NATURAL HAZARDS CENTER

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Recently Awarded Grants

The following is a list of recently awarded grants involving hazards/disaster research. The information is taken from the ***Natural Hazards Observer***. Included is the grant title, name of the granting organization, amount and duration of the grant, and the name of and contact information for the principle investigator.

Previous Years: 2006 Go

Modeling of Catastrophic Failures in Power and Communication Systems: Supporting Design, Preparation, and Recovery. Funding Organization: National Science Foundation, $299,842. Three years. Principal Investigator: Chanan Singh, Texas Engineering Experiment Station, (979) 862-1696, singh@ee.tamu.edu.

The objective of this research is to develop tools for understanding and improving the reliability and performance of interdependent power and communication systems during catastrophic events such as hurricanes. Analytical and simulation approaches for analyzing reliability, survivability, and performance of these critical systems during catastrophic events will be developed. These tools will allow probabilistic prediction of the performance of these systems during natural catastrophes; efficient allocation of critical resources for improving survivability; development of techniques for failure localization; and fast recovery and system restoration. The project will provide tools that can be used by government agencies and private utilities to minimize the impact of loss of power and communications on both immediate post-event emergency response and longer-term economic and social recovery.

Hurricane Wind Simulation and Testing to Develop Damage Mitigation Techniques. Funding Organization: National Science Foundation, $149,997. Three years. Principal Investigator: Arindam Chowdhury, Florida International University, (305) 554-2000, arindam.chowdhury@fiu.edu.

During the last few years, thousands of lives have been lost and billions of dollars worth of property have been destroyed by hurricanes. More importantly, the public's belief in the effectiveness of its built environment and its ability to withstand the brutal forces of nature has been shattered. Engineered structures are vulnerable to damage from hurricane-induced wind, rain, and debris, though the combined impacts are not well understood. Damages during these extreme wind events highlight the weaknesses inherent in coastal residential building construction and underscore the need for improving their structural performance. This research will advance knowledge pertaining to hurricane-structure interaction in full-scale by capturing some of the intricate flow separation, vortex generation, and re-attachment phenomena and their effects on structures and components built with real materials. Combined effects of hurricane wind, rain, and debris will be studied to improve safety and serviceability conditions through performance-based engineering. The work will address the need to understand extreme windstorm effects on structures and improve the resiliency of coastal construction in a manner similar to the way that the automobile industry tackled

the crash worthiness issue and the earthquake engineering community approached building safety. Integration of this research project with education will be accomplished by assigning various aspects of the research to undergraduate and graduate students. Wall of Wind Contests, with student and industry participations, will be held to brainstorm and test innovative mitigation concepts, thus transferring the technology from academia to field applications. These activities will help in developing a trained workforce of students and professionals with needed expertise. Research results will be disseminated widely through peer-reviewed journal and conference publications, and reports to policy makers and building code committees to improve current standards. The research is expected to benefit society as a whole by developing hurricane mitigation techniques that will lead to human safety, property loss reduction, insurance cost reduction, and a "culture of preparedness" for natural disasters.

Mitigating Disaster and Terrorism Impacts to Critical Infrastructure. Funding Organization: National Science Foundation. One year. Principal Investigators: Timothy Matisziw, Ohio State University ($100,526), (614) 292-3732, matisziw.1@osu.edu; Tony Grubesic, Indiana University ($17,751), (812) 855-0516, tgrubesi@indiana.edu.

Critical network infrastructures, such as transportation, communication, and utility systems, are designed to facilitate the movement of essential goods and services over geographic space. Many of these vital infrastructures are geographically extensive; increasing vulnerability to disruption by natural disasters, accidents, and/or sabotage. Planning for and managing the vulnerability of critical infrastructure to extreme events is a challenging task, particularly given the uncertainty associated with the timing and severity of these events and the network components involved. Effective planning is reliant on the ability to rigorously characterize potential disruptions. This collaborative research project will develop several new approaches for assessing network vulnerability to interdiction, which is broadly defined as the debilitation of network elements due to disaster, accident, or intentional harm. The investigators will develop a general spatial optimization modeling framework for addressing the interdiction of system flow and will refine and further develop the general framework to address a number of practical planning concerns. The ultimate aim of modeling interdiction impact is to better inform mitigation and remediation efforts. A final goal of this research project will be the operationalization of a modeling framework to support system recovery in the event of interdiction. This research will be rooted in theoretical developments applicable to any networked system, with the analytical framework being designed for cross-cutting use over a broad spectrum of infrastructures. The results of this research will be of interest to the scientific community, as well as to governmental and private-sector agencies involved in planning for the continuity of critical infrastructures.

