

NIST Special Publication 1093

Mass Notification Messages: Workshop Proceedings

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ABSTRACT

The goal of the workshop was to provide a forum where representatives from federal agencies could exchange ideas and current practices for mass notification in the event of an emergency and to discuss best practices for the creation of the messages that are disseminated during emergencies in the United States. The workshop included experts on mass notification from 12 different agencies in the federal government.

After a review of the state-of-the-art on public warnings, the workshop participants spent the morning and afternoon sessions discussing the following questions:

- 1) Break-out Groups: What are the differences/gaps between current mass notification systems and the lessons learned from research on community disasters?
- 2) Large Group Discussion: How do we close these gaps to ensure that the correct information is given to the public when an emergency is imminent?

The results of each session's deliberations were discussed in the concluding session of the workshop. The most significant gap identified by the workshop participants was the lack of information transfer from researchers studying how the public responds to warnings to the individuals developing warnings to disseminate to the public during an emergency. In order to close this gap, several workshop participants expressed the need for federal guidelines and tools for message providers (e.g., local officials, building managers, etc.) that outline how to develop messages for each type of emergency and then how to disseminate these messages appropriately. In addition to federal guidelines, training courses and on-line resources for message providers could ensure more effective message creation and dissemination during disasters.

Keywords: mass notification, public warnings, emergency messages, hazards, disasters, fires, emergencies

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Mass Notification Messages Workshop

February 19, 2009

National Institute of Standards and Technology

1. Introduction

On February 19, 2009, the National Institute of Standards and Technology (NIST) held a Federal Workshop on Mass Notification Messages. Participants from 12 federal agencies attended to discuss issues surrounding warning the public, building occupants, and other organizations during an emergency. The workshop, in addition to being a networking success, brought 37 federal employees and others around the table to discuss different perspectives and ideas surrounding mass notification messages and information dissemination during emergencies.

The workshop was held at the Building and Fire Research Laboratory (BFRL) within NIST. BFRL's mission is to promote U.S. innovation and competitiveness by anticipating and meeting the measurement science, standards, and technology needs of the U.S. building and fire safety industries in ways that enhance economic security and improve the quality of life. BFRL's interest in mass notification systems focuses on the disconnect between the attention paid to the development of the hardware systems (which has received a great deal of attention) and the attention paid to the creation of messages and information to be disseminated by that hardware (which has received less). There are significant measurement science and standards opportunities in this area, which must be addressed.

The purpose of this workshop was twofold: 1) to provide a forum where representatives from federal agencies could exchange ideas and current practices for mass notification in the event of an emergency and 2) to discuss the lack of attention paid to the creation of the messages that are disseminated during emergencies in the United States. During the discussion, agencies learned about the mass notification activities that are currently taking place in other agencies, discussed gaps in the current system, and then identified some possible ways forward to closing these gaps with current systems and future steps. This workshop encouraged the exchange of ideas and the development of new linkages between agency efforts that will likely continue in the months and year to come.

This workshop proceedings contains the workshop agenda; a list of the workshop participants; notes from the discussion during the workshop; a discussion of future work in the area of mass notification; a public warnings presentation given by Dennis Mileti, University of Colorado, and Erica Kuligowski, NIST; and resources provided by workshop participants to share best practices among agencies.

2. Workshop Agenda

9:00 - 9:15 am	Brief discussion of workshop agenda/organization Introductions
9:15 – 11:00 am	Presentation of social science research on public warnings given by Dennis Mileti, University of Colorado and Erica Kuligowski, NIST Questions from the audience
11:00 – 11:15 am	Break
11:15 – 11:45 am	Break-out Session: Comparison of research with current best practices
11:45 am – 12:30 pm	Group discussion about Break-out Session
12:30 – 1:30 pm	Lunch in the NIST cafeteria
1:30 – 3:00 pm	Large Group Discussion: Methods to bridge the gaps identified in the Break-out Session through current practice and future steps
3:00 – 3:15 pm	Break
3:15 – 4:00 pm	NIST wrap-up and discussion
4:00 pm	Adjourn

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4. Notes from Workshop Discussions

As a start to the workshop, Dennis Mileti and Erica Kuligowski gave an overview of the social science research on public warnings. Their presentation had three main sections; 1) a discussion regarding the research base, 2) an overview of a complete and integrated warning system, and 3) the factors that influence public warning response. The complete presentation can be found in Appendix A. After the presentation, workshop participants formed four break-out groups that discussed how their agency's and/or the nation's best practices (either research-based or applications-based) compared with the lessons learned from research performed on community-based disasters. From these groups, a series of gaps were identified. They are provided below.

Breakout Session: Comparison of research with current best practices

- 1) Messages created to follow a set of regulations (for a certain federal agency) do not necessarily equate to a meaningful message that will ensure appropriate public response. Messages need to be tested to confirm effectiveness and ensure appropriate public response.
- 2) There is no current national education system to assist in the development of a national warning system.
- 3) There is a need for a standardization of terms that would be used in public warning messages, e.g., shelter in place, defend in place, lock-down, etc. These terms are used, sometimes interchangeably; however, they can be confusing for the general public.
- 4) At the moment, there are several individual federal agencies, some focusing on specific sets of hazards and although some of the agencies have commonalities, there are still silos among the agencies/hazards. There is a need for a coordinated agency-wide effort for warning the public in emergencies.
- 5) There is an information transfer gap between the research/technology and the local governments (the people developing and providing the messages). There needs to be larger effort at clearly transferring research and data to the people who need to use this information in planning for emergencies.
- 6) There is no single, consistent message for each type of hazard; i.e., there is no single message on hurricanes from all agencies; no single message on fires for all agencies, etc.
- 7) There is a need to train and provide the necessary resources to the message providers.
- 8) The emergency messages that are disseminated to the public in an emergency should avoid information overload. There is specific information that should be provided to the people with special needs and then other information that should be provided to the general public.

- 9) The federal government needs to construct a multi-hazards, multi-jurisdictional approach to warning the public in an emergency.
- 10) The local and state emergency officials are invited to the region or federal planning and/or training meetings; however, they are usually too busy to attend.
- 11) During an emergency, there is not always enough time to coordinate among agencies on the development of an appropriate message (at the community level, campus level or building level). At the present time, little effort has gone into pre-coordination for public warnings. The lack of pre-coordination on messages and dissemination is a problem because sometimes in disasters, messages are not provided to the public or they are provided, without the appropriate information from the warning players involved.
- 12) There is an issue with the use of jargon in emergency messages. When messages use jargon, there is a possibility that the public may not understand the messages. This is especially likely with visitors, people whose first language is not English, etc.
- 13) Question – how does a community/building/agency, etc. use technology systems (e.g., alarms and sirens) without inducing an inappropriate reaction from the public?
- 14) Question – in an emergency, how does one convey the actual threat to life? For example, in Hurricane Katrina, the actual threat to life was the water/flooding from the hurricane, instead of the hurricane itself.
- 15) In the Mileti/Kuligowski presentation, one of the suggestions was to continually monitor the actions of the public during a disaster, so that warnings/messages can be refined to ensure appropriate public response. At the moment, monitoring the public response and adapting the warnings to that response is not being done as well as it should be in the United States.

