NCAR

Weather and Society Watch

A Publication of NCAR's Societal Impacts Program (SIP) **Volume 1, Number 4, July 20, 2007**

USABLE Science vs. Usable *SCIENCE*: Choose Your Emphasis[1]

by Michael H. Glantz*

> **us·able**; adjective
> variant(s) also **use·able**
> 1: capable of being used
> 2. convenient and practicable for use
>
> -Webster's Ninth Edition 1991

The phrase "usable information" as it relates to science has been around for well over two decades. The phrase was purposely used in the wording of the law that created the US Global Change Research Program (USGCRP) in 1990. The USGCRP was established to develop "usable information on which to base policy decisions."

Most likely, though, the desire for usable information stemming from scientific inquiries or from observations has existed at least since the formation of human settlements. How can we do something to protect ourselves from the elements? How can we do what we do now *even better, faster, or more efficiently?* These are the kinds of questions that likely led to various usable scientific and technological developments. The idea behind "usable science" was driven as much by humanitarian practical needs as by the scientific community seeking to "sell" its products to society.

Some societies have managed to push ahead of others in the drive to develop and use helpful, new technological devices, which are examples of the products of usable science. Even in ancient times, there was always a gap between the technological "haves" and "have-nots" that persists today. This gap, however, seems to be growing by leaps and bounds as we enter the 21st century. As an example, although we are in the digital era, a "digital divide" has already emerged between developed and developing countries, and even in industrialized countries, including the United States. Today, many around the globe are attempting to bridge this divide between rich countries and poor ones, and between rich and poor citizens in any given country.

The truth is that all science, even basic science, becomes usable at some point, even if that point is in the distant future.

The phrase "usable science" seems pretty obvious and straightforward. It suggests that scientific research findings are useful for societal or individual well-being, and especially useful for decision makers. The belief is that the more scientific research that is being undertaken, the "better" the decisions are likely to be. This is accompanied by the belief that the better the scientific research output becomes, the more usable it is likely to be. As simple and straightforward as the phrase appears to be, though, closer scrutiny leads us to realize that it sends mixed messages.

We can emphasize the first word, "usable," or we can emphasize the last word, "science." Depending on which emphasis we choose, a different message is conveyed.

(continued on page 6)

An April 2007 tornado caused extensive damage to this preschool in Rosita Valley, Texas. (Photo by Ilan Kelman; http://www.ilankelman.org/)

In This Issue

Impact of Severe Weather on People with Hearing Loss

by Vincent T. Wood*

Everybody is affected by one of the most common emergencies, a severe weather event. When inclement weather approaches a community, hearing people can obtain the warnings through a variety of sources—television and radio announcements, word of mouth, wireless technology, and tornado warning sirens. Some hard of hearing and almost all deaf people, though, have limited access to these sources and often have difficulty receiving warning information (Wood and Weisman, 2003). These individuals may not be able to hear a tornado warning siren's ear-piercing wail when a tornado has been sighted. Nor may they hear noise from approaching storms. Whether they're driving or at home, they have little or no access to radio emergency information because they may not completely hear or understand radio weather broadcasts. They may also have difficulty gathering hazardous weather information from television. For example, weather alerts may not feature closed captioning[1], or weather "crawls" along the bottom of the screen may be obscured by closed captioning of regular programming. Uninformed individuals with hearing loss have difficulty making appropriate decisions about when to seek shelter or assistance.

Lack of weather education, including safety tips, preparedness plans and assistive technologies, further isolates deaf and hard of hearing citizens from weather alerts. These individuals are forced to rely on visual references in the sky or alerts from hearing people as their primary methods of receiving both routine and emergency information. Lack of awareness of the weather alerting needs of people with hearing loss has created a deficiency or "hole" in the nation's weather warning system. Hearing loss has a major impact on communication in weather emergencies because a hard of hearing person's dependence on auditory information becomes impossible.

In this brief article, I use the term "deaf and hard of hearing" to encompass a diverse group of Americans. These individuals have various onsets and degrees of hearing loss. For instance, people can be born deaf or hard of hearing, become deaf after they have developed a spoken language base ("late-deafened"), or become hard of hearing at any age for a variety of reasons. In the subsequent sections, I discuss several methods of access to severe weather information for people with hearing loss.

Aftermath of a 2003 hail storm in Muleshoe, Texas
(Photo by Gregory Thompson; http://www.inclouds.com)

Lack of awareness of the weather alerting needs of people with hearing loss has created a deficiency or "hole" in the nation's weather warning system.

Television

Television has become the primary source of daily weather information for the American public. Many families have at least one television set and depend entirely on local weather information for help in planning their daily activities. Nearly all viewers with hearing loss receive visual weather alerts from television because stations display weather news crawls and maps that highlight counties under watches and warnings.

Under the 2000 Federal Communications Commission (FCC) emergency ruling, broadcasters, cable operators, and other multichannel video program distributors are required to make the emergency information that they disseminate to their hearing viewers accessible to people with hearing loss. The information must be provided in a visual format such as closed captioning, scrolling words, crawls, or an alternative method of visual presentation.

