Hurricane Forecast Socio-Economic Working Group: Social Science Research Agenda on the Hurricane Forecast and Warning System

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The Hurricane Forecast Socio-Economic Working Group

• Many at NOAA
  – have come to recognize the importance of social science research and the need to incorporate research from these fields to enhance their mission capabilities.

• NOAA and the National Center for Atmospheric Research’s (NCAR) Societal Impacts Program formed the Hurricane Forecast Socio-Economic Working Group (HFSEWG).

• Goals:
  – Identify social science research capabilities, needs, and priorities for the hurricane forecast and warning system
  – Recommend research initiatives and projects that can be supported through interagency cooperative funding for public- and private sector academic and commercial enterprises.

• Initial planning and organization late 2003/early 2004
• 1st formal meeting at 2004 Natural Hazards Workshop in Boulder, Colorado.
HFSEWG’s activities…

- Fall 2004 and early 2005: 5 white papers drafted by 13 coauthors focusing on the state of social science research related to the hurricane forecast and warning system and future needs.
  - Social Science Research Needs: A focus on Vulnerable Populations (Phillips and Morrow)
  - Hurricane Forecasting: the State of the Art (Willoughby, Rappaport, and Marks)
  - Evacuation Decision Making and Behavioral Response (Dash and Gladwin)
  - The Economic Value of Hurricane Forecasts: An Overview and Research Needs (Letson, Sutter, and Lazo)
  - Organizational Communication and Decision Making in Hurricane Emergencies (Lindell, Prater, and Peacock)

- February, 2005: Pomona Workshop. Thirty participants included social scientists, forecasters, meteorologists, policy makers, etc.
  - Workshop report prepared and circulated spring of 2005.

- July 2005, two sessions at Natural Hazard Workshop in Boulder were held to discuss and review research priorities
  - John Sorenson of Oak Ridge National Laboratory provided a perspective on the effort and made additional suggestions.
HFSEWG’s activities...

- Fall 2005 draft summary paper prepared and circulated
  - Social Science Research Needs for the Hurricane Forecast and Warning system
- Feb 1, 2006 white papers and summary paper presented at AMS.
  - Available at www.sip.ucar.edu
- General Research Areas Identified:
  - Warning Processes
  - Decision Making
  - Behavioral Response
  - Social Impacts and Valuation
Social Science Issues Identified…

- **Warning Processes**
  - Nonlinear process involving multiple messages, sources and end users
  - **Messages (structure, format, timing, etc.)**
    - Examples: precise low probability versus less precise higher probability forecasts; watch/warning terminology; lead time analysis; graphics and visualization issues; responding to local needs; etc.
  - **Source of messages (rapid expansion of sources and repackaging of NWS forecasts)**
    - Examples: content and flow issues; utilization of sources by various decision makers; authority, trust, and knowledge perceptions; source prevalence and utilization; media consolidation for local area information, etc.
  - **Users (increased diversity of population, consumer needs and interests)**
    - Examples: cultural diversity issues; variations in interpretation vulnerable and special needs populations; public education; etc.
Social Science Issues Identified...

• Decision Making
  • Multilayered, complex, individuals, groups, organizations
    – Emergency management decisions making
    – Decision support systems
    – Integrating temporal dimensions into research
    – Decision making by businesses and non-EM governmental organizations at all levels
    – Risk Perception and role of forecast/warning
    – Formal and informal warning networks
    – Warning perception rate estimates
    – Decision constraints
Social Science Issues Identified...