In the afternoon session, the workshop participants discussed ways in which the federal government could close the gaps identified in the morning session. Some workshop participants mentioned that many agencies may have already developed the technology to ensure a complete, integrated warning system, including reverse 9-1-1, Integrated Public Alert and Warning System (IPAWS), social networking technology such as texting technology, and others. However, these require positive actions by the public. There was a brief discussion about how to get the public to enroll in the receipt of these messages via various technologies, and participants suggested code requirements and/or providing some impetus to get people to sign up for such technology services.

Even if the technology exists, effective communication depends also on the content of the message. Therefore, the large group discussion focused on what should be done to ensure that the correct, appropriate information is provided to the public in an emergency. A series of suggestions are provided here from the discussion.

Large Group Discussion – What should be done to ensure that the correct information is given to the public in an emergency?

- 1) The public should be educated well before the threat. It is important to know that a hazard is approaching or the likelihood that a disaster will occur, e.g., tornadoes or other short lead-time warning events. At the moment, there is no national education campaign.
- 2) Currently, there is no education on what to do in preparation for or during a disaster. The public (e.g., school children) could be educated similar to the methods used around the time of the Cold War – in the schools.
- 3) This discussion has focused more on preparedness for a disaster rather than how to warn the public when a disaster is imminent.
- 4) A question was raised regarding who gives the message. The consensus reached was that it was “the locals” (e.g., local emergency managers, local officials, building managers, etc.) who were responsible for providing messages to the public in a disaster. Therefore, the federal government needs to make sure that “the locals” are trained in providing appropriate messages in emergencies.
- 5) An emphasis should be placed on providing the local officials with the resources that they need to ensure that the correct information is given to the public during a disaster.

What is our federal approach? What does the federal government need to do to ensure that the correct information is given to the public when a disaster is imminent?

Guidelines, standards and requirements/generic templates

- 6) Best practices and guidelines on message development should be created for message developers (e.g., the locals who are tasked with writing emergency messages). These can be placed as an appendix to the building codes; e.g., National Fire Protection Association (NFPA) 72, National Fire Alarm Code.
- 7) Generic templates should be established for different types of hazards, so that messages can be developed quickly in an emergency.
- 8) Both training and guidance on message writing for each emergency hazard should be developed. The federal government should provide tools so that consistency in messages among regions in the country can occur. Currently, the information provided to the public in an emergency is very different from state to state. The federal government can help by providing expertise, tools, techniques, guidelines, etc.
- 9) However, the issue is initiating the standards rather than enforcing the standards. Generic process standards on how to write a message and disseminate the message should be developed rather than the specific words for each community. The reason for this is because each community's needs and requirements are different, so it must be left up to the local officials to provide the community-based information during a disaster.

Training and education/workshops

- 10) Another way to ensure that the local officials provide the correct information to the public is through training, possibly through the Federal Emergency Management Agency (FEMA). One possibility is to take advantage of the FEMA alert warning course (See Appendix B – Resource Section). Training courses and/or workshops should be given to the state/local emergency officials on message writing and dissemination.

Metric/Measurement

- 11) A metric to measure how well the new messages for specific emergencies actually do what they are supposed to do (elicit appropriate public response) should be developed. Once tests are performed using this metric, the results from these tests should be communicated to message providers in order to improve current best practices.

Regional approach

- 12) Within these approaches (guidelines, training, templates, etc.), the differences in response among the regions should be taken into account. For example, if there are sirens blaring in Norman, OK (where tornadoes are prevalent), the public is likely to understand what that means. However, in Washington, DC, what would the public do?

Other suggestions

- 13) Standardized terminology should be developed for use in public warnings/messages around the country. For example, some messages may use “defend in place,” while others may use “remain in place” or “shelter in place” to instruct people to remain in their current location (without relocating) until further notified. These become confusing to people not familiar with the evacuation procedure for their community and/or building.
- 14) The federal government should advertise its information and research in a better way. Money should be spent on better communicating our messages out to the people who need them. For example, take a look at that “freecreditreport.com” commercial – this is a commercial that is very difficult to forget.
- 15) Attention should be paid to the organizations that have been warning outside of official channels (e.g., Rim of the World - <http://www.rimoftheworld.net/>). The newer generations will tackle technology and warning issues in a new way. There will be an interface (the bottom up approach meets the top down approach, e.g., the government) that will require quality control.
- 16) Incentives should be provided for local officials to create appropriate messages and use the appropriate dissemination methods. One method of incentivizing is to tie any grants provided to the local governments to their attendance at training workshops or courses on how to write an emergency message.

Concerns with the approach, the future

- 17) There is a perception of resistance from the local level to instructions and/or requirements established at the federal level.
- 18) In reference to the federal government providing guidelines on message development, the local officials are the most knowledgeable about their terrain (e.g., the weather in their region, the subpopulations that live in the area, etc). Therefore, the responsibility of message development should be left entirely to them.
- 19) The federal government is so big with so many different agencies. How do different agencies within the federal government make sure that the information that one

agency is giving out does not conflict with the information provided by another agency? How do we make sure that the federal information is consistent?

- 20) Where does the grant funding come from? For example, the National Oceanic and Atmospheric Administration does not have any grant funding associated with the HazCollect project (See Appendix B – Resource Section) at this time that can be used as leverage to motivate warning authorities to take training modules.

What has already been done?

- 21) At the Nuclear Regulatory Commission, there are standards for the time frame to deliver/provide the message. This standard is 15 minutes and needs to be physically demonstrated by those applying for the plant licenses.
- 22) The Centers for Disease Control and Prevention has templates for messages for specific disasters and the National Public Health Information Coalition also has templates for messages for other types of disasters (See Appendix B – Resource Section). These templates should be made accessible to message providers.
- 23) The Department of Homeland Security has a new program on improvised explosive devices (IEDs) that will produce best practices to train local officials and community leaders on how to frame warnings in these types of events.
- 24) The Federal Emergency Management Agency has a disaster management program that focuses on writing emergency messages and how to decide when to issue a warning.
- 25) Common Alerting Protocol (CAP) is a non-proprietary data exchange format that can be used to transfer emergency information between alerting systems. The Federal Emergency Management Agency is working with other federal agencies and the private sector to bring CAP to fruition. The CAP Alert Origination Working Group will work with representatives from emergency management, weather service, manufacturing, special needs, and other communities of interest to develop best practices for message content and format (in progress). At the moment, it is unclear how CAP is defining message content.

5. Conclusions and Future Work

The purpose of the workshop was twofold: 1) to provide a forum where representatives from federal agencies could exchange ideas and current practices for mass notification in the event of an emergency and 2) to discuss the lack of attention paid to the creation of the messages that are disseminated during emergencies in the United States. To do this, the day was structured for two separate discussions, one discussion about gaps in the current mass notification messages and dissemination strategies, and another discussion about methods (both current efforts and future steps) to bridge these gaps related to message creation.

Gaps in message creation and dissemination

During the discussion about gaps in message creation and dissemination, a major theme surfaced regarding information transfer. Essentially, the people providing the messages (i.e., message providers) in a disaster do not have the necessary tools, techniques, guidance, and training that they require to provide information to the public when a disaster is imminent. Workshop participants identified the lack of canned or standardized messages for specific emergencies for message providers to use when that emergency occurs. Also, information transfer becomes particularly difficult since message providers are usually local officials or building managers that are extremely busy on a daily basis and do not necessarily have the time and/or institutional support to attend training sessions or perform research on public warnings. In most instances, messages are “created” moments before they are disseminated with little or no reference to the expertise or research on effective public warnings.