Before the FCC ruling, television warnings were issued through bulletins, during which regular programming was interrupted for severe weather or other emergency information. These bulletins usually consisted of an ad-libbing broadcast meteorologist showing a live radar display or video of the severe weather. Most of the bulletins contained little text information about the warnings. As with other live programs, no closed captioning was provided. This latter problem was usually shared by the weather segment of regular news broadcasts; these segments were not scripted and no closed captioning was

(continued on page 7)

From the Director

Thank You!
by Jeff Lazo*

This issue represents the completion of our first year of publication of *Weather and Society Watch*!

I sincerely want to thank all of the individuals involved in this effort for your editorials, articles, photos, announcements and other invaluable contributions. While there are too many of you to mention in this brief note, please know that our readers have enjoyed a variety of excellent and insightful articles from all sectors of the weather enterprise and societal impacts community, as well as eye-catching photos, book reviews, etc.

As stated in our first newsletter edition and on the newsletter Web site at http://www.sip.ucar.edu/news, the purpose of *Weather and Society Watch* is to "provide a forum for those interested in the societal impacts of weather and weather forecasting to discuss and debate relevant issues, ask questions, and stimulate perspective." The newsletter is just one of the many vehicles through which we have worked to build a stronger, more connected and more informed societal impacts community.

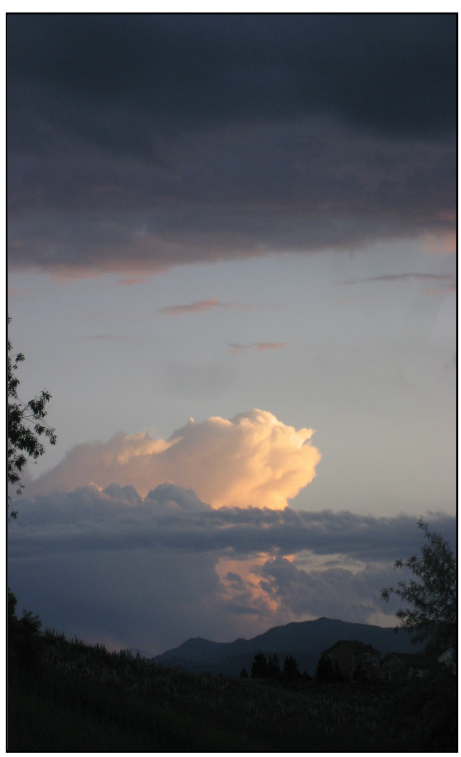
As we move into our second year of *Weather and Society Watch* publication, we want to know how we are doing with respect to meeting these objectives. And even more importantly, we want to know if we are adding value in the area of societal impacts of weather and weather forecasting, as well as satisfying the needs and curiosities of our readers.

As part of our effort to assess these issues, we will be contacting subscribers, contributors and others with an online survey to ask how we've done so far—and where we should go next! Your feedback will be an integral part of helping us improve future issues. So please keep an eye out for correspondence from us later this summer or early in the fall!

In anticipation of this assessment, I would like to ask you, our reader, to please share your thoughts, issues, questions and concerns with us now so that we may address those in the assessment. Please send your feedback to me at lazo@ucar.edu by the middle of August, when we plan to finalize development of our survey.

I look forward to hearing from you, and I hope you will respond when you hear from us! Thanks again for sharing this first year with us. We hope you have enjoyed the journey.

*Jeff (lazo@ucar.edu) is the director of NCAR's SIP.



Clouds build over Boulder, Colo. foothills on a summer afternoon
(Photo by Emily Laidlaw)

Job Opportunities

GIS Coordination Officer

UNJLC Pakistan's information and communications unit seeks candidates with at least 8 years of GIS experience for a 1 to 2-month position to assist in coordinating humanitarian aid as a result of recent floods.

The position's primary responsibilities are to:
- Maintain UNJLC's GIS capacity to support the logistics cluster's coordination activities
- Represent UNJLC within the humanitarian GIS community in Pakistan
- Serve as inter-agency focal point for the generation and dissemination of maps and spatial data related to logistics and aid distribution provided by UN agencies and NGOs
- Build capacity within NDMA through the management and training of local GIS staff, as per the UNJLC exit strategy

The right candidate should have:
- Experience in inter-organizational collaboration
- Ability to maintain strong coordination with a dispersed team
- Ability to adapt to difficult working conditions in the field
- Working knowledge of ArcGIS including: advanced cartography, data editing, data management
- Hardcopy map production skills: Adobe Acrobat, Illustrator, Photoshop, large format printing
- GPS data collection and data processing skills
- Fluency in written and spoken English

Please contact Sean Messick immediately at smessick@vi.org or (503) 233 3692 if you are interested in the position.

(continued on page 11)

Science, Technology and Disasters: Integrating End-User Needs[1]

by Havidán Rodríguez,[1] Jenniffer Santos,[2] William Donner,[3] and Walter Díaz [4]

Disaster losses result from the intersections among the physical, the built, and the social environments (Mileti, 1999). If we are to understand the causes and consequences of disasters and how to mitigate their devastating effects, then we must first understand the social context in which they take place.