Displacement Due to Catastrophic Hurricanes: Assessing Potential Magnitude and Policy Implications for Housing and Land Development. Funding Organization: National Science Foundation, $301,643. Three years. Principal Investigator: Ann-Margaret Esnard, Florida Atlantic University, (561) 297-0777, aesnard@fau.edu.

This research examines populations predisposed to long-term displacement from catastrophic hurricanes. The examination is most critical in the coastal portions of the eight most hurricane-prone states—a band that stretches from Texas on the west along the Gulf Coast to Florida and then up the Atlantic Coast to North Carolina. The research will result in a variety of products including a new Displacement Index and related maps to estimate the magnitude of the potential displaced-persons problem, using indicators drawn from earlier studies of vulnerability as well as indicators specific to housing and policy conditions, and an analysis of how state-level policies associated with housing, emergency assistance, planning, and land development enhance or reduce vulnerability and displacement. Underrepresented populations (who are oftentimes the most vulnerable and predisposed to displacement) and society will benefit from identification and explication of the gaps found in both the emergency-management model and in policies for housing and land development, specifically as they relate to catastrophic events and large-scale displacement. The research will also help clarify the role played by various political actors and institutions in their mitigation of and response to long-term displacement

problems, and will serve to affirm or reject existing theories of the policy process.

Optimization Models and Algorithms for Emergency Response Planning. Funding Organization: National Science Foundation, $250,000. Three years. Principal Investigator: Fernando Ordonez, University of Southern California, (213) 740-7762, fordon@usc.edu.

This project will develop better plans for an effective deployment of medical supplies in response to a large-scale infectious disease outbreak. The multiple decisions involved in an efficient logistics response, compounded with the uncertainty present, leads to large-scale optimization/decision problems that are intractable using current methods. The proposed research will create models that provide robust solutions to uncertainty and develop algorithms that will use new results on sensitivity measures for problems under uncertainty. Recent events, such as the 2004 Indian Ocean tsunami and the 2005 Hurricane Katrina, have highlighted the massive impact that large-scale emergencies can inflict on society. Ultimately, improving preparedness can help save lives in emergencies. This project includes an outreach component to local, state, and federal stakeholders through the Governmental Advisory Committee of the CREATE Research Center, a Department of Homeland Security funded research center at the University of Southern California (USC). This project will lead to curricular developments in logistics and optimization and will involve minority undergraduate students in summer research projects through USC's McNair Scholar's Program.

Geographic Emergency Response Vehicle (GeoERV). Funding Organization: Americorps Vista, $80,000. One year. Principal Investigator: Juana Ibanez, University of New Orleans, in partnership with Global Map Aid, (504) 280-6294, jibanez@uno.edu.

Global Map Aid (GMA) and the University of New Orleans (UNO) propose to collaborate in the development of a mobile Geographic Emergency Response Vehicle (GeoERV)—a mobile office capable of being quickly deployed into disaster areas to produce maps for emergency service personnel, longer term aid workers, and evacuees. All necessary map production equipment will be housed within the GeoERV, as will simple living quarters to allow a small field team to quickly travel to critical locations and produce maps onsite for those who urgently need them. The goal of the GeoERV project is to build a team of highly qualified mappers with the skills to provide a critical resource (up-to-the-minute maps) in a time of disaster. The GeoERV will be focused on the southern coastline of the USA, but will also be able to drive to disaster zones in other states when called upon. The goal of the community mapping component of the GMA/UNO project is to support decision-making and consensus-building for improved program design, policy development, organizing, and advocacy in low-income and struggling communities recovering from the effects of Hurricane Katrina. Ultimately, the project will stand as an inspiration for future GeoERVs in other disaster-prone areas.

Exploring the Dynamics of Individual Pedestrian and Crowd Behavior in Dense Urban Settings: A Computational Approach. Funding Organization: National Science Foundation, $89,671. One year. Principal Investigator: Paul Torrens, Arizona State University, (480) 965-5479, torrens@geosimulation.com.

Modeling and simulation occupy a pivotal role in the research of crowd behavior as synthetic laboratories for exploring ideas and hypotheses that are simply not amenable to investigation by other means. Major advances have been made in modeling crowd dynamics, but challenges remain. The goal of this Faculty Early-Career Development (CAREER) award is to support research, education, and related activities that will develop a reusable and behaviorally founded computer model of pedestrian movement and crowd behavior amid dense urban environments. The research will seek to advance the state-of-the-art in crowd modeling by representing individuals, crowds, and the ambient city with rich detail. Models will be built with theory-informed algorithms that capture the intricacies of human behavior. The model will be realized as a fully immersive three-dimensional environment that engages both the public and students, and it will convey intuitively complicated ideas about human movement and crowd behavior. A robust calibration and validation scheme will be employed to facilitate

evaluation of policies and plans in simulation and mapping of models to real-world scenarios in public health, downtown revitalization, public safety, defense, large-scale event-planning, escape, evacuation, and emergencies. The work will broaden the behavioral base for computational modeling of human movement, contribute to the development of dynamic geographic information science, and produce a novel validation scheme that combines GIS analytics based on time geography with spatial analysis, landscape metrics, and spatial statistics. Moreover, the model will serve as an experimental but wholly realistic environment for exploring "what-if" and unforeseen scenarios of relevance to cities and their citizens.