Along with the information transfer gap, other gaps were discussed. Participants identified the lack of standardization of the emergency terms that are used in warning messages (e.g., shelter in place, defend in place, lock-down, and other ways to keep people in their homes and buildings). Similarly, the issue of jargon in current messages was raised along with the confusion over how much information should be provided in one message. There was a consensus that while a text message character limit, for example, may not be sufficient to provide an efficient message, message writers must be careful to avoid information overload.

Methods to close the gaps

Workshop participants spent the afternoon discussing methods to close these gaps with current and/or future efforts among federal agencies. The overwhelming response from workshop participants was the need for federal guidelines and/or tools for local message providers (e.g., local officials, building managers, etc.) on how to develop messages for each type of emergency. The participants envisioned that these guidelines would very clearly translate the research identified in the social sciences and other disciplines on evidence-based messages into guidelines as well as generic templates and canned messages. The implementation of these guidelines into a standard was suggested; however, not all workshop participants were interested in imposing federal guidelines on local officials in the United States. It is important that these guidelines remain relevant,

but generic so that local officials and building managers can incorporate regional factors into their message to ensure appropriate public response.

In the group discussion, some suggested that additional help should be given to the message providers to ensure better message creation. One suggestion was to provide training sessions and workshops for local message providers, in addition to or instead of a guidelines document. Additionally, the federal government could institute incentives that would accompany the use of guidelines or attendance to training sessions, and these incentives could include providing grants to the local officials or building managers that incorporate certain techniques into their message creation and dissemination program. Last, another suggestion involved creating a metric to measure the efficiency of developed messages in eliciting a certain response from the public. Participants suggested that other agencies were already incorporating message metrics into their projects by actually testing, in a laboratory, the effectiveness of certain types of messages. Once these tests are performed, results should be communicated to the message providers so that current best practices can be improved.

Where do we go from here?

During the discussion, certain agencies identified publicly-available resources that help to initiate the process of information transfer to the local message developers/providers. These resources are provided in Appendix B of this proceedings. The resources include documentation on alerting and warning the public (including agency regulations and/or specifications for messages), descriptions of warning training courses (both used in the past by FEMA and currently in development at the National Weather Service), and message templates and examples for use in certain types of emergencies (e.g., bioterrorism, chemical agents, radiation, hurricanes and pandemic flu). It is clear that some agencies have noticed and begun responding to the need for common practices in warning content (see Appendix B).

Through this workshop, NIST has begun the necessary effort of collecting the wealth of knowledge on public warnings in the federal government for local message providers. What is still needed, however, is a broad federal effort to extend and supplement this information with guidance on message creation for types of emergencies not mentioned above, including fire, tornadoes, floods, etc. Many participants felt that, from this effort, an all-inclusive guidance document should be developed for local warning providers that outlines how to develop messages for all types of emergencies that occur in the United States. This guidance document could include guidelines on how to structure a warning message, guidelines on how to disseminate that message appropriately, and examples of this method through the use of generic templates and canned messages for different types of emergencies. Also, the guidance document could provide metrics to use when evaluating whether messages elicit the intended public behavior.

Federal agencies are in the unique position to work together on this effort to improve the way that warnings are created and disseminated in this country. Some at the meeting suggested the value of developing a federal standing committee on mass notification messages to continue discussion on warning resources and begin the development of the

federal guidance document. This standing committee could consist of many people representing the agencies present at the workshop as well as other interested parties.

Appendix A

Mass Notification Messages Workshop Presentation

Mass Notification Messages Workshop

February 19, 2009

National Institute of Standards and Technology

WARNING SYSTEMS AND PUBLIC RESPONSE

Social Science Research Findings and Application Needs

NIST Federal Workshop on Mass Notification Messages
February 19, 2009

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DISCLAIMER

▣ **Supported by :**

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▣ **H owever:**

- Opinions, findings & conclusions are the author's and do not necessarily reflect the views of the U.S. Department of Homeland Security

PURPOSE

▣ **Present and provide:**

- Social science research findings on warnings
- Networking opportunity for federal agencies on messages

▣ **Viewpoint:**

- What the public/customer needs to motivate timely and effective protective actions
- Not an agency-specific perspective

BASIC QUESTION

How Do You Help People in Danger To:

-STOP....

-HEAR.... &

-TAKE PROTECTIVE ACTIONS for....

TERRORIST ATTACKS



TECHNOLOGICAL EVENTS



NATURAL DISASTERS



BUILDING FIRES



HAZARDOUS MATERIALS AND MORE.....



***INCLUDING PUBLIC PROTECTIVE
ACTIONS SUCH AS....***

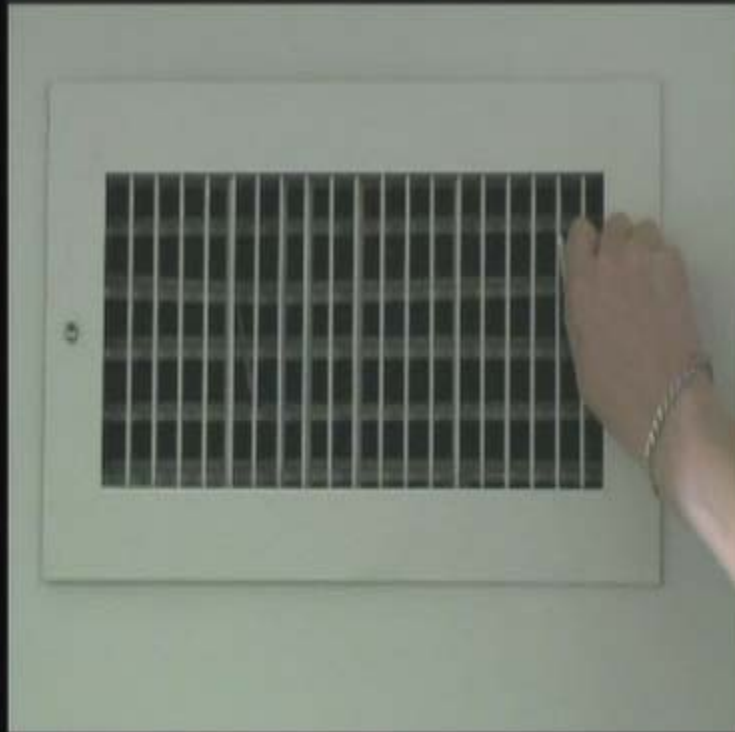
VEHICLE EVACUATION



PEDESTRIAN & OCCUPANT EVACUATION



SHELTER IN PLACE



**Turn Off Fans,
Heating & Air
Conditioning
Systems That
Bring In Air
From Outside**

BREATHING PROTECTION



TOPICS COVERED

- ▣ **Research Basis**
- ▣ **Structure of Public Warning Systems**
- ▣ **Warning Messages & Public Response**
- ▣ **Conclusions**

TOPIC 1: THE RESEARCH BASIS FOR WHAT WE'LL COVER

RESEARCH BASIS

▣ 50+ Years of Research:

- People in disaster research literature
- U.S. emphasis (not exclusively)

▣ Hazards Researched Include:

- Natural: Hurricane Camille, Mt. St. Helens
- Terrorism: World Trade Center 1993 & 9/11
- Hazardous Materials: Mississauga, Nanticoke
- Technology: Three Mile Island
- Building Fire: MGM Grand, Cook County Hospital

▣ We Know a Lot About:

- What works & doesn't, why & how to apply it

RESEARCH: PEOPLE IN COMMUNITY DISASTERS



- ❑ **350 Page Annotated Bibliography (One Page per Publication Key Findings Listed) Available at:**
- ❑ *<http://www.colorado.edu/hazards/publications/informer/infrmr2/pubhazbibann.pdf>*

KNOWLEDGE SYNTHESIS: COMMUNITY DISASTERS

Mileti, Dennis S., and John H. Sorensen. 1990.