New and innovative technological developments have allowed us to enhance our understanding, prediction, and sensing of climatological events, resulting in greater access to weather information, improved data quality, and reduced uncertainty associated with weather events. However, the public receives, interprets and responds to this information in a myriad of ways that can be, in many instances, contrary to expectations. For example, instead of immediately taking protective action, many individuals seek to confirm the information they receive, sometimes putting their lives at risk.

As a result, we need to understand how individuals receive and process information and if and how they decide to take protective action. We need to understand the underlying social factors that have an impact on the individual decision-making process at times of imminent danger. Consequently, we must focus on integrating climate- and weather-related research issues with social science research issues.

In the April 2007 issue of *Weather and Society Watch*, Raymond Ban, the executive vice president for meteorological science and strategy at The Weather Channel, argued that the atmospheric science community devotes insufficient time and energy to understanding user needs and the decision-making process. Although we agree with this observation, it is also important to note the work of the Center for Collaborative Adaptive Sensing of the Atmosphere (CASA), a collaboration among the University of Massachusetts, the University of Oklahoma, Colorado State University, and the University of Puerto Rico.

As an NSF-funded engineering center, CASA allows researchers to strive to integrate the knowledge and technology generated by engineers and meteorologists with the findings and knowledge generated by social scientists. Their goal is to diminish the devastating impacts of disasters, thus contributing to a reduction in the loss of life, injuries, and damage to property.

This house in Rosita Valley, Texas was severly damaged in an April 2007 tornado . (Photo by Ilan Kelman; http://www.ilankelman.org/)

CASA aims to develop weather technology that takes into account the difficulties, needs and recommendations of end users; its goal is to revolutionize how we detect, monitor and predict severe weather. Social science research, however, shows that the demographic and socioeconomic characteristics of end users—along with their access to and use of technology—inform their decisions. Consequently, we must take these factors into account if new technologies or policies are to effectively address the range of problems public safety institutions routinely face.

Social scientists at the University of Delaware's Disaster Research Center (DRC) and the Center for Applied Social Research (CISA) at University of Puerto Rico-Mayagüez are contributing to CASA's research efforts by exploring the social and behavioral dimensions of severe weather forecasts and warnings. We are examining how improved forecasting can reduce the exposure and vulnerability of individuals and property to routine and extreme weather events. Results from these studies systematically address issues related to end users' views of and preferences for available and preferred weather information, the technology needed to access information, weather forecasting, warning processes, and risk communication, among others.

Our work shows that interdisciplinary research collaborations are critical, both for examining the adequacy of the emergency management infrastructure and for ensuring that emergency managers are able to manage the information and data provided by CASA.

The Okla. End-User Community

In-depth interviews with the Oklahoma end-user community show that there are significant differences in terms of training, experience and access to resources among emergency managers. A number of interviewees reported a variety of concerns, including inadequate radar coverage in their geographic areas, inadequate and obsolete technology, limited lead time, a high incidence of false alarm rates (FARs), poor communication with the public and other agencies, and a lack of training among emergency management personnel.

(continued on page 9)

Evaluating the Effectiveness of Storm-related Risk and Emergency Communication

by Donna J. Kain*

It seems like common sense to suggest that effectively communicating with the public about weather emergencies and their risks may save lives and property and diminish the severity of storm impacts. Yet communication problems during recent disasters, including hurricanes Katrina and Rita in 2005, illustrate the challenges of providing adequate information to the public before, during and after serious events, along with the consequences of failing to communicate effectively.

Communication with the public is a multilateral activity shaped by social and cultural realities, as well as specific circumstances. Literature about risk and emergency communication from the fields of sociology, risk analysis, psychology, and communication studies establishes that the public's ability to understand and use risk information depends on message reception, as well as access to information. The efficacy of communication depends on factors such as timing and medium; language and literacy; culture; occupation and economic status; and other demographics.

In addition, research has demonstrated that, for both expert and lay audiences, decisions about how to respond to emergencies are determined by personal and social considerations (see, for example, Grabill and Simmons, 1998; Baron et al., 2000; Roepik and Slovic, 2003; and Rosati and Saba, 2004). These determining factors include risk awareness and perception; level of media focus on an issue; trust in information and in the groups disseminating that information; risk–benefit trade-offs; and proximity (the closeness of personal experience to a risk). Although we can list the considerations that go into developing risk and emergency information for different segments of the public, converting general principles into communication strategies that work for different types of emergencies and with different audiences requires that we understand why communication succeeds or fails in a specific context.

To further this understanding, researchers at East Carolina University conducted document-based interviews with residents of a coastal community using a guide to surviving hurricanes as a sample text. The interviews were part of a recent pilot study of risk and emergency communication related to severe weather events. By asking people to react to comprehensive official information about hurricanes and evacuation, we hoped to uncover their implicit knowledge and opinions and inventory possible determinants for their decisions about whether or not to evacuate.

