preparing for hazards, often wins the high-stakes game of chance.

"We're playing a high-stakes game against nature without thinking about what we're doing," geophysicist Seth Stein of Northwestern University said. "We're mostly winging it instead of carefully thinking through the costs and benefits of different strategies. Sometimes we overprepare, and sometimes we underprepare."

Stein will discuss his research in a presentation titled "How Much Natural Hazard Mitigation is Enough?" at the American Association for the Advancement of Science (AAAS) annual meeting in Chicago. His presentation is part of the symposium "Hazards: What Do We Build For?" to be held on Monday, Feb. 17, in Grand Ballroom B of the Hyatt Regency Chicago.

Stein is the William Deering Professor of Geological Sciences in Northwestern's Weinberg College of Arts and Sciences. He is the author of a new book, "Playing Against Nature: Integrating Science and Economics to Mitigate Natural Hazards in an Uncertain World" (Wiley, 2014) and the book "Disaster Deferred: A New View of Earthquake Hazards in the New Madrid Seismic Zone" (Columbia University Press, 2010).

Sometimes nature surprises us when an earthquake, hurricane or flood is

bigger or has greater effects than expected. In other cases, nature outsmarts us, doing great damage despite expensive mitigation measures or causing us to divert limited resources to mitigate hazards that are overestimated.

"To do better we need to get smarter," Stein said. "This means thoughtfully tackling the tough questions about how much natural hazard mitigation is enough. Choices have to be made in a very uncertain world."

Stein's talk will use general principles and case studies to explore how communities can do better by taking an integrated view of natural hazards issues, rather than treating the relevant geoscience, engineering, economics and policy formulation separately.

Some of the tough questions include:

- How should a community allocate its budget between measures that could reduce the effect of future natural disasters and many other applications, some of which could do more good? For example, how to balance making schools earthquake resistant with hiring teachers to improve instruction?
- Does it make more sense to build levees to protect against floods or to prevent development in the areas at risk?
- Would more lives be saved by making hospitals earthquake resistant or by using the funds for patient care?

The choice is difficult because although science has learned a lot about natural hazards, Stein says, our ability to predict the future is much more limited than often assumed. Much of the problem comes from the fact that formulating effective natural hazard policy involves combining science, economics and risk analysis to analyze a problem and explore costs and benefits of different options in situations where the future is

very uncertain.

Because mitigation policies are typically chosen without such analysis—often by a government mandate that does not consider the costs to the affected communities—the results are often disappointing.

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