Communication of Emergency Public Warnings: A Social Science Perspective and State-of-the-Art Assessment. Oak Ridge, TN: Report #ORNL-6609 for the Federal Emergency Management Agency.

Available at:

<http://emc.ornl.gov/EMCWeb/EMC/PDF/CommunicationFinal.pdf>

RESEARCH: OCCUPANTS IN BUILDING DISASTERS



- ▣ **150 Entry Bibliography Available at:**
- ▣ *<http://www.colorado.edu/hazards/library/BuildingsEvacBib2007.doc>*

NOTE: PEOPLE KNOWLEDGE TRANSCENDS HAZARD TYPE

- ▣ **People Stay People Across Hazards:**
- ▣ **Same Variables Determine Public Warning Response Across Hazards & Events:**
 - Mathematically modeled
 - Same equations apply
- ▣ **Behavior Outcomes Vary Across Events:**
 - Because different quantities for the variables that determine public response occur in different events

TOPIC 2: STRUCTURE OF “INTEGRATED” WARNING SYSTEMS

BASIC DEFINITIONS

- ▣ **ALERTING:**

- Getting people's attention

- ▣ **INFORMING:**

- Telling people about pending disaster

- ▣ **WARNING:**

- Telling people what to do & why

INTEGRATED WARNING SYSTEMS

▣ **“Warning System” Means:**

- Different things to different people

▣ **Integrated Warning Systems:**

- Have the same subsystems, functions & linkages
- Involve technology & people
- Merge organizations, people, disciplines & “silos”
- Take exogenous factors into account

SUBSYSTEMS AND FUNCTIONS

RISK

Natural Environment
Technological
Civil

MANAGEMENT

Interpretation
Decision to Warn
Warning Content
Warning Method & Channel
Response Monitoring
Warning Feedback

DETECTION

Monitoring
Detection
Data Assessment & Analysis
Prediction
Informing

PUBLIC RESPONSE

Interpretation
Confirmation
Response
Warn Others

SUBSYSTEM ACTORS

RISK
Nature
Technology
Terrorists & more

MANAGEMENT
Government
(Local, State, Tribal)
Building Operators

DETECTION
Scientific Agencies
Law Enforcement
(Police, DHS, CIA, FBI)
Public

RESPONSE
General Public
Racial & Ethnic Minorities
Visitors & Transients
Organizations & Facilities

TYPES OF SUBSYSTEM LINKAGES

CUES

Observations from the Risk
Environment

MONITOR

Observe Another Subsystem

INFORM

Communicate to Another
Subsystem

WARN

Communicate What to Do to
People at Risk

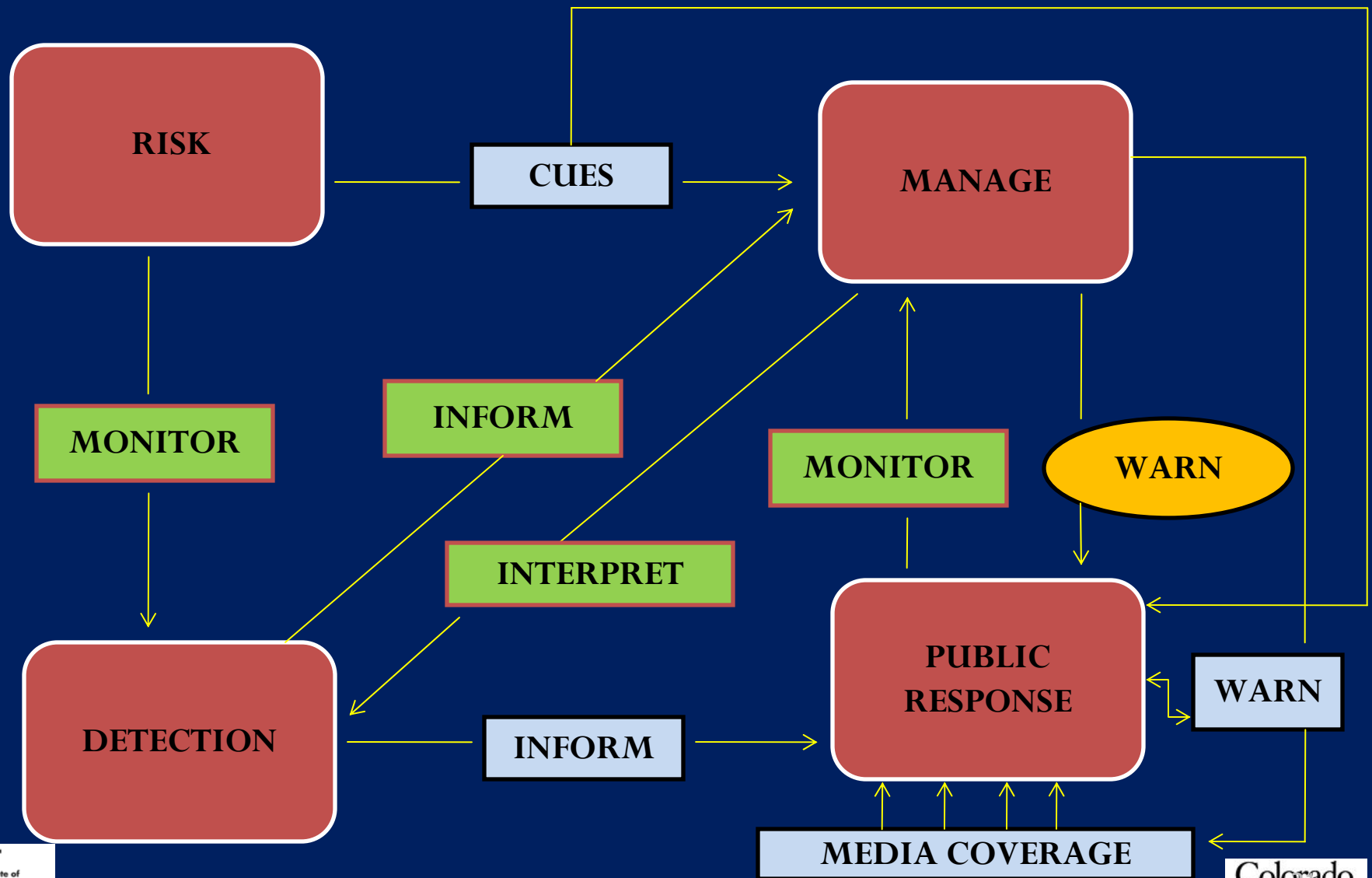
INTERPRET

Make Sense Out of Cues &
Information Received

EXOGENOUS FACTORS



INTEGRATED SYSTEM



A HARD-WON LESSON

- ▣ **Like the Links of a Chain....**

- ▣ **Warning Systems Work Best When:**
 - All subsystems & linkages present
 - All subsystems, linkages, & exogenous factors integrated into a system
 - ▣ E.g., end-to-end not end-to-middle
 - Linkages don't break when used

PREPAREDNESS OBJECTIVES

▣ 1. Modern Systems & Plans:

- Eliminate sources of past warning failures

▣ 2. Evidence-Based Messages:

- Documented by research to maximize the odds of sound public response

▣ 3. Modern Technologies for Today's World:

- Provide warning in our “non-linear” communication world using modern technologies

HISTORICAL FAILURES

▣ **Past Failures:**

- Are often repeated
- Many lessons haven't been learned

▣ **Warning Preparedness:**

- Could eliminate repeating failures

▣ **Documented Warning Failures:**

- (Worded positively) follow....

