Houston unveils Storm Risk Calculator for 2012 hurricane season

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The next time a hurricane approaches Houston, residents trying to decide whether to evacuate or shelter in place will be able to get real-time updates about the risks from storm surge, rainfall flooding, wind damage and power outages in their neighborhood, thanks to a new website created by Rice University researchers.

Houston Mayor Annise Parker ’78 unveiled the Storm Risk Calculator (risk.rtsnets.com) this week at City Hall. The risk calculator uses the latest wind, storm surge and rainfall forecasts from the National Weather Service (NWS) to give specific risk assessments for single-family homes in Harris County.

“The decision about whether to evacuate or shelter in place is different for everyone,” said Rice’s Robert Stein, a professor of political science who teamed with colleagues from civil engineering and computer science to create the Storm Risk Calculator. “What we want to do is provide the information people can use to make those decisions for themselves.”

Work on the Storm Risk Calculator began in the wake of Hurricane Rita in 2005 and was spurred by Hurricane Ike in 2008. As Rita approached the Texas Gulf Coast, Houston witnessed the largest evacuation in United States history; more than 2.5 million fled the storm, but many from the most vulnerable coastal zones became stranded on clogged freeways because of “shadow” evacuees, people from low-risk areas who decided to flee at just the wrong time. Similar problems occurred to a

lesser degree during Ike.

Stein and his students surveyed thousands of Rita and Ike evacuees and determined that many would have acted differently if they had received specific information about the risks to their neighborhoods. In 2007, Stein teamed with Rice colleagues Leonardo Dueñas-Osorio, assistant professor of civil and environmental engineering, and Devika Subramanian, professor of computer science, to create a Web-based tool that could provide that information.

“Building predictive models of risks at the neighborhood level was a daunting engineering undertaking,” Dueñas-Osorio said. “We needed to integrate a vast amount of information on home structures, terrains, hydrology and hydraulics, power transmission and distribution systems, wind fields, surge and precipitation. This required advanced probabilistic and computational techniques, and we also had to reach out to the public to understand how to effectively communicate these risks. Of course, these models reflect our reasonable estimates based on the data we have compiled to date, but we believe they provide useful information for the public. This was truly an interdisciplinary collaboration.”

The Storm Risk Calculator contains a set of sophisticated computer models and a massive database of information about each of the 1.2 million single-family homes in Harris County. The computer models use up-to-date NWS forecasts for wind, rain and storm surge, as well as data from the Harris County Tax Appraisal District’s residential housing inventory. For each home, the wind risk model incorporates 17 factors, including the home’s elevation, age, roof composition and roof shape. An additional database of more than 40,000 electrical service points is used to calculate risks of power outage, and rainfall flooding is estimated with models from Rice’s Severe Storm Prediction, Education and Evacuation from Disasters (SSPEED) Center.

To use the system, residents simply enter their address on the website; the site displays a color-coded map for the risk of wind damage, power outages and flooding from rainfall or storm surge in their immediate neighborhood. Risks are presented in green, yellow, orange and red, and each grid square covers one square kilometer, or a little less than half of a square mile.

“During Rita and Ike, people who lived in areas not under evacuation orders had little to go on in making the decision whether to comply with the implied directive to shelter in place or to evacuate,” Subramanian said. “Our system provides estimates of risk of storm-surge and rainfall flooding, wind damage as well as power loss for more than 2,300 neighborhood-sized blocks that cover all of Harris County. Now all residents in Harris County, including ones not in evacuation zones, are empowered with information to assist them in responding to a hurricane threat.”

The Houston Storm Risk Calculator was funded by grants from the Department of Homeland Security through the Mayor’s Office of Public Safety and Homeland Security, the National Science Foundation and Rice University’s Faculty Initiative Fund.

Rice undergraduates did some of the initial work on the Storm Risk Calculator in a course co-taught by Stein, Dueñas-Osorio and Subramanian. The three faculty were later joined by graduate students and other researchers, including Birnur Guven ’03, research scientist at the Houston Advanced Research Center, who joined the team in 2010.

“We plan to monitor the website throughout the year and gather information to improve both user access and risk estimates,” Guven said. “For example, we would like to be able to extend our risk estimates to cover commercial properties, multifamily residences like apartment buildings, and new houses that were built after 2008.”

Others from Rice who helped create the Storm Risk Calculator include former undergraduates James Winkler ’09 and Grant Warnecke ’09, postdoctoral researcher Min Ouyang, graduate students Josue Salazar and David Kahle, and colleagues at the SSPEED Center. The website and interface were built by LJA Engineering of Houston.

Provided by Rice University