

University of Notre Dame
Strategic Academic Planning Committee
September 2009

PROPOSAL COVER SHEET

Proposal Type: Full Grant _____ Seed Grant x

Proposal Title: CYBER-EYE: A Cyber-Collaboratory for National Risk Modeling and Assessment to Mitigate the Impacts of Hurricanes in a Changing Climate

Principal Investigator: Tracy Kijewski-Correa

Date Submitted: September 30, 2009

Participants:

Last Name	First Name	Department
Corke	Thomas	Dept. of Aerospace & Mechanical Engineering
Fernando	Harindra Joseph	Dept. of Civil Engineering & Geological Sciences
Kareem	Ahsan	Dept. of Civil Engineering & Geological Sciences
Kennedy	Andrew	Dept. of Civil Engineering & Geological Sciences
Khandelwal	Kapil	Dept. of Civil Engineering & Geological Sciences
Madey Gregory		Dept. of Computer Science & Engineering
Morris	Scott	Dept. of Aerospace & Mechanical Engineering
Taflanidis	Alexandros	Dept. of Civil Engineering & Geological Sciences
Westerink	Joannes	Dept. of Civil Engineering & Geological Sciences
Xu	Zhiliang	Dept. of Mathematics
Zhang	Yongtao	Dept. of Mathematics

ABSTRACT

Every year, thousands of lives are lost around the world as communities are devastated by natural disasters; in our increasingly interconnected society, the effects of these events can ripple regionally and even globally. Particularly, in the case of hurricanes, the risk of future disasters continues to escalate with population shifts toward coastal areas and increased hurricane intensity, size, and frequency due to climate change and Atlantic Multidecadal Oscillations (1-9). In addition to these safety concerns, hurricanes threaten consumer supply chains including the production of energy, with both economic and environmental consequences, e.g., Hurricane Katrina halted production and delivery of oil from the Gulf of Mexico and caused havoc to regional ecosystems through inundation of wetlands and transport of harmful chemicals and waste products. Recent losses from Hurricane Katrina made it very clear that the models used in risk assessment and loss estimation (10-15) need adjustments not only to capture changes in hurricane frequency and intensity, but also to include secondary hazards like the impact of waves, storm surge and inland flooding (16, 17). Sadly, our response to these challenges has failed to account for such factors by leveraging the intellectual and computational resources and cyberinfrastructure being developed across the country to decrease threats to life and health, to infrastructure, to ecosystems, and to local and global economies. Meanwhile, our educational pipeline continues to neglect the training of a 21st Century workforce prepared to deal with these challenges at the intersection of technology, economy, public policy and human health, e.g., (18). Therefore, any response must address both the immediate delivery of tangible products to society to mitigate these disasters, supported by innovative fundamental research, as well as a commitment to the education of the next generation workforce and national leaders in the area of hazard resilient and sustainable communities.

Yet within the national landscape, no single university has stepped forward with the vision to lead our country's response to this challenge in an unprecedented way. It is here that Notre Dame can make her next strategic investment one that spurs lasting impacts in support of her Catholic mission. By working in a spirit of true collaboration to mitigate the effects of these disasters altogether, Notre Dame can place herself at the "eye of the information hurricane" as the founder of **CYBER-EYE: A Cyber-Collaboratory for National Risk Modeling and Assessment to Mitigate the Impacts of Hurricanes in a Changing Climate**. To achieve such a collaboratory, a scalable plan of sustained cyberinfrastructure development, coordinated fundamental research, and technology prototyping is outlined in this proposal, with the understanding that the ultimate scope and vision of CYBER-EYE will be only partially realized at the conclusion of this three year seed grant. As such, this proposal presents the short-term SAPC seed scope and activities couched within the larger context of the 10-year CYBER-EYE vision. Specifically, since even our internal collaborations are largely in their infancy, the SAPC seeding phase will focus on the establishment of a cyber-enabled computational framework, which will synergize the existing models, simulation tools and risk assessment frameworks of the project team and a limited body of external collaborators, to assess the impacts of hurricanes on civil infrastructure. In particular, our use of a cyber-platform is critical to creating a collaboratory whose research and educational products are visible and accessible to wide cross sections of national and even international stakeholders. By doing so, this seed grant will better position the group and its external partners to develop the full capabilities and research agenda ultimately envisioned for CYBER-EYE to address the broader impacts of these disasters on communities and ecosystems, including their far reaching social, economic and political consequences, with the ultimate goal of more hazard resilient and sustainable communities.