DESIGN-OUT FAILURES

- ▣ **Design a Complete Warning System:**
 - Subsystems specified
 - Linkages operational
 - Subsystems & linkages integrated
 - Exogenous factors incorporated in the system

- ▣ **Ensure that Subsystems & Linkages Work:**
 - Appropriate technology
 - Sound system actor behavior
 - ▣ Practice makes perfect

DESIGN-OUT FAILURES (cont'd)

▣ Eliminate System Actor's Personality:

- Believe myths (e.g., panic) & withhold warnings
- Downplay risk as communicate “up” an organization
- Procedures (not individuals) determine actions

▣ Use “Complete” Evidence-Based Messages:

- Don't know research findings on warning messaging so say something else (“canned” messages would help)
- Don't think about “ending” a protective action

▣ Guarantee Repetitive Messaging:

- Few know to say it many times (most think shouldn't)

DESIGN-OUT FAILURES (cont'd)

▣ Eliminate Public Confusion from Others Giving Conflicting Information:

- Address wrong information given by others
- Render inconsistent information consistent
- Focus public on “best” warnings
- Give “official warning” to other warning providers to upgrade what they say

DESIGN-OUT FAILURES (cont'd)

▣ Reach Everyone at Risk:

- Use diverse devices and channels to
 - ▣ Avoid missing audience segments
 - ▣ Reach all special populations

▣ Communicate to People not at Risk:

- Safe members of public who are near
- Other warning providers (many are non-local)

▣ Monitor Response & Change What's Said Next Based on What's Observed:

- Warnings should not be “static” but an “adapted” conversation based on how people respond

DESIGN-OUT FAILURES (cont'd)

▣ Solve Technological Communication Problems with Technological Solutions:

- Compatibility: problems observed since 1950s
- Overload: inevitable
- Electrical supply: some warnings go out after impact
- Fail safe: has to work when needed
- Mutually exclusive/redundant: more than one
- Dedicated: available when needed
- Customized: for special populations

DESIGN-OUT FAILURES (cont'd)

- ▣ **Solve Social Communication Problems with Social Solutions:**
 - **Between organizations:**
 - Organizations who don't communicate routinely are disinclined to do so during warnings
 - Staff who don't communicate to centralized personnel routinely don't do so during warnings
 - **To the public:**
 - Install ways to reach marginalized sub-populations

PREPAREDNESS GOALS

▣ **Warning System Preparedness:**

- Elaborate: all warning systems elements
- Integrate: subsystems, linkages, and exogenous factors into one system

▣ **Major Goals:**

- Rarely used system will work when needed
- Weave together agencies & disciplines from different silos that rarely interact
- Communication links don't break when used

PREPAREDNESS ELEMENTS

▣ Ready the Warning Players:

- Warning plans, operating procedures & protocols
- Warning training & exercises
- Human factors issues identified & addressed
- Standards of performance
- Evidence based:
 - ▣ Warning messages & dissemination channels

▣ Modernized Communication Technologies

▣ Prime the Audience:

- Public warning & response education (another topic)

▣ Rationally “Grow” the Warning System:

- Development priorities based on risk assessment

WHAT'S NEEDED: GIVING WARNING INFORMATION

▣ Public:

- Location-specific (customize)
- Diverse publics = diverse warnings pathways
- People at risk & people not at risk

▣ Organizations & Special Facilities:

- Location-specific (customize)
- Diverse facilities = diverse warning pathways
- Facilities at risk & host facilities

▣ Warning Partners:

- Location-specific (customize)
- Diverse partners = diverse communication pathways
- All of them (whether you want them or not):
 - ▣ Local, regional, statewide, national, international

WHAT'S NEEDED: MONITORING, EVALUATION & FEEDBACK

▣ Monitor Public Response in Events

- Find out what the public is doing

▣ Range of Ways to Monitor, e.g.,

- Traffic guides (can tell you)
- Police & fire (can call in reports)
- Video monitors (you can see it)

▣ Adjust Next Messages Accordingly

- What you say impacts what the public does

WHAT'S NEEDED: GETTING INFORMATION

▣ **Other Organizations:**

- What other say in their warnings
- What emergency organizations are doing

▣ **Media & Call-Ins:**

- Rumor control

▣ **Special Facilities:**

- What they're doing

▣ **Public Protective Response:**

- Are they doing it or not

▣ **What the Public is Saying to Each Other:**

- Warning “informatics”

WHAT'S NEEDED: OPERATIONAL CONCEPT

▣ **Centralized Approach:**

- All inputs & outputs available in one place

▣ **Configuration:**

- State-of-the-art “virtual” communication system
- Dedicated, redundant, & mutually exclusive

▣ **Systems Architecture:**

- Capacity to communicate (send & receive) over all of today's devices

TOPIC 3: WARNING MESSAGES AND PUBLIC RESPONSE

THREE MYTHS

- ▣ **A Myth Exists When Someone:**
 - **BELIEVES** its true (but its not)
 - Think they have **EVIDENCE** for it (but they don't)
 - **WON'T STOP BELIEVING** it (no matter what)

- ▣ **Here Are Three of Them.....**

MYTH 1: PANIC

- ▣ **Non-problem:**
 - ▣ Never occurred after a warning
- ▣ **Actual Problem:**
 - ▣ “We didn’t issue a warning so we wouldn’t cause a panic”
- ▣ **Panic Occurs When:**
 - ▣ Spaces are confined
 - ▣ Escape routes ARE available, but
 - ▣ People think: not enough time for everyone to use them, resulting in
 - ▣ People must: “compete to live”
- ▣ **Even then, Panic is Rare**



MYTH 2: “KISS”

▣ Definition:

- “Keep it simple stupid”

▣ Myth:

- Applies to public warnings

▣ Reality:

- Applies to advertising, not warnings
- Warned people become “information starved”
- If warnings don’t tell enough, they’ll find what they want to know someplace else & confusion results

MYTH 3: CRY WOLF

▣ **Myth:**

- People don't respond after false alarms

▣ **Reality:**

- They do (perhaps differently)

▣ **False Alarms:**

- Can be productive for future response “if explained”
- **REAL ISSUE:** their cost angers local government

▣ **Exception:**

- People ignore sirens (especially if sounded frequently, e.g., for siren tests)

ALERT

- **STOP** Ongoing Life
- Get People's **ATTENTION**
- **CAPTURE** Your Audience First, then Talk
- **But Keep in Mind that....**



PEOPLE DON'T REMEMBER INDICATORS

▣ People:

- Don't remember meaning of:
 - Siren signals (wails, whoops, tones)
 - Color codes
- Don't distinguish between:
 - Advisories, watches & warnings

▣ Except:

- When signals/codes are “drilled into them”, e.g., weekly fire drills in schools



ALERTING ISN'T SIMPLE

- ▣ **Many Isolate “Themselves” from Information**
 - Some are isolated by circumstance, e.g., poor
- ▣ **Even when Signals Blare, Many:**
 - Think they’re “safe” &
 - Disasters happen to other people
- ▣ **Some Sub-populations Need Unique Alerts, e.g.,**
 - Hospitals in communities
 - Hearing impaired in buildings
 - Visitors & “out-of-towners”
 - Different language speakers