- Behavioral Response
  - Evacuation, preparation, mitigation, etc.
  - Traffic modeling (development, validation, efficiency)
  - Evacuation time estimation
  - Spatial evacuation modeling
  - Development of Common protocols and data depository
  - Modeling preparation and other behavioral responses
Social Science Issues Identified…

• Social Impacts and Valuation
  – Broaden “valuation”
    • “Hidden” and broader social costs
    • Distributional aspects of costs and impacts
    • Proportional losses
  – Refine and expand economic evaluation
    • Different aspects and attributes of forecasts
      – Wind fields, forward speed, intensity, lead times, etc.
    • Different valuation methods
      – Stated and revealed preference, Bayesian, cost-loss, cost minimization
    • Different temporal and spatial scales
      – City, regional; hourly, weekly, decadal, etc.
    • Range of stakeholders
      – EM, industrial, public, vulnerable populations, etc.
  – Interdisciplinary approaches
    • Among social sciences
    • Between Social sciences and with other scientific disciplines
Recovery and Restoration Research

• Current State of the field
  – Units of Analysis
    • Individual, household/family, Businesses and other organizations, community
  – Limited, at best
    • Few in number and limited in scope
    • Majority focused on Earthquakes
  – Methodological problems and compromises
    • Sample selection bias
      – survivors or those that stay, homeowners,
    • Measurement issues
    • Limited design options
    • Often dependent on secondary data
      – Units of observation compromises
      – Temporal compromises
  – Limited cumulative knowledge
    • Results are often inconsistent and problematic
    • Require too many assumptions to combine and generalize

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Recovery / Restoration Research Needs…

• Impact / loss
  – Heterogeneity not explained by the physical event
  – Need to develop systematic and consistent approaches

• Population Displacement / Dislocation
  • Prevalence and duration
  • Determinants
  • Consequences for housing needs and recovery

• Shelter and housing

Figure 1: Impact Area Residents’ Changes in Housing Status Over Time

Need systemic research of factors determining its…
  - forms
  - prevalence of usage
  - use patterns and duration
  - transitions
  - consequences for long term recovery
Recovery / Restoration Research Needs…

- **Permanent Housing Recovery**
  - Limited planning yet critical for recovery
  - Model development needed
    - Owner/rental
    - Single family, multi-family, condominiums, etc.

- **Long term household recovery**

- **Business recovery**

- **Systemic analysis and evaluation of recovery programs and policies**
Mitigation

- Actions undertaken with the intent of reducing disaster impact and consequences
- Structural versus nonstructural
  - Structural
    - Primary focus on technological fixes to the problem
      - Dams, levees, construction materials and practices, engineered structures etc.
    - Research has been limited relative to earthquake
  - Non-structural
    - Land use planning and other approaches to reducing exposure and risk
    - Adoption, implementation, enforcement of building codes
    - Hazard adjustment by households, businesses, communities, etc
    - Insurance or other mechanisms of spreading risks
    - Research has been very limited to nonexistent
Mitigation Research Needs…

• Analysis at all levels
  – Household, businesses, communities, counties
• Political, legal, and economic constraints to various forms of mitigation
• Dynamics and complexities of choice
  – Complex nested chains of choices
    • Developers, builders, homeowners, renters
  – Political economy of choices
  – Constraints regarding choice
• Evaluate the effectiveness of various forms of nonstructural mitigation
• The temporal and spatial consequences of building code changes for improving built environment
Mitigation Research Needs…

• Research into policies and programs to enhance and encourage adoption and implementation of mitigation technology

• Improvement of models predicting household and business hazard adjustment/adooption
  – Most research has focused on earthquake hazard adjustment
  – Limited to homeowners
Couple of general comments…

- Three cross-cutting issues emerged from the HFSEWG that have equal relevance whether addressing warning, response, recovery and mitigation:
  - Vulnerable populations
    - Special needs, race, socio-economic status, gender…
  - Nonlinear warning/communication systems and decision/choice processes
  - Interdisciplinary research
    - Among Social Sciences
    - Between Social and other sciences
Additional Considerations…

• Encourage funding disciplinary and interdisciplinary workshops for developing specific hurricane research agendas
  – Diverse social science community is primed to develop a multidisciplinary advances…

• Lets not be quick to follow the Earthquake Center model
  – Some strengths and many weaknesses
  – Multi-university center model
  – Interdisciplinary agenda setting teams