What We Did

The document we used in the pilot study provides information about preparing for storms, evacuating safely, and returning to the area after an evacuation. Additional information in the guide includes definitions of storm categories 1–5, checklists for emergency preparedness, and information about where to obtain further information in the event of a severe storm. The interviews consisted of "plus-minus" evaluations (de Jong and Schellens 2000; de Jong and Rijnks 2006) of the document and involved three steps:

1. We asked participants to read the complete four-page document, giving them red pens and asking them to mark plus signs by material to which they reacted positively and minus signs by material to which they reacted negatively. Participants could mark the text for any reason and in any unit (word, sentence, paragraph, section, or graphic) that they chose.

2. We then reviewed responses with each participant individually, asking each individual to comment on the reasons they marked particular items. Participants' comments were collected on information sheets preformatted with sections that corresponded to each section of the guide. The sheets

(Continued on page 8)

Scattered debris surrounds a former preschool after an April 2007 tornado in Rosita Valley, Texas. (Photo by Ilan Kelman; http://www.ilankelman.org/)

Usable *(continued from page 1)*

To me, "usable SCIENCE" (emphasis on science) is a call to improve physical science research so that it can be packaged for the public, hopefully in a form people can effectively use. "Usable SCIENCE" also suggests that the problem of understanding the interactions among the physical, biological, and social processes rests with a public lack of understanding of science. If that is the interpretation, then the remedy for enhancing the *usability* of scientific research output is to come up with better scientific research (i.e., reduce uncertainties) and an improved understanding of statistics (i.e., probabilities). The remedy also includes identifying ways to reduce scientific uncertainties with faster and bigger hardware (i.e., computers) that can run gazillions of calculations in fractions of seconds, enhancing science and math education from K-12, and so forth.

Consider now the phrase "USABLE science" (emphasis on usable). This emphasis represents a call for improving not the science but the ways in which society can use scientific information that already exists. The truth is that all science, even basic science, becomes usable at some point, even if that point is in the distant future. In fact, lots of scientific research findings are ready for use today for the benefit of society and the well-being of its citizens. Even though most scientific research output may be surrounded by uncertainties, it can still be used in decision-making processes. The truth is that decisions are made all the time with less-than-perfect information available to decision makers.

Some years ago, there was a political debate about how funds for science are allocated. A U.S. senator questioned whether the National Science Foundation was supporting research that was useful to the nation. More specifically, she questioned support for "curiosity-based" scientific research versus "need-based" research that would demonstrably benefit society in the not-too-distant future. This is a false dichotomy. Society needs both kinds of research because it is highly likely that curiosity-based research will eventually yield benefits to society. The controversy died a quiet death after the senator withdrew her opposition to curiosity-based research. Yet, another conflict still rages: To what extent should funding for physical science research be shared with the social sciences interested in making scientific research output more usable to the public?

The funds required for social scientists and other practitioners to make existing scientific information more usable and useful represent but a small percentage of those allocated to the study of physical sciences. Supporting scientific inquiry without supporting efforts to enable society to better use such information would be could be equated to trying to make a sound by clapping one hand.

A good example of the conundrum is the 60-hour (in advance of landfall), near-perfect forecast of the trajectory of devastating Hurricane Katrina in late August 2005. The scientific community cheered the "success" of the forecast's accuracy. Shortly after the event, a call was heard for increased research funding in order to increase the forecast's lead time to 70 hours. Yet we can question whether more lives might have been saved (of the more than 1,800 official deaths associated with Katrina) if only more lead time had been available to respond.

Or, would it make more sense to focus on social science research aimed at making the 60-hour forecast more usable and more effective—*before* providing more research support for an improved understanding of the physical aspects of a hurricane that would produce a reliable 70-hour lead time for landfall? It is well beyond the time that the physical science community enter into a true partnership of equals with the social sciences and those engaged in applied research to make scientific information useful in the public's decision-making processes.

[1] A similar version of this article first appeared on the Fragilecologies Web site at http://www.fragilecologies.com.

*Michael (glantz@ucar.edu) is a senior scientist at NCAR and director of the Center for Capacity Building (CCB).

Heads Up!

Many early warning systems (EWSs) are in operation today to warn the public, governments and businesses about impending climate, water, and weather-related hazards, along with other natural and human-made threats. The experiences and insights identified in the use of EWSs around the globe can help inform officials and other decision makers about how to prepare and communicate effective early warnings. Shared experiences and insights from the use of EWSs can also educate the media and the general public on how to interpret warnings and apply them to their own local needs.

Heads Up! Early Warning Systems for Climate, Water and Weather, a new book edited by Dr. Michael H. Glantz, purports to identify ways to make early warnings of potential "threats" to society and the environment more useful, usable, credible and reliable. More than a dozen researchers have contributed sections to the book, which contains 190 pages and 70 full-color photos. The cost is $10 plus $2 shipping. To order, please email jan@ucar.edu. For more information, please visit http://www.ccb.ucar.edu/warning/headsup.html.

available. This prevented deaf and hard of hearing viewers from obtaining the needed information. Additionally, weather news programs using pre-scripted captions typically presented only partial information, and captions were often not synchronized with what viewers saw on the television screen.

After the FCC ruling, most local television stations have taken steps to prevent the blocking of crawls by captioning or vice versa. Solutions have included moving the crawls to the top of the television screen or slightly shrinking the portion of the screen containing the regular programming and its associated closed captioning and running the unobstructed crawl below or above it.