USE “OBTRUSIVE” ALERTS

- ▣ **Get People’s Attention, e.g.,**
 - “Lights on” in theaters
 - Piercing sounds with TV crawlers
- ▣ **Wake People Up, e.g.,**
 - Sleeping children & older adults
 - Hearing loss & under the influence
- ▣ **Outside Devices Loose Effectiveness if:**
 - Windows shut & air/heat is on
 - 3 minute sounding 10 decibels over ambient outdoor siren has a 62% chance of waking someone up
- ▣ **Need Indoor Devices for Alert at Night:**
 - Fast moving community event
 - Fire in a hotel



INFORMAL ALERTING

- ▣ **Warning Diffusion “Among those Warned”**
 - Always happens, count on it, & use it
- ▣ **9/11 Example:**
 - Most in country learned about attack in 1 hour
 - Many in towers found out a plane hit from friends/relatives
- ▣ **Rule of Thumb:**
 - 1 informal first warning for every 2 formal first warnings
- ▣ **Informal Alerting Increasing with New Technologies**



HOW WARNING MESSAGES INFLUENCE PUBLIC RESPONSE

PREDICTING PUBLIC BEHAVIOR

▣ **Predictions Based on SCIENCE Work:**

- “A” causes “B”

▣ **Predictions Based on NON-SCIENCE Don't:**

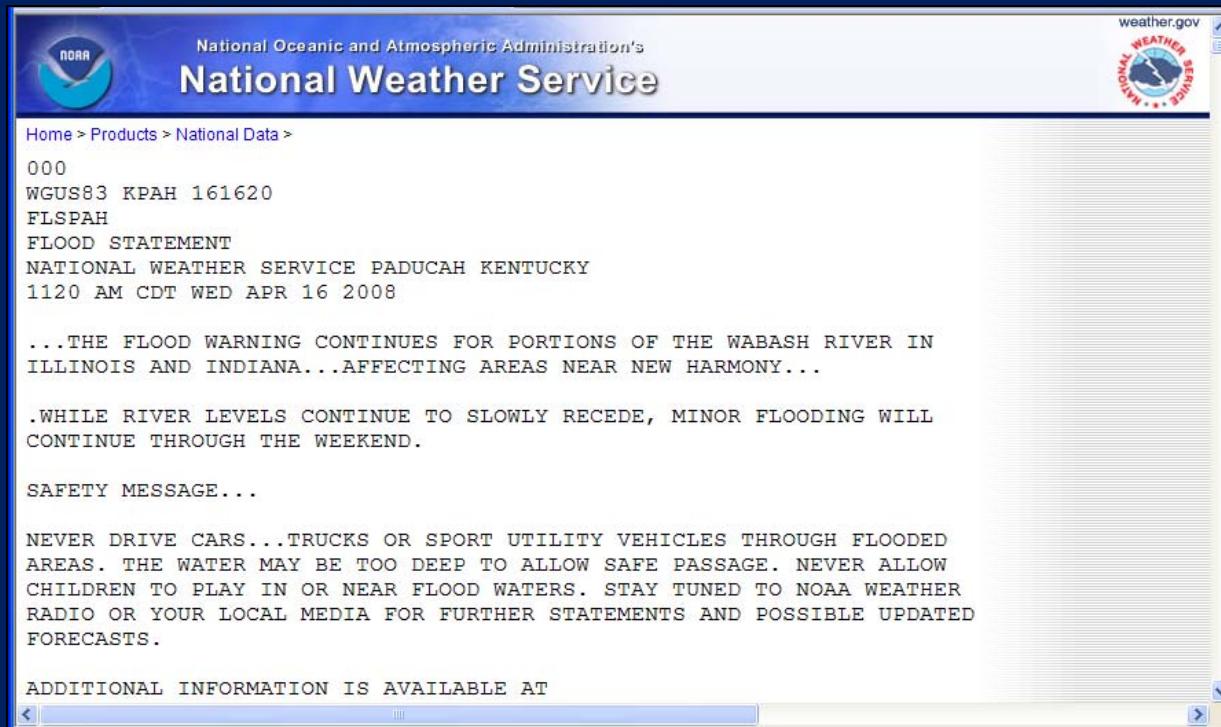
- What people did in past events:
 - ▣ Using a past “B” to predict a future “B”
- Guesses, hunches, or personal experience
- Intention surveys or focus groups:
 - ▣ Intentions & behavior are different
 - ▣ Public response determinants don't operate in pre-event surveys or focus groups & aren't known by respondents

FACTORS THAT INFLUENCE PUBLIC RESPONSE

- ▣ **Many “Statistically Significant” Factors Documented by Research but....**
- ▣ **They Vary Greatly in Importance:**
 - Strong vs. weak relationships
 - Real vs. spurious effects
 - High vs. low supporting evidence
- ▣ **Solid Evidence Exists for What Follows**

INFORMATION FACTORS

“About the Warning Message”



FACTOR 1: THE MESSAGE

▣ **Five Dimensions:**

- ▣ Channel
- ▣ Frequency
- ▣ Content
- ▣ Style
- ▣ Source



FACTOR 1: THE MESSAGE (cont'd)

▣ Number of Communication Channels:

- The “more the better”

▣ Type of Communication Channel:

- Personal channels work best
- The “more the better”

▣ Communication Frequency:

- The “more” its repeated & heard the better:
 - ▣ Repetition fosters confirmation
 - ▣ Confirmation fosters belief
 - ▣ Belief fosters taking action

FACTOR 1: THE MESSAGE ***(cont'd)***

▣ **CONTENT (What to Say):**

- **WHAT:** Tell them what to do
- **WHEN:** Tell them when (time) to do it
- **WHERE:** Say who should & shouldn't do it
- **WHY:** Tell about the hazard's consequences
- **WHO:** Say who's talking (source):
 - ▣ There is NO single credible source, so use multiple sources for the same message

FACTOR 1: THE MESSAGE (cont'd)

▣ **STYLE (How to Say It):**

- **CLEAR:** Simply worded is best
- **SPECIFIC:** Precise & non-ambiguous
- **ACCURATE:** Errors cause problems
- **CERTAIN:** Authoritative and confident
- **CONSISTENT:**
 - Externally: Explain changes from past messages & differences from what others are saying
 - Internally: Never say “attack will occur soon, don’t worry”

FACTOR 2: CUES

(Non-verbal Information)

▣ **Social Cues Help:**

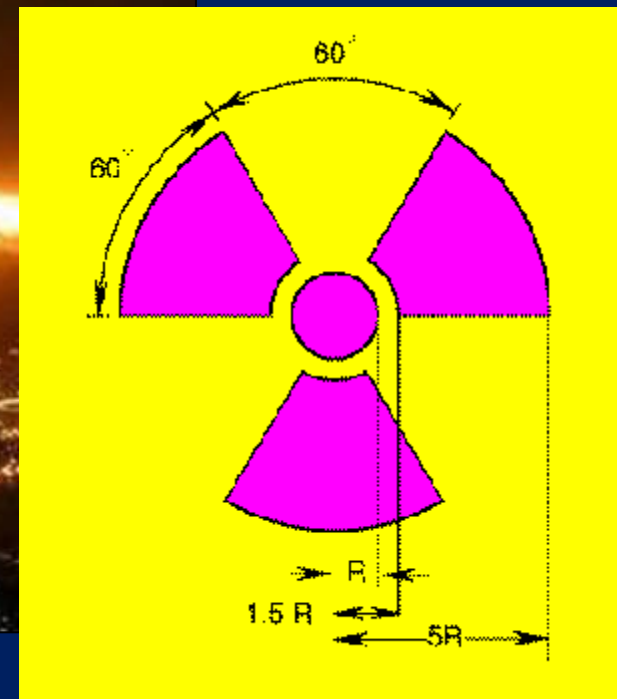
- “Monkey see, monkey do”
 - ▣ What neighbors, friends, & relatives are doing
 - ▣ What organizations are doing

