Uncertainties key to balancing flood risk and cost in elevating houses

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Sultan, WA, November 11, 2006 -- Mitch McKron pumps water from the basement of his mitigated home that he had just raised in time to prevent it from flooding. Record rains swelled many western Washington Rivers that have breached their levees and flooded roads, property and towns. Credit: MARVIN NAUMAN/FEMA

What do you have on your 2020 Bingo Card? Wildfire, heat wave, global pandemic, or flooding? If it's flooding, then it's a good bet it will happen in many places in the U.S. sometime during the year.

People who live in areas designated as river flood zones often seek to raise their homes. Now a team of Penn State researchers suggests that considering uncertainties can improve decisions.

"Many houses located along rivers in Pennsylvania are in danger of being flooded," said Klaus Keller, professor of geosciences. "Some houses are elevated high, some to intermediate levels, and some not at all. Why is this?"

People in river flood zones are looking for good strategies on how high to elevate their houses. The Federal Emergency Management Agency—FEMA—recommends elevating houses to the height of a flood that has a 1% chance to occur in a given year, also known as the 100-year flood, plus at least one foot. This is the minimum elevation for which federal funding may be available. The researchers investigated if they might improve on this suggested elevation given uncertainties surrounding, for example, future flooding, the future value of money and the vulnerability of a house to flooding. They reported their results today (Oct. 26) in *Nature Communications*.

New Orleans, LA, March 8, 2006 - This house in Gentilly is in the process of being elevated above the base flood elevation adopted by the community in result of flooding from Hurricane Katrina. The homeowner will raise the house a total of 11' and has received the Increased Cost of Compliance (ICC) benefit included with his National Flood Insurance Program (NFIP) policy because of his compliance to the community's floodplain management ordinance. Credit: Robert Kaufmann/FEMA

"Looking at the range of possible outcomes can help to improve decisions on how high to elevate a house," said Mahkameh Zarekarizi, former Penn State postdoctoral fellow, now a hydroclimate scientist at Jupiter Intelligence. "It is arguably better to fail in a computer model than in real life. In the computer, we can look at many possible future outcomes of flooding, costs and other uncertainties."

Decision makers may want to reduce the probability of being flooded

and reduce the net costs.

"The decision makers may benefit from a map that shows the trade-offs between these goals," said Vivek Srikrishnan, assistant research professor, Earth and Environmental Systems Institute. "Home owners may want to see, for example, the total net price of reducing the risk of being flooded. A single recommendation such as the 100-year flood height plus at least one foot is silent on this question."

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