This requirement doesn't only benefit the deaf and hard of hearing community; increasingly, it is bringing about improvements for hearing people who have difficulty hearing television broadcasts in places such as noisy sports bars, airports, and restaurants. Additionally, the captions benefit hearing individuals who are learning English as a second language or developing reading skills. Thus, emergency information can reach a broad spectrum of people.

Buddy System

Individuals with hearing loss often ask their hearing families, neighbors, coworkers and friends to be their source of weather emergency information. Reliance on hearing persons, though, sometimes delays the emergency weather response for those relaying the warning and those being warned. This warning method is also unreliable because the hearing individuals may not relay all of the pertinent details of the warning information. In addition, this system can easily break down in that the hearing person may not be able to contact the person in need because of other responsibilities, a downed telephone line, unavailable cell phone service, or other reasons. And in times of stress, hearing people can sometimes simply forget their buddy responsibility.

The Internet

Individuals with hearing loss can obtain Internet-based emergency weather information via e-mail alert notification services through local newspaper Web sites and state and local government Web sites. But an Internet site can be slow to load or can sometimes be inaccessible. Power failures, common during lightning activity accompanying severe weather, can also prevent an individual from accessing a Web site. Some Web sites deliver live weather broadcasts available through streaming video on the Internet. This video information, though, continues to be a barrier because captioning to make audio information accessible to deaf and hard of hearing individuals is often lacking.

Wireless Pagers and Personal Digital Assistants (PDAs)

Wireless pagers and PDAs play an increasingly important role in disseminating life-saving information to people with hearing loss (even though they must be located within a good coverage area). For example, the Oklahoma Weather Alert Remote Notification (OK-WARN) program gives deaf and hard of hearing Oklahomans better access to hazardous weather information via alphanumeric pagers, PDAs, and e-mail addresses (Wood, 2007). Another example is the emergency e-mail and wireless network (www.emergencyemailnetwork.com), a national, free public service that can send a deaf or hard of hearing individual e-mail notifications about local natural disasters or other emergencies. By having an instant severe weather report at a user's fingertips, he or she can (1) be informed without having to rely entirely on television, radio, other forms of media or word of mouth; (2) be prepared by knowing what to do when adverse weather approaches; and (3) be educated about the changing weather.

NOAA Weather Radio

NOAA designed its special-needs NOAA Weather Radio (NWR) receiver to adapt to the needs of the deaf and hard of hearing community. The receiver, which is programmable and has Specific Area Message Encoding (SAME) capabilities, can warn the community of hazardous conditions by disseminating round-the-clock, up-to-the minute weather information (Wood and Weisman, 2003; Putkovich, 2006). The receiver has outputs that turn on bed or pillow shakers or strobe lights,

(continued on page 11)

Vivid lightning strikes Longmont, Colo. during this 1999 storm. (Photo by Greg Thompson; http:www.inclouds.com)

also contained a section for overall impressions. We also digitally recorded the interviews.

3. After reviewing the documents, we asked the participants about themselves, including where they lived and worked, whether they had experienced any tropical storms or hurricanes, and whether they had ever evacuated. We also posed questions about demographics such as age, education, and occupation. Finally, we asked participants experiential questions about their motives for not evacuating when an evacuation order is issued, their perceptions of characteristics of people who evacuate and people who stay during a hurricane, and the roles that media and authorities play during serious weather events.

Resulting data were placed into an Excel spreadsheet for analysis. Our analyses are not yet complete; however, we have developed some preliminary observations.

What We're Finding Out

The document-based interviews are part of a larger, ongoing study of risk and emergency communication. Although our primary purpose in the interviews was not to test the document's effectiveness, we learned a number of things about readers' reception of the information provided and the document's design. For example, interviewees identified information that they regarded as important, such as descriptions of storm categories that included examples of potential damage at different storm strengths, and information they regarded as unimportant, such as a list of the names of past storms. They also commented on readability problems, pointing out, for example, sections in which the font was too small to read comfortably and passages that they found confusing. Based on their experiences, participants also made suggestions about information they thought should be included. A number of participants found the information in the guide "useful" and "comprehensive," but viewed the guide as more appropriate for newcomers and visitors than for residents.

More interesting to us than their observations about the document were participants' responses that revealed individual knowledge of emergency procedures, attitudes about risks, and their decision-making processes. For example, some participants indicated that they were unfamiliar with the characteristics of different storm categories; some didn't know where to find shelters in the event of an emergency. By contrast, several participants told us that they have their own weather forecasting instrumentation and tracked the path of each storm. Even though most participants we interviewed indicated that they were unlikely to evacuate for Category One or Category Two hurricanes, they characterized people who didn't evacuate as "risk takers," implicitly—though unintentionally—including themselves in that category. Overall, participants indicated that their decisions to evacuate or stay were informed by a number of factors including personal safety, fears that sitting in evacuation traffic might be more dangerous than staying, and concerns that they would have difficulty returning to their property after an evacuation.