▣ **Physical Cues Help too:**

- If confirm the risk (rain in flood warnings)

SOME HAZARDS HAVE CUES (fires)

SOME DON'T (radiation)



PEOPLE FACTORS



“About the Audience”

THE “HUMAN FILTER”

- ▣ **Everyone May “Receive” the Same Warning Message, BUT:**
 - Differences in the people who hear it result in it “meaning” different things to different people
- ▣ **Overcoming Receiver “Biases” is Possible, but Requires:**
 - Well-crafted warning messages
 - Well-designed warning delivery systems
- ▣ **The Human Filter Includes....**

FACTOR 3: STATUSES ***(worded as constraints)***

- ▣ **Socio-economic Status:**
 - Having little money, education, employment
- ▣ **Age:**
 - Being young or old
- ▣ **Gender:**
 - Being male
- ▣ **Ethnicity:**
 - Being non-Anglo
- ▣ **Acculturation:**
 - Not speaking English, born in another country

FACTOR 4: ROLES ***(worded as incentives)***

▣ **Roles of Responsibility for Others:**

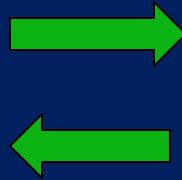
- Having children & larger family size
- Having pets
- More kin relationships
- Family united
- Greater community involvement

FACTOR 5: EXPERIENCE

- **People “Normalize” Warning Information Based on Their Experience:**
 - Think disasters faced will be like those experienced
 - Inclined to do what was appropriate in past events experienced

PROCESS FACTORS

▣ How Message & People Factors Interact



FACTOR 6: BELIEF

- ▣ **There is NO Single Credible Spokesperson:**
 - STOP LOOKING FOR ONE
 - Why? People have different ideas about who's credible
- ▣ **“Who's Credible?” = Wrong Question:**
 - Many “think” spokesperson credibility = message belief
 - They're different & belief is what's important
- ▣ **How to Achieve Warning Belief:**
 - ONE MESSAGE OVER DIVERSE CHANNELS
 - FROM A “PANEL” OF SPOKESPERSONS :
 - ▣ e.g., officials, Red Cross, scientists, familiar newscaster, & others
 - REPEATED MULTIPLE TIMES
- ▣ **Here's as Good as Single Spokespersons Get....**

FIREFIGHTERS = MOST CREDIBLE SOURCE IN AMERICA (for 35%)



FACTOR 7: KNOWLEDGE

▣ **Multi-faceted Concept Including:**

- **PAST:** What people “import” into the event
- **PRESENT:** What people “think” based on the information/cues they get during the event
- **NATURAL INCLINATION:** “I’m safe, don’t tell me I’m not”

▣ **Not Static & Can Change**

▣ **Manage it in Warning Messages:**

- Provide warning information that “overcomes” differences in people’s past, present, & natural inclinations

FACTOR 8: PERCEIVED RISK

- ▣ **Its About Perceived Risk DURING the Event:**

- Different from pre-event risk perception

- ▣ **Usually a Roadblock to Taking Action:**

- People don't perceive they're at risk
- People perceive they're safe
 - ▣ And search for information to confirm that they are

- ▣ **Moreover:**

- People dichotomize risk into: do something vs. do nothing
 - ▣ They don't act in proportion to probability estimates
- And they're inclined to:
 - ▣ "Normalize" the risk information they receive

FACTOR 9: MILLING

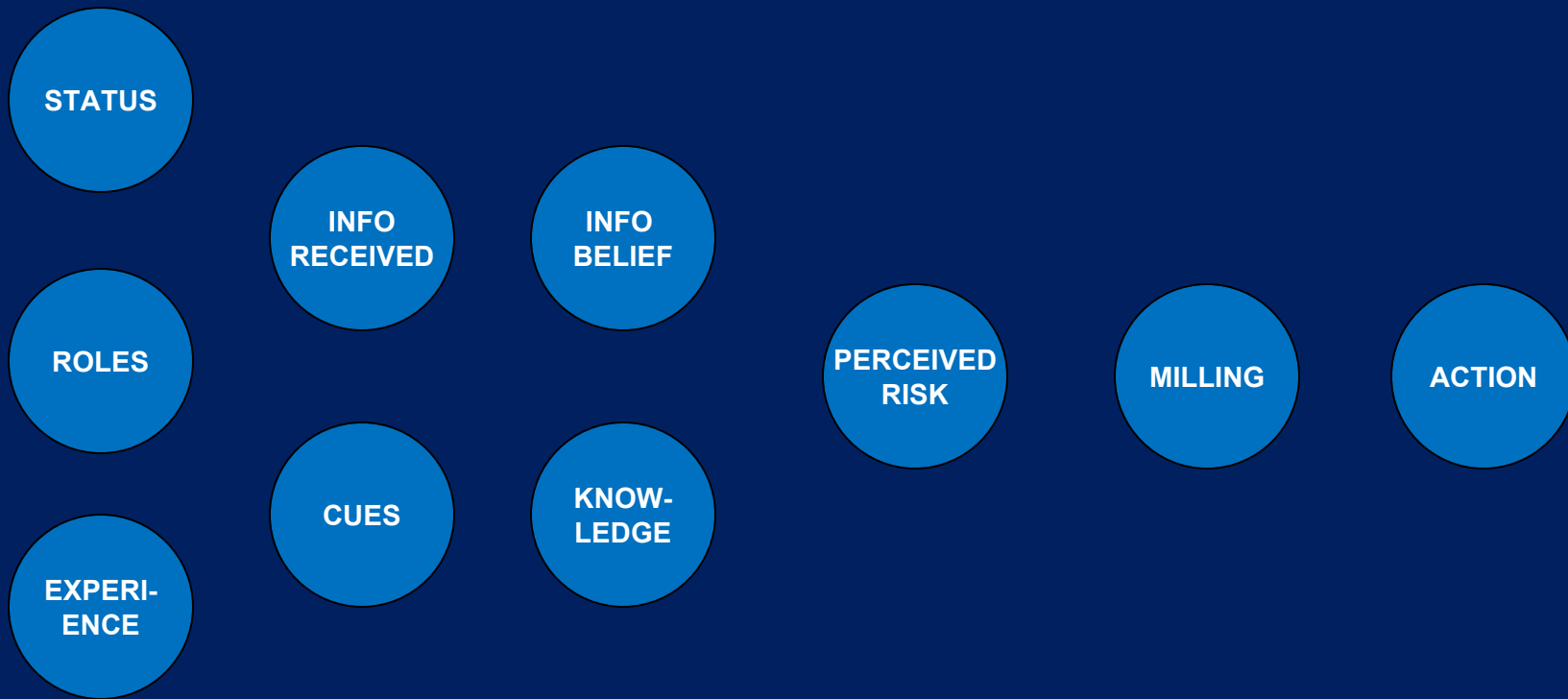
- ▣ **Milling/Confirmation:**
 - The **KEY** to how warnings work
- ▣ **Few Do Something because They're Told to:**
 - People need to think it's their own idea
- ▣ **People Think It's Their Idea & then Act After:**
 - **MILLING AROUND:** talking about it with others and confirming the risk and what they could do about it
- ▣ **Before Taking Protective Actions, People Need to:**
 - Have confirmation (additional information)
 - Talk it over with others