Exploring Earth's Volcanic Environment: Development of Virtual Reality Education Modules (Phase 2). Funding Organization: National Science Foundation, $222,823. Three years. Principal Investigator: Steven Carey, University of Rhode Island, (401) 874-5138, scarey@gso.uri.edu.

An integral part of Earth and Environmental Science education at the undergraduate level is the opportunity for students to explore the natural world through fieldtrips and to make primary observations about geological processes. Web-based virtual fieldtrips to Vesuvius volcano in Italy, Kilauea volcano in Hawaii, and Laki volcano in Iceland are being developed to explore the hazards and impacts of explosive and effusive volcanism. The modules utilize Quicktime Virtual Reality (QTVR) panoramic images, digital video clips, interactive Flash animations, and inquiry-based exercises. The main intellectual objective of the project is to engage students as explorers and observers, enabling them to learn about volcanic processes and hazards, collect virtual field information, and formulate hypotheses about the effects of explosive volcanic eruptions and the deposits that they produce. The exercises are being tested on a diverse set of users participating in geoscience courses at five academic institutions including the University of Rhode Island, Tulsa University, Southern Indiana University, Community College of Rhode Island, and Tallahassee Community College. The modules can be used in a variety of undergraduate geoscience courses, such as physical and environmental geology, geologic hazards, igneous petrology, and volcanology. They can also be used outside of academia to increase public awareness of volcanic hazards to those living in areas adjacent to volcanoes.

Integrating Household Decision-Making and Transportation Simulation under No-Notice Evacuation Conditions. Funding Organization: National Science Foundation, $439,313. Three years. Principal Investigator: Pamela Murray-Tuite, Virginia Polytechnic Institute and State University, (540) 231-5281, murraytu@vt.edu.

This grant funds the development of an approach that more accurately predicts evacuation time for no-notice events by explicitly integrating household interactions and characteristics with transportation modeling and simulation. Original data on household decision-making will be gathered through in-depth personal interviews, which will reveal household evacuation planning, decision-making processes, the degree to which households optimize their plans, and their transportation needs, reliance on communications technology, and dependence on schools to evacuate children. Additional interviews with schools will identify their evacuation plans and coordination with parents. The data will inform new behavior models of household member interactions and decision-making in a no-notice evacuation. These new models will then be integrated with transportation simulation to examine effects on traffic and evacuation times. Finally, using the traffic information, an original mathematical program and solution methodology will be developed for schools and other entities to select optimal relocation sites for people within their care that facilitate collection by family members. The models will be tested for three hazardous materials incidents and evaluated for home evacuation and workplace evacuation with and without home clearance.

Knowledge, Attitudes and Behavioral Intentions of Essential Personnel with Respect to Avian Influenza and SARS. Funding Organization: National Science Foundation, $150,000. One year. Principal Investigators: Robyn Gershon ($75,000), Columbia University, (212) 854-6851, rg405@columbia.edu; Kristine Qureshi ($75,000), University of Hawaii, (808) 956-7800, kqureshi@hawaii.edu.

This collaborative research grant provides funding that will enable a better understanding of the factors that influence the attitudes and behavioral intentions of essential workers (police, fire, EMS, public health, hospital intensive care unit, and emergency department personnel), with respect to reporting to work, assuming assigned duties, and complying with infection control protocols during outbreaks of avian influenza (AI), sudden acute respiratory distress syndrome (SARS), or other infectious disease epidemics; and to identify strategies to enhance overall willingness to work during these events. The study will take place in two strategically located settings: the New York City metropolitan area and Honolulu County, Hawaii. The project will be organized into four phases: Phase 1: a series of focus groups will be conducted to collect qualitative data regarding factors that influence readiness, ability, and willingness to report to work during an AI or SARS outbreak; Phase 2: the survey will be administered to 3,000 essential workers; Phase 3: the survey results will be analyzed and presented to a variety of personnel from the participating agencies; and Phase 4: participatory action research (PAR) teams will be formed for the purpose of validating the findings and for developing strategies to address issues or barriers identified by the survey. The findings will provide key information that can be used to optimize essential workers' readiness, ability, and willingness to report to work and perform their duties competently during an infectious disease epidemic such as AI or SARS.