One way to gauge the effectiveness of information about risks and emergencies is to test messages with representatives of the public well before they need to use it. But we're finding that the benefits of testing information designed for the public extend beyond the specific message under consideration. When participants talk about what works and what doesn't, they also tell us about their attitudes and behaviors.

References

Baron, J., J.C. Hershey, and H. Kunreuther, 2000. Determinants of priority for risk reductions: The role of worry. *Risk Analysis,* **20**(4): 413–427.

de Jong, M., and D. Rijnks, 2006. Dynamics of iterative reader feedback: An analysis of two successive plus-minus evaluation studies. *Journal of Business and Technical Communication*, **20**(2): 159–176.

de Jong, M., and P.J. Schellens, 2000. Toward a document evaluation methodology: What does research tell us about the validity and reliability of evaluation methods? *IEEE Transactions on Professional Communication,* **43**(3): 242–260.

Grabill, J.T., and W.M. Simmons, 1998. Toward a critical rhetoric of risk communication: Producing citizens and the role of technical communicators. *Technical Communication Quarterly,* **7**(4): 415–441.

Ropeik, D., and P. Slovic, 2003. Risk communication: A neglected tool in protecting public health. *Risk in Perspective,* **11**(2): 1-4.

Rosati, S., and A. Saba, 2004. The perception of risks associated with food-related hazards and the perceived reliability of sources of information. *International Journal of Food Science and Technology* **39**: 491–500.

Sapp, S.G. 2003. A comparison of alternative theoretical explanations of consumer food safety assessments. *International Journal of Consumer Studies* **27**(1): 34–39.

*Donna (kaind@ecu.edu) is an assistant professor of English, specializing in technical and professional discourse; director of outreach for the Renaissance Computing Institute at East Carolina University/Coastal Systems Informatics and Modeling (RENCI/C-SIM); and a core faculty member of the Center for Natural Hazards Research at East Carolina University. Menno de Jong, professor of technical communication at the University of Twente and Catherine Smith, professor of English, specializing in technical and professional Discourse at East Carolina University, also contributed to this article.

It is also noteworthy that there is rarely a single piece of information that leads emergency managers to sound local sirens. Generally, such decisions are made when a variety of sources—such as radar data from the National Weather Service (NWS) and reports from storm spotters and amateur ham radio operators—agree that severe weather is imminent.

But not all jurisdictions in Oklahoma have access to the same technology or the same sources of information. Moreover, information sources often regarded as secondary or complementary in well-financed jurisdictions are often the only ones available to emergency managers in poorer rural communities. For example, even though nearly all emergency managers regarded the media as an important information source, its importance seems to be greater for those located in more rural areas. The emergency managers in these areas, however, also acknowledge that they are generally ignored by the media, particularly if another event is taking place in an urban area at the same time.

Our research also documents that emergency managers in rural areas may not have the resources they need, including up-to-date technology, high-speed Internet access, or access to continuous training opportunities, among others (Rodriguez et al., 2005). Economic and technological resources are unevenly distributed between urban and rural (and poorer) communities, generating a "digital divide" (Marks, 2006). The lack of resources has negative implications for the professional growth and development of emergency managers and, therefore, on their ability to adequately prepare and respond to hazard events in their communities.

Consequently, these communities may suffer greater negative impacts from hazard events than communities with more resources. This presents major challenges for technological innovations, particularly when communities already have limited access to existing resources. Our work shows that interdisciplinary research collaborations are critical, both for examining the adequacy of the emergency management infrastructure and for ensuring that emergency managers are able to manage the information and data provided by CASA.

Conclusions

Improved technology may increasingly contribute to better disaster mitigation, preparedness and response. Nevertheless, the social, demographic, economic, cultural and political characteristics of different communities hold significant consequences for preparedness and response to severe weather at the organizational and community level. CASA has taken on a major challenge—addressing the inequities between urban and rural areas—with the goal that new technology does not exclusively or primarily enhance the capabilities of end-user communities in urban areas at the expense of rural and remote communities. Our research confirms that when developing and implementing technological innovations, the atmospheric science and engineering community must take into account end-user characteristics and needs, and how these affect the decision-making process during severe weather events. CASA continues to move in this direction.

This "end-user integration approach," however, should also be applied to other technology development and transfer efforts in the atmospheric sciences, as well as in other areas of the physical sciences and engineering. Improving weather forecasts, reducing FARs, and increasing lead times are only part of the equation in determining the ultimate effectiveness of organizational and individual preparedness and hazard response (Rodriguez et al., 2006). It is also imperative that we take into account the social context in which these events occur.

[1] This work was supported in part by the Engineering Research Centers Program of NSF under NSF Award Number 0313747. Any opinions, findings, conclusions or recommendations expressed are those of the authors and do not necessarily reflect those of NSF.

References

Ban, R., 2007. Moving Toward Symbiosis Between Physical and Social Sciences. *Weather and Society Watch,* **1**(3), 1.

Marks, D., 2006. *Digital Inequality and the Implementation of New Technologies: Problems with Technological Diffusion among Oklahoma Emergency Managers.* Disaster Research Center Preliminary Paper #354. Newark, DE: University of Delaware.

