

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

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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.
 - 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.

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.**

Conclusion

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