Toward a Social Science Research Agenda on Hurricane Forecast and Warning Issues

David Letson
University of Miami/RSMAS

Jeffrey K. Lazo
National Center for Atmospheric Research

Walter Gillis Peacock
Texas A&M University

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Hurricanes and Society

Q: Is hurricane forecasting a societal impacts problem?

If goal is to save lives, reduce injuries or minimize social impacts of hurricanes then YES hurricane forecasting is (by definition) a societal impacts problem.

Q: Is social science research essential to solving problem?

YES! Regardless of hurricane forecasts skill, social science research improves how people communicate, perceive, understand, respond to & value forecasts.

Message: Social science research creates enormous value.
Importance of Social Science Research

Issues necessitating social science research on the hurricane forecast and warning system:
- Changes and improvements in forecast products at NOAA/NWS
- Increasing population and assets in harm’s way
- Increasingly diverse population in harm’s way
- Changes in ways to create, manipulate, and disseminate information
- New tools, methods, and paradigms within the social sciences
- Increased recognition of hurricanes impacts as social phenomena
- Specific needs of agencies such as NOAA to evaluate and justify programs and to develop guidance for future practices
In response to perceived needs…

• 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 cooperation, funding for public- and private sector academic and commercial enterprises and partnerships with private-sector information consumers.
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.

• February, 2005: Pomona Workshop. Thirty participants included social scientists, forecasters, meteorologists, policy makers, etc.

• 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.
Social Science Issues Identified...

Four thematic areas:

a) Warning Processes
b) Decision Making
c) Behavioral Response
d) Social Impacts and Valuation
Social Science Issues Identified...

a) Warnings

- Nonlinear process involving multiple messages, sources & 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 & repackaging of NWS forecasts)
    - Examples: content and flow issues; utilization of sources by various decision makers; authority, trust, & knowledge perceptions; source prevalence & utilization; media consolidation for local area information, etc.
  - Users (diversity of population, consumer needs & interests)
    - Examples: cultural diversity issues; variations in interpretation vulnerable and special needs populations; public education; etc.
Social Science Issues Identified...

b) Decision Making: Multi-layered, 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…

c) Behavioral Response: Evacuation, preparation, mitigation, etc.

– Traffic modeling (development, validation, efficiency)

– Evacuation time estimation

– Spatial evacuation modeling

– Use of Common protocols & data depository

– Modeling preparation & other behavioral responses
Social Science Issues Identified...

d) 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
    - Emergency Managers, industrial, public, vulnerable populations, etc.

- Interdisciplinary approaches
  - Among social sciences
  - Between social sciences and with natural sciences.
A Cross-Cutting Issue: Socially Vulnerable Populations

- comparative analysis to see how people perceive, receive, interpret, and respond to warning messages;
- study how informal and formal networks work to translate or effectively communicate warning information;
- similarities and differences in behavioral responses within and across groups; and
- how agencies responsible for disseminating the information can be sensitized to appropriate communication methods.
Q: Is hurricane forecasting a “societal problem?”
If the goal is to reduce societal impacts of hurricanes then absolutely YES.

Q: Is social science research essential to solving this problem?
Social science research is essential to improving how people communicate, perceive, understand, respond to, and value hurricane forecasts.

A coordinated social science research agenda for hurricane forecasting.

**Message:** Social science research create enormous value.
HFSEWG White Papers

http://www.sip.ucar.edu/hurricane/working.jsp

HURRICANE FORECASTING, THE STATE OF THE ART
H. E. Willoughby, E. N. Rappaport, and F. D. Marks

EVACUATION DECISION MAKING AND BEHAVIORAL RESPONSES
N. Dash, and H. Gladwin

ORGANIZATIONAL COMMUNICATION AND DECISION MAKING IN HURRICANE EMERGENCIES
M.K. Lindell, C.S. Prater, and W.G. Peacock

SOCIAL SCIENCE RESEARCH NEEDS: A FOCUS ON VULNERABLE POPULATIONS, FORECASTING, AND WARNINGS
B.D. Phillips and Betty Hearn Morrow

THE ECONOMIC VALUE OF HURRICANE FORECASTS
D. Letson, D. Sutter, and J.K. Lazo