Mapping Risks and Vulnerabilities to Increase Resilience Planning

Columbia, SC: As we learn more about the dynamic arena of disaster preparedness, the realities of just how little we understand about the potential hazards we face reveal a need for increased focus on the educational front of this evolving field. The University of South Carolina's (USC) Hazards & Vulnerability Research Institute (HVRI) is working to advance theories and promote practical uses of geospatial mapping and analysis. They strive to develop and maintain powerful analytical tools with the purpose of planning for - and protecting against – potential disasters.

An HVRI researcher collecting data for use in one of the Institute's many tools

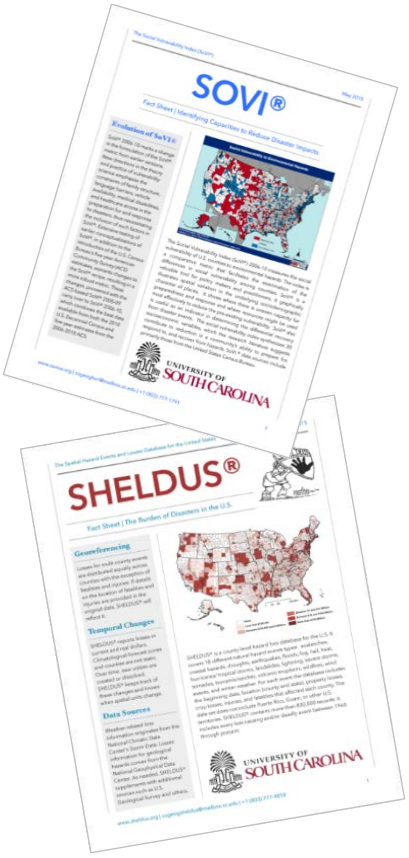
"It could be argued that 100% of the United States is potentially hazardous, for different reasons in different places," said Dr. Christopher Emrich, Ph.D., Associate Director for the Institute, who has been involved from its early days.

"Understanding these hazardous elements in context with where people live, work and worship provides the basis for making smart planning decisions, so that whether you're putting boots on the ground, shovels into the earth, or elevating structures, you're making these choices with a full understanding of all the existing vulnerabilities across a landscape. Understanding these hazards really helps planners make smart decisions."

To qualify for certain forms of assistance in the wake of a presidentially declared disaster, communities must have an approved Hazard Mitigation Plan (HMP) on file. Part of the requirements of such a plan involves identifying the hazard risks present within a community and formulating strategies to deal with such threats. Many of the tools the HVRI has created, or is in the process of developing, are useful to those communities that are lacking the resources or capabilities to gather that data themselves. The Integrated Hazards Assessment Tool (IHAT), for example, provides a simple-to- use, online resource for South Carolina communities to create and print out customizable maps. These maps can display data such as population features, hazard frequencies and associated loss statistics, threatened areas, and critical facilities.

These maps can be included in the community's HMP, which significantly reduces the amount of time and resources that community must allocate to the risk assessment portion of the planning process.

The brainchild of Director Susan Cutter, Ph.D., a Carolina Distinguished Professor, the HVRI arose from what started as the Hazards Research Lab, or simply "The Lab," in the basement of USC's Geography department in the mid-1990s. When the Dean of the College of Arts and Sciences recognized the exceptional work the Lab was producing, they requested the creation of a center devoted to GIS mapping. Dr. Cutter took the opportunity to leverage the college's interest into the formation of a larger institute with a broader focus; in 2006, the HVRI was born.



Since the Lab's early days, Institute faculty have maintained a close association with South Carolina's Emergency Management Division (SCEMD). "We've had a long relationship with the SCEMD," said Dr. Emrich. "Historically there haven't been many presidentially declared disasters in South Carolina, which is where a great deal of the money to fund mitigation response and recovery activities comes from, but there have always been disasters. We thought we could help those communities that don't have the resources to perform GIS-related activities for whatever reason."

One of the first tools created by the HVRI that is beginning to take on more widespread use is the Social Vulnerability Index, or SoVI, which is a program that utilizes uses a comprehensive metric to analyze a community's socio-economic vulnerability to potential disasters. Based on 29 criteria (economic status, social demographics, housing types, occupations, etc.), SoVI can assist in identifying a community's capacity to prepare for, respond to, or rebound from environmental threats, allowing for a more focused strategy. NOAA's Coastal Services Center contracted with the HVRI to update SoVI to include all 30 coastal states at the census tract-level and the U.S. Army Corps of Engineers has begun to use the program to identify social impacts from flooding.

Though the primary emphasis of the HVRI's efforts is oriented towards the State of South Carolina and its counties and residents, they often collaborate with other state and federal agencies and the tools they create are used by numerous organizations. The Spatial Hazards Events and Losses Database for the U.S (SHELDUS), for instance, is used by mitigation planners throughout the country to profile hazards for risk assessments in HMPs. Initiated in 2000, SHELDUS has been recognized by other prominent international entities involved with the collection of hazard loss data (SwissRe, MunichRe & DesInventar) as being a model for such data collection tools. SHELDUS provides statistics on 18 forms of natural and climate-sensitive hazard events covering every county in the continental United States dating back to 1960. Collected data includes event dates, event locations, amounts of property losses, crop losses, injuries and fatalities.

"So, for the past 55 years we can give you a trend line of disaster losses," said Dr. Emrich. "We can boil that down into a ratio of per capita/per person loss, or a per gross domestic product (GDP) loss. By looking at historical losses, we can start to project potential future losses."

HVRI staff evaluating collected data *(Photograph courtesy of HVRI)*

Funding for the HVRI's staff and projects is provided almost entirely through grants from various government entities such as the Federal Emergency Management Agency (FEMA,) the National Oceanic and Atmospheric Administration (NOAA,) the National Science Foundation (NSF,) and the National Aeronautics and Space Administration (NASA,) with only a small part of their budget coming from the university itself. In this way, the Institute is able to provide a significant service HVRI staff evaluating collected data (Photograph courtesy of Hazard & Vulnerability Research Institute) to SCEMD without putting any additional financial strain on the State's resources.

According to Dr. Emrich, at any given time, there are five to twelve graduate level students and another five or six undergrads working on the numerous projects the Institute undertakes. To date, the HVRI has shepherded more than 40 graduate students through its program, with more than 20 of those receiving their Ph.Ds. The Institute's alumni have gone on to successful careers with various federal agencies, as consultants, or in academia.

Though there have been significant advances over the years in the arena of disaster preparedness and the spreading of the "mitigation gospel," as Dr. Emrich refers to it, there is still a great deal of work to do. Much emphasis is still placed on the idea of "building back" in the aftermath of any disaster. The HVRI seeks to connect the value of examining prior disaster events, interpreting that historical data, and using those findings to prepare and plan for future disasters.

"I think that there's a rather large disconnect between research and academia and the real world," concluded Dr. Emrich. "It's taken us since 1995 to be as actively involved in emergency management in South Carolina as we are. I love the field I do research in, and I know that pretty much everyone in emergency management feels the same way. We all want to help people, and we each come to the table with our different skills to do that. What we're doing here (at the HVRI) is one spoke in a much larger wheel that will eventually turn in such a way that it can benefit everyone."

For more information on HRVI: http://artsandsciences.sc.edu/geog/hvri/front-page

For ideas your community might implement: http://www.fema.gov/mitigation-best-practices-portfolio