Natural Hazards and Related Health Issues in Bangladesh: Standards and Issues Based Geography Curricular Project for Grades K-16. Funding Organization: Fulbright-Hays Group Projects Abroad, $64,000. One year. Principal Investigator: Kay Weller, University of Northern Iowa, (319) 273-7343, kay.weller@uni.edu.

Bangladesh is one of the most disaster-prone countries in the world. Nearly every year the country experiences natural events such as floods, tropical cyclones and associated surges, droughts, and tornadoes. The University of Northern Iowa (UNI) proposed Bangladesh for development of an issues- and standards-based geography curricular project focusing on how humans living in Bangladesh cope with their many natural hazards and health related issues.

This project involves three distinct phases: 1) work conducted prior to going to Bangladesh, 2) work conducted in Bangladesh, and 3) work conducted upon returning to the United States, including a professional development program enabling educators to integrate the developed materials into their curriculum. The project will take 15 team members to four primary destinations: Dhaka, Chittagong, Sylhet, and Rajshahi, Bangladesh. These destinations provide accessibility for field trips to observe locations where drought, monsoon floods, tropical cyclones, flash floods and landslides, and arsenic contamination occur.

Prediction of MCS Hazards and Simulations of Aerosol Influences on Severe Convective Storms. Funding Organization: National Science Foundation, $194,492. One year. Principal Investigator: William Cotton, Colorado State University, (970) 491-8593, cotton@atmos.colostate.edu.

This project focuses on investigations of hazardous weather from mesoscale convective systems (MCS) and will address two research objectives: (1) modeling studies of the effects of dust and pollution-produced aerosol on severe storms with an emphasis on tornado outbreaks; and (2) implementation of a three-moment hail model and applying it to studies of impacts of aerosol on hail size and severe storm dynamics. Thus, it will explore relationships between aerosols and the severity of convective storms. The broader impacts involve investigating a causal relationship between dust and storm severity, which potentially could lead to a modification of severe storm forecasting techniques to include aerosol variability. These techniques could include nowcasting of severe weather using satellite-derived dust and pollution products, as well as development of a new infrastructure in numerical weather prediction centers for implementation of aerosol physics into models, the retrieval of quantitative aerosol products, and models for dust and pollution sources and transport. This improvement in forecasting could lead to a reduction in storm damage and loss of life.

Acquisition of a Large-Stroke, Pistin Type Wavemaker for Coastal Hazards

Research and Education. Funding Organization: National Science Foundation, $1,132,800. Two years. Principle Investigator: Daniel Cox, Oregon State University, (541) 737-4933, dan.cox@pregonstate.edu.

This research seeks to acquire a new control system for the nation's largest coastal wave flume to enable precise, large-scale simulation of hurricane waves, tsunami, and other coastal hazards under controlled conditions in a hydraulic laboratory wave flume. This new capability will allow the research community to study a range of engineering and scientific problems in constructed and natural coastal environments, including wave impacts on coastal infrastructure; development of wave energy systems; advances in numerical modeling of fluid-structure interaction with application to coastal systems, cross-shore sediment suspension, and transport related to coastal erosion and recovery after storms; dune erosion and overtopping; tsunami propagation over reefs; and environmental fluid-sediment dynamics. The high performance wavemaker will provide a national asset for precision, large-scale studies enabling safer and more cost effective design of coastal infrastructure including bridges, levees, buildings, and lifelines. This project enhances the training of graduate students in the areas of coastal structures and coastal erosion. Research and education are integrated at the undergraduate level through a Research Experience for Undergraduates (REU) program established at the laboratory. Education and outreach activities are targeted to the recruitment and retention of women and minorities in engineering at the undergraduate level and to inspire K-12 students at the third through

Heat and Death in France: History and the Social Ecology of Catastrophe. Funding Organization: National Science Foundation, $32,383. One year. Principal Investigator: Richard Keller, University of Wisconsin-Madison, (608) 263-7378, rckeller@wisc.edu.