Mileti, D., 1999. *Disasters by Design: A Reassessment of Natural Hazards in the United States.* Washington, DC: Joseph Henry Press.

Rodríguez, H., W. Diaz, J. Santos, and B. Aguirre, 2006. Communicating Risk and Uncertainty: Science, Technology, and Disasters at the Crossroads. Pages 476–488 in *Handbook of Disaster Research*. Edited by H. Rodriguez.

E.L. Quarantelli, and R. Dynes. New York: Springer.
Rodríguez, H., W. Diaz, W. Donner, J. Santos, and D. Marks, 2005. *Allocation of Radar Resources and Policy Implications: The End-User Community in Oklahoma.* Disaster Research Center Preliminary Paper No. 345. Newark, DE: University of Delaware. Havidan

[1] Havidan (havidan@udel.edu) is the vice-provost for academic affairs & international programs at the University of Delaware.

[2] Jenniffer (jsantos@udel.edu) is a graduate research assistant for DRC.

[3] William (wdonner@udel.edu) is a graduate research assistant for DRC.

[4] Walter (wdiaz@uprm.edu) is the director of the Center for Applied Social Research (CISA) at the University of Puerto Rico-Mayagüez.

Conferences and Opportunities

Call for Papers: Third Symposium on Policy and Socio-Economic Research

Symposium Date: January 20-24, 2008
Location: New Orleans, La.
Abstract Deadline: August 1, 2007

The Third Symposium on Policy and Socio-Economic Research will be part of the 88th AMS Annual Meeting in New Orleans, La. Meeting information will be posted on the AMS Web site (http://www.ametsoc.org/meet/annual/) in mid-September.

Papers are being solicited on: 1) Natural hazards and the role of the earth system sciences in planning and mitigating future impacts, 2) International atmospheric science policy, and opportunities for collaboration and cooperation 3) Policy and socio-economic research methods, and evaluations of the success of interdisciplinary research, and 4) Emerging policy issues and challenges.

The symposium will include an additional session focused on hazards, restricted to papers addressing the following questions: 1) Does planning, mitigation, and improved prediction actually reduce the costs of future natural disasters? and 2) What does the answer to this question mean for our future endeavors as a field?. Papers will be selected that provide a diversity of disciplinary, organizational and cultural perspectives on this issue.

Please submit your abstract electronically at http://www.ametsoc.org/meet/online_submit.html by August 1, 2007. An abstract fee of $90 is charged at the time of submission. Authors of accepted presentations will be notified by late September 2007.

For additional information, please contact the program co-chairpersons: Mark Shafer at 405-325-3044 or mshafer@ou.edu; and Genevieve Maricle at 303-735-4174 or genevieve.maricle@colorado.edu.

Symposium on Linkages Among Societal Benefits, Prediction Systems, and Process Studies for 1 to 14-day Weather Forecasts

Symposium Date: January 23, 2008
Location: New Orleans, La.
Abstract Deadline: August 1, 2007

This Symposium, sponsored by AMS and organized by the US THORPEX community, will be part of the 88th AMS Annual Meeting. Papers are solicited that focus on the overlaps among the socio-economic aspects of weather and weather forecasts, elements of forecast systems and forecast system design, and improved understanding of high-impact weather phenomena. Papers that focus on any one of these three aspects will be considered, but those that link two or three aspects are preferred. Abstracts must be submitted electronically at http://www.ametsoc.org/meet/online_submit.html by August 1, 2007. For additional information, please contact: Jim Hansen at (831) 656-4741 or jim.hansen@nrlmry.navy.mil; Rebecca Morss at (303) 497-8172 or morss@ucar.edu; or Greg Hakim at (206) 685-2439 or hakim@atmos.washington.edu.

University of Melbourne Future Generation Fellowships

In seeking to foster and develop excellence in research and related activities, the University is offering four Future Generation Fellowships to outstanding early career researchers. Candidates must hold a Ph.D or demonstrate equivalent standing through other expertise and experience, have an outstanding research record relative to opportunity, and be in a research field that aligns with the strategic direction of the University: Asian and Middle Eastern Interactions; Communications; Cultural, Economic and Social Analysis; Health and Medicine; or Physical and Biological Systems.

Successful fellows will be offered a fellowship of up to three years. Salary in the range A$68,256 - $73,376 p.a. will be negotiated in accordance with experience and suitability. To submit your application, you must access the online advertisement at http://www.jobs.unimelb.edu.au by using the position number (FGF2007) as the keyword in the job search screen. The closing date for this announcement is August 31, 2007.

Hearing Loss *(continued from page 7)*

or that activate a central alarm system, in which a small text display shows what type of watch, warning, or advisory has been issued, along with its duration.

Even though they represent an improvement for severe weather access, the special-needs NWR receivers have some limitations. The receiver does not display the full text of a local NWS warning, such as the source or types of weather hazards expected, nor does it display the basic safety measures to be taken. Because of this limitation, many persons with hearing loss continue to use television or to depend on hearing people for up-to-the-minute weather information.