Described as a meteorological catastrophe, the heat wave that struck France in August 2003 resulted in nearly 15,000 deaths. Yet, to frame the crisis in the language of natural disaster misses a crucial point. Significant disparities in mortality—the disproportional selection of the elderly, the poor, and city-dwellers for death—indicate patterns of risk that resulted as much from the social ecology of modern France as from the "natural" causes of disaster, calling attention to the intersection of society, nature, and environmental security. Central to this project is an analysis of the political, social, and cultural factors that placed France, and particularly Paris, at such inordinate risk. The project scrutinizes the place of the elderly in modern society by questioning social, political, and scientific representations of the elderly and their effects on social citizenship. Finally, the project explores the rise of a voluble discourse of "insecurity" since the 1980s and its role in shaping an urban landscape of vulnerability. Linked to uneasiness around immigration and social disorder, a climate of fear has contributed to an elevation of risk by encouraging many elderly French city-dwellers to remain in their apartments, at heightened danger for heat stroke, but spared from the perceived dangers of urban public space. This project will examine these and other phenomena that played essential roles in shaping the 2003 catastrophe. Interviews with citizens, government officials, epidemiologists, and social scientists, along with close analysis of media coverage of the heat wave as it unfolded and in its aftermath, will illuminate the critical social dimensions of this crisis of environmental health and social ecology.

How Institutions Think about the Unthinkable: Organizational Learning and Communication about Catastrophic Events. Funding Organization: National Science Foundation, $749,446. Three years. Principal Investigator: Karlene Roberts, University of California-Berkeley, (510) 642-5221, karlene@haas.berkeley.edu.

During and after Hurricane Katrina, some organizations responded miserably despite experience with other major hurricanes, while other organizations performed well. Why do some organizations learn from past disasters while others apparently suffer from amnesia? How do organizations learn from their own past involvement in catastrophes—or fail to do so? Even when individual organizations have the necessary knowledge, they may not communicate it to those who need it. It is important to understand how organizations learn or fail to learn from others' experiences. This project draws on the fields of organizational

behavior, economics, engineering, and legal policy, and includes five interlinked studies to investigate one actual disaster (Hurricane Katrina) and one potential disaster (grave earthquake and flood threats to the California Delta area). Study One shows how gaps between agencies and organizations prevented learning in the New Orleans and California flood control communities. Study Two addresses behavioral organizational learning from crises. Study Three examines how disasters like Hurricane Katrina affect other citizens, as measured by sales of emergency supplies in other localities. Study Four asks how to design legal and institutional relationships that will foster organizational learning and effective information management. Study Five uses a laboratory for social science experiments to analyze how incentives drive information exchange and learning. The knowledge gained from these studies should help organizations learn from past disasters rather than repeating the same mistakes that have already been so costly to society.

Modeling Tsunami Effects on Mangrove Ecosystems and the Role They Play in Saving Lives and Properties. Funding Organization: National Science Foundation, $49,997. Eighteen months. Principal Investigator: Soe Win Myint, Arizona State University, (480) 965-6514, soe.myint@asu.edu.

Some observers have posited that mangrove forests act as a bio-shield to protect people and property from natural disasters, such as tsunamis and hurricanes. The loss and degradation of mangroves may make coastal regions more vulnerable to tsunamis and hurricanes, thereby leading to the loss of hundreds of thousands of lives and billions of dollars in property. When the highly destructive Indian Ocean tsunami hit India's southern state of Tamil Nadu in December 2004, some areas with dense mangroves suffered fewer human casualties and less damage than areas without mangroves. Loss of coastal vegetation along the Mississippi Delta may have also contributed to the enormous devastation caused by Hurricane Katrina in 2005. Although many scientists have emphasized the importance and role of mangrove forests in saving lives and property, only sparse data exist to support this claim, and the protective function of mangroves has never been scientifically and systematically investigated. The long-term goal of this project is to explore the role that mangrove forests play in saving lives and property from natural disasters. The investigators will conduct field surveys in tsunami-hit areas in South and Southeast Asia and collect remotely sensed data and other ancillary data. The assessment techniques, indices, or composites developed in the proposed plan will have a significant impact on disaster management and planning, because all hazard mitigation, planning, and preparedness programs need to begin with an estimate of the number of people and structures that would be affected by a disaster event.

National Earthquake Hazards Reduction Program (NEHRP). Funding Organization: National Science Foundation, $85,000. One year. Principal Investigator: John Hayes, National Institute of Standards and Technology, (301) 975-5639, jack.hayes@nist.gov.

The National Earthquake Hazards Reduction Program (NEHRP) includes the Federal Emergency Management Agency (FEMA), National Institute of Standards and Technology (NIST), National Science Foundation (NSF), and U.S. Geological Survey (USGS). With the 2004 reauthorization of NEHRP (PL 108-360), NIST was established as the lead agency for NEHRP. In order to coordinate NEHRP activities among the four agencies as required by this reauthorization, NIST has established the NEHRP secretariat. This award provides partial support for the NEHRP secretariat housed at NIST. The secretariat will help facilitate the intellectual merit of NEHRP through coordinating various interagency activities, updating the NEHRP strategic plan, publishing the annual NEHRP report, and facilitating the NEHRP advisory committee. The broader impacts of NEHRP are to advance knowledge and understanding for earthquake hazards reduction. Through NEHRP, FEMA, NIST, NSF, and USGS work together to improve understanding, characterization, and assessment of hazards and vulnerabilities; improve model building codes and land use practices; reduce risks through post-earthquake investigations and education; improve design and construction techniques; improve the capacity of government at all levels and the private sector to reduce and manage earthquake risk; and accelerate the application of research results.

Protective Action Decision Making in Wildfires. Funding Organization: National Science Foundation, $96,146. One year. Principal Investigator: Thomas Cova, University of Utah, (801) 581-7930, cova@geog.utah.edu.

Emergency managers recommend protective actions in the face of many threats to minimize loss of life and property and to maximize use of limited resources. In the context of wildfire, two common recommendations are to evacuate or shelter those at risk. Given these two options, questions arise as to which protective action is best in a given scenario and when it should be issued. This project will examine the factors that are important in determining which protective action is best in a given wildfire, the strategies that decision makers use to combine the factors, and the effect of uncertainty on the decision-making process. The research is based on a three-step experimental approach that relies on interviews, static information boards, and an interactive wildfire simulator to elicit knowledge from both expert and novice decision makers in wildfire management. Causal models of the decision-making process will be developed and tested, which include the relevant factors and their importance, the method by which they are combined, and the effect of uncertainty. The results of this research will advance protective-action decision theory and provide a basis for improving the quality of decision-making in emergencies.

A Gulf States Collaborative to Develop a Strategic Plan for a Gulf States Advanced Technology Education Center for Coastal Resources. Funding Organization: National Science Foundation, $70,000. Principal Investigator: JoDale Ales, Baton Rouge Community College, (225) 219-0450, alesj@mybrcc.edu.

This project is for development of a comprehensive, inclusive plan for an Advanced Technology Education (ATE) regional center that will educate technicians and improve the prospects of economic development associated with coastal wetlands, estuarine and marine environments of the Gulf States. The Gulf States -- Louisiana, Texas, Mississippi, Alabama, and Florida -- are geographically, socially, and economically linked and have similar job needs for environmental and engineering related technicians. Skilled technicians are needed for preserving and restoring coastal and wetland ecosystems; building levees and other containment structures for retaining water; building structures for offshore energy production and transport; rebuilding and repairing storm damaged infrastructure; facilitating shipping, logistics, and commerce at ports; cleaning up oil spills; implementing the designs of city planners; hurricane response; and dredging.

Inferred and Experienced Intergroup Emotions as Predictors of Helping of Victim Groups: Helping When We -- not They -- Need it Most. Funding Organization: National Science Foundation, $17,915. Principal Investigator: Amy Cuddy, Northwestern University, Kellogg School of Management, (847) 491-3003, a-cuddy@kellogg.northwestern.edu.

The proposed research will explore how people's perceptions of the emotional suffering of Hurricane Katrina victims - many of whom are members of stigmatized groups -- influence their intentions to help or not to help. A growing body of evidence suggests that intergroup biases strongly influence people's inferences about the emotional states of others. People are less likely to attribute higher order, "human" emotions - like grief, or mourning - to members of stigmatized groups. However, research has not yet addressed how biased inferences about others' emotional suffering might influence how people respond to those others. The proposed studies examine the hypothesis that "dehumanization" of Hurricane Katrina victims will decrease people's intentions to help Hurricane Katrina victims, in general. In the proposed series of experiments, participants from student and non-student samples will read short newspaper articles about the victims of Hurricane Katrina, in which social category information, such as race, age, and socio-economic status, is varied. Using both direct and indirect methods, investigators will measure the effects of these social category manipulations on participants' inferences about victims' emotional states, participants' experienced emotions, and participants' helping behaviors toward Hurricane Katrina victims (via real opportunities to contribute money and time to aid organizations). The results of the proposed experiments would contribute to an understanding of how the inferred emotional suffering of victim

groups affects how people respond to those victims, and more broadly, how emotions can influence potentially discriminatory behaviors.

Inter-organizational Decision Making and Organization Design for Improved ICT Coordination in Disaster Relief. Funding Organization: National Science Foundation, three years, $650,000. Principal Investigator: Carleen Maitland, Pennsylvania State University, (814) 865-1372, cmaitland@ist.psu.edu.