Weather Safety Education

Many weather education sources—which contain detailed information on safety tips, preparedness plans, and various types of weather hazards—can be found on the Internet. Weather safety education resources like these should help reduce the risk of injuries or fatalities while also preparing deaf and hard of hearing people to respond properly to weather threats.

Substantial progress has been made in the last decade to close this hole in the nation's weather warning system by increasing the amount of weather emergency information available to people with hearing loss. Television stations continue to come into compliance with the FCC's emergency regulations. New technologies, such as pager systems, PDAs, and weather radios adapted for use by those with special needs, along with other visual warning systems, have given this population greater and more reliable access to the information.

[1] Closed captioning is similar to captions or subtitles that are encoded (hidden) in the blanking interval of the TV signal; that provide information about spoken dialogue, background noise, and sound effects; and that are invisible without a special decoder (Robson 1997). The Television Decoder Circuitry Act of 1990 states that since July 1993, all American television sets with screens 33 cm (13 in.) or larger diagonally must contain built-in decoder circuitry.

References

Putkovich, K., 2006. Emergency warnings save lives. *Hearing Loss,* **27,** 1, 40–42.

Robson, G. D., 1997. *Inside Captioning.* CyberDawg Publishing, 245 pp.

Wood, V.T., 2007. OK-WARN: Oklahoma weather alert remote notification. Preprints, American Meteorological Society 16th Symposium on Education, San Antonio, Texas, 14–16 January, CD-ROM, P1.25.

Wood, V.T., and R.A. Weisman, 2003. A hole in the weather warning system: Improving access to hazardous weather information for deaf and hard of hearing people. *Bull. Amer. Meteor. Soc.,* **84,** 187–194.

*Vincent (Vincent.Wood@noaa.gov) is a research meteorologist with NOAA's National Severe Storms Laboratory in Norman, Okla.

Jobs *(continued from page 3)*

OU Assistant Professor

The Department of Geography at the University of Oklahoma invites applications for a nine-month, tenure-track assistant professor position in physical geography, beginning August 16, 2008. Ph.D. required at time of appointment. Salary commensurate with experience.

Broadly trained physical geographers with research interests in fluvial geomorphology, soils, or hydro-climatology are encouraged to apply. Research and teaching in environmental conservation with a regional interest in the Great Plains or other semi-arid regions is preferred. The candidate must engage in both graduate and undergraduate education programs, including introductory courses.

Letters of application should include a statement of teaching experience/goals and a C.V., as well as the names and contact information for three referees. Applicants must also provide an outline of their current and continuing research program including potential for extramural funding. Review of applications will begin October 15, 2007 and continue until the position is filled.

Apply by email to Dr. Bruce Hoagland (bhoagland@ou.edu) or send application materials to:
Dr. Bruce Hoagland
Committee Chair
Department of Geography
University of Oklahoma
Norman, OK 73019

About *Weather and Society Watch*

Weather and Society Watch is published quarterly by the Societal Impacts Program (SIP) at the National Center for Atmospheric Research (NCAR). The University Corporation for Atmospheric Research (UCAR) operates NCAR with support from the National Science Foundation and other sponsors.

The purpose of *Weather and Society Watch* is to provide a forum for those interested in the societal impacts of weather and weather forecasting to discuss and debate relevant issues, ask questions, and stimulate perspective. The newsletter is intended to serve as a vehicle for building a stronger, more informed societal impacts community.

Any opinions, findings, and conclusions or recommendations expressed in this publication are those of the author(s) and do not necessarily reflect the views of NSF or other sponsors. Contributions to *Weather and Society Watch* are subject to technical editing at the discretion of SIP staff.

Weather and Society Watch is available on the World Wide Web at: http://www.sip.ucar.edu/news/. Archives of *WeatherZine*, a previous weather impacts newsletter upon which *Weather and Society Watch* was modeled, are available on the Web at http://sciencepolicy.colorado.edu/zine/archives/.

Contact Us

For additional information or to submit ideas for a news item, please contact:

SIP Director: Jeff Lazo (lazo@ucar.edu)
SIP Associate Scientist: Emily Laidlaw (laidlaw@ucar.edu)

To send mail about Weather and Society Watch, please write to:

Jeff Lazo
Societal Impacts Program
National Center for Atmospheric Research
P.O. Box 3000
Boulder, CO 80307

About SIP

All aspects of the U.S. public sector, along with the nation's economy, are directly and indirectly affected by weather. Although the economic impacts of weather and weather information on U.S. economic agents have been loosely documented over the years, no definitive assessments have been performed, and information generated from the previous studies is difficult to locate and synthesize.

SIP, initiated in 2004 and funded by NOAA's U.S. Weather Research Program (USWRP) and NCAR, aims to improve the societal gains from weather forecasting. SIP researchers work to infuse social science and economic research, methods and capabilities into the planning, execution and analysis of weather information, applications, and research directions. SIP serves as a focal point for developing and supporting a closer relationship between researchers, operational forecasters, relevant end users, and social scientists concerned with the impacts of weather and weather information on society. Program activities include primary research, outreach and education, and development and support for the weather impacts community.

For more general information on SIP, contact Jeff Lazo at lazo@ucar.edu or http://www.sip.ucar.edu.