Highly complex decision making involving multiple organizations, which have both shared and private interests, pose many challenges in the critical area of disaster relief as well as for organizational scholars. In particular, it is difficult to understand how the structure, distribution of decision rights, and governance of a multi-organization coordination body influences decision making processes and outcomes. Also, systematic assessment of the effects of improved decision making for related activities, such as the provision of goods in a supply chain, presents a significant challenge. This research will address these problems in the context of decision making for information and communication technology (ICT) coordination in humanitarian relief, an area which, as exemplified by the communication failures in the relief effort for hurricane Katrina, requires significant attention.

The coordination bodies who will participate in this study are the International Working Group for Emergency Capacity Building (IWG ECB), consisting of representatives from the largest international humanitarian relief agencies, including CARE, Oxfam and Save the Children; and HumaniNet, consisting of primarily smaller agencies. Data gathered from these organizations using qualitative methods, will then be used to modify an agent-based architecture to perform sensitivity analyses of the effects of these designs on decision making, generating recommendations for improved designs. Subsequently, the outputs of the simulation will be used in analytic models to predict the effects of decision making improvements on disaster relief supply chain performance.

The Recovery Divide: Sociospatial Disparities in Disaster Recovery from Hurricane Katrina along Mississippi's Gulf Coast. Funding Organization: National Science Foundation, three years, $719,000. Principal Investigator: Susan Cutter, University of South Carolina, Department of Geography, (803) 777-1590, scutter@gwm.sc.edu.

This project uses Hurricane Katrina and its impact on Mississippi's Gulf Coast to understand the factors that influence the rate of recovery in the region, but more importantly, the potential inequalities in the process. The research combines baseline geographic data on the social, built environment and hazard vulnerability of the region, a historical narrative on past conditions that influence the current (pre-Katrina) settlement history, a statistical analysis of historical rates of settlement and demographic change in the region, and forecasts for the future trajectory of settlement and demographic change as well as its geographic footprint. Lastly, the project documents the recovery processes itself and the role of inequalities in shaping it through interviews with key individuals in selected case study communities. In this way, the research not only furthers our understanding of the pace of recovery and its geographic extent, but also the role of inequalities in the recovery process and those antecedent conditions that could give rise to a "recovery divide".

Social and Environmental Vulnerability to Disasters. Funding Organization: National Science Foundation, three years, $664,000. Principal Investigator: Gilbert Burnham, Johns Hopkins University, School of Public Health, (410) 955-3928, gburnham@jhsph.edu.

The growing awareness of the impact of natural disasters on human communities has also raised awareness of the need for better measurements and models of vulnerability to disasters and for improved management of information that guides the humanitarian response. A collaboration to develop an integrated approach to disaster assessment will enhance the understanding of vulnerability and provide information for decision making in the post-disaster context. The principal partners in this collaboration are the Center for Refugee and Disaster Response at the Johns Hopkins School of Public Health (CRDR/JHU), and the Center for International Earth Science Information Network (CIESIN) at Columbia

University.

This collaboration is a multidisciplinary approach to vulnerability and disaster assessment that brings together the fields of physical science, demography, public health, and informatics. The research will develop the means by which spatial dependencies and interactions between population and environmental variables can be described and studied using GIS models, available socio-demographic information, and data from field surveys of disaster-affected areas with the dual objectives of assessing the risk of populations to natural disasters, and providing information on affected populations to decision makers in the post-disaster relief and rehabilitation environment.

Southern California Earthquake Center. Funding Organization: National Science Foundation, five years, $2,637,000. Principal Investigator: Thomas Jordan, University of Southern California, (213) 740-7762, tjordan@usc.edu.

This grant renews the funding of the Southern California Earthquake Center (SCEC) for an additional five-year period. The basic science goal of the SCEC is to understand the physics of the Southern California fault system and encode this understanding in a system-level model that can predict salient aspects of earthquake behavior. Southern California's network of several hundred active faults forms a superb natural laboratory for the study of earthquake physics. Its seismic, geodetic, and geologic data are among the best in the world. Moreover, Southern California contains 23 million people, so that high seismic hazard translates to nearly one-half of the national earthquake risk. The Center's tripartite mission statement emphasizes the connections between information gathering, knowledge formulation through physics-based modeling, and public communication of hazard and risk. Created in 1991, SCEC has since expanded to 54 institutions involving over 560 scientists.

Improving the Trauma System Response to Disaster. Funding Organization: National Library of Medicine, two years, $246,534. Principal Investigator: Charles C. Branas, University of Pennsylvania, Department of Biostatistics and Epidemiology; (215) 573-5381; cbranas@cceb.med.upenn.edu.

Although trauma center hospitals play a major role in responding to disasters, there has been little attention paid to preparing multiple trauma centers to work together in a network in anticipation of an overwhelming catastrophe. This research will answer the following questions for the 25 most urbanized cities in the United States: 1) Are medical capabilities available to respond to injury-generating disasters and at what point will those abilities be overwhelmed? 2) What will be the optimal order of execution of mutual aid agreements among neighboring trauma centers so that casualties are addressed as quickly as possible? What will be the health impacts when, during and after a disaster, one center is unable to address its day-to-day injuries? 3) How can different national databases best be used to improve disaster management via the trauma care system?

Homeland Security and Medical Response. Funding Organization: National Library of Medicine. $150,000. Principal Investigator: Louise Dembry, Yale New Haven Health System; (203) 688-3224; louise-marie.dembry@ynhh.org.

This project will cooperate with federal agencies and various medical schools and universities to develop a secure electronic repository of homeland security and medical response information and best practices. When completed, the database will be accessible via a secure Web site to target audiences such as first responders, healthcare professionals, urgent care centers, government agencies, and academics.

Social Complexity and the Management of the Commons. Funding Organization: National Science Foundation, three years. Principal Investigator: David Bennett, University of Iowa, $198,355; (319) 335-2123; david-bennett@uiowa.edu. Principal Investigator: Paul Robbins, University of Arizona, $143,607; (520) 626-6000; robbins@email.arizona.edu. Principal Investigator: Catherine L. Kling, Iowa State University; $251,380; (515) 294-5225; ckling@iastate.edu. Principal Investigator: David L. McGinnis, Montana State University at Billings; $81,658; (406) 657-2046; dmcginnis@msubillings.edu.

These collaborative projects will study the mechanisms by which place-based decision making leads to changes in the management of shared resources and ecosystem services, such as clean water, wildlife, recreational opportunities, and scenic beauty. Through surveys and interviews, the researchers will explore differences in the way social and economic groups value economic and non-economic services of the landscape; endogenous and exogenous agents of change that affect these values; and power relationships among individuals, coalitions, and public decision makers. Statistical and agent-based models will be developed to evaluate the efficacy with which the will of the people is transformed into changes in land use practices and thus the production of the ecosystem services. The research will focus on the greater Yellowstone ecosystem, but will be transferable to other regions. The questions are particularly important to the western United States and to hazardous coastal areas, where population influx and greater mobility have led to a profound transition in valuation and management of the land as new stakeholders make claims on resources traditionally managed by differing communities and constituencies.

Coping with the Threat of Terror. Funding Organization: National Institute of Mental Health, two years, $138,852. Principal Investigator: Brett T. Litz, Boston University Medical Campus, (617) 232-9500; brett.litz@va.gov.

Little is known about the extent to which people's mental health and function are impaired by the threat of terrorism. This research will assess how Israelis cope with terrorist threats and will produce measures of coping and related functional impairment that can be used in the United States to help advise citizens how they should address terrorism-related anxiety. Specifically, the project will generate a psychometrically sound measure that indexes the specific attributes of Israelis' coping mechanisms; construct a checklist that measures the functional impact of the terrorist threat; and test a causal model that posits a number of mediators and moderators of functional impairment.

Terrorism and Traumatic Responding: Exposure and Resiliency Factors. Funding Organization: National Institute of Mental Health, four years; $571,245. Principal Investigator: Stevan E. Hobfoll; (330) 672-2137; shobfoll@kent.edu.

There is increased interest in terrorism's psychological impact and its relationship to post-traumatic stress disorder, depression, generalized psychological distress, and unhealthy behaviors. However, there have been few studies of how multiple terrorist threats or strikes affect people's resiliency, vulnerability, and psychological distress. Under this grant, three studies will be conducted in Israel to examine how terrorism affects the population over time, whether resiliency dampens traumatic responses, whether vulnerability to psychological distress increases with ongoing terrorism threats, and how exposure to terrorism and subsequent psychological distress are related to a defensive coping style (characterized by support for political violence, authoritarianism, or ethnocentrism).

Patient Triage in the Aftermath of a Mass Casualty Event—A Dynamic Programming Approach. Funding Organization: National Science Foundation, three years, $350,000. Principal Investigators: Nilay Argon, University of Wisconsin—Madison, Industrial and Systems Engineering Department; nilay@engr.wisc.edu, Serhan Ziya, University of North Carolina at Chapel Hill, Statistics and Operations Research; (919) 843-6022; ziya@unc.edu, and James Winslow, Wake Forest University School of Medicine; jwinslow@wfubmc.edu.

The objective of this research project is to use operations research tools to develop a better understanding of patient triage and prioritization decisions in the aftermath of mass casualty incidents. One basic question is how medical resources should be allocated to patients in need of treatment so as to do the greatest good for the greatest number. These researchers will build mathematical models to help develop better policies that can be used in the field.

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