HOW THE FACTORS RELATE TO EACH OTHER

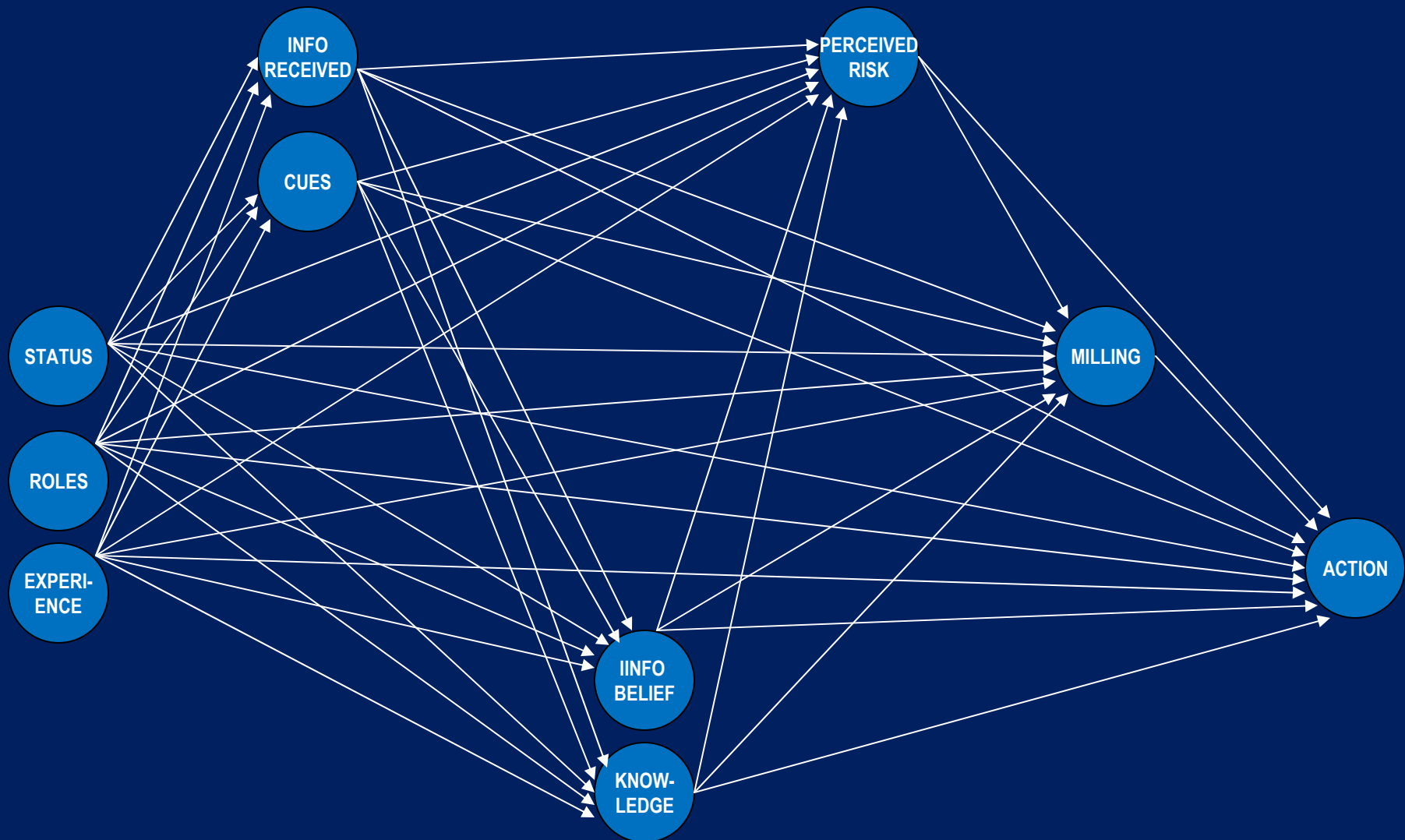
SEQUENCED CUMMULATIVE EFFECTS OF FACTORS, e.g.,

- ▣ **Perceived Risk Determined by:**
 - ▣ Multiple communications = A
 - ▣ Multiple channels = B
- ▣ **Milling Determined by:**
 - ▣ Multiple communications = A
 - ▣ Multiple channels = B
 - ▣ Plus Perceived risk = C
- ▣ **Warning Response Behavior Determined by:**
 - ▣ Multiple communications = A
 - ▣ Multiple channels = B
 - ▣ Perceived risk = C
 - ▣ Plus Milling = D

SEQUENCING THE FACTORS



GENERAL MODEL



CONVERTING THE MODEL TO MATHEMATICS

- ▣ **Models Are Represented by Equations:**

- Called “simultaneous multiple regression equations”

- ▣ **Equations Enable Us to Determine:**

- Effect of every factor while controlling for the effects of everything else (good science)

- ▣ **The Result is:**

- Distinguish between what’s really important & what isn’t

- ▣ **When to Get Excited:**

- When different studies reach the same conclusions
- That’s where we are with research on public response to warnings for hazardous events

CONCLUSIONS FROM THE MATHEMATICS

- ▣ **All Factors AREN'T EQUAL**
- ▣ **Some Factors are REALLY Important:**
 - CONTENT: what the message says:
 - ▣ Especially what actions to take
 - REPETITION: Hearing same warning many times
 - CUES: Seeing things that confirm the message
 - MILLING: Confirming it with others
- ▣ **Other Factors are LESS Important:**
 - Demographics (unless information is poor)

GENERAL OBSERVATIONS

- ▣ **Message Factors:**
 - Largest impact of all on public response

- ▣ **If “High Quality” Message Factors:**
 - Influence of other factors decrease
 - Ability to manage public response can be high
 - Example: Nanticoke

- ▣ **If “Low Quality” Message Factors:**
 - Influence of other factors “increases”
 - Ability to manage public response can be lost
 - Example: Three Mile Island

GENERAL CONCLUSIONS

- ▣ **Sound Public Warning Response Doesn't Happen Naturally:**
 - Due to differences between people being warned
- ▣ **Influence of People Differences:**
 - Can be overcome by providing evidence based warning messages
- ▣ **Evidence Based Warning Messages Don't Happen Naturally:**
 - Don't make up what's in a warning "on the spot"
 - Message training & preparedness is needed

WHAT WOULD PUBLIC WARNINGS SAY IF THEY WERE RESEARCH EVIDENCE-BASED?

WARNING MESSAGE EXAMPLE

(Mud Slides)

- ▣ This is a MANDATORY EVACUATION ORDER from the Yellow County Sheriff's Department AND Fire Authority. There's a high risk of CATASTROPHIC MUDSLIDES & DEBRIS FLOWS due to rain on BURNT SLOPES. After consulting with the U.S. Geological Survey and the National Weather Service, WE issue a mandatory evacuation order for the following people in Yellow County:
 - If you LIVE IN or ARE IN an area BELOW or NEAR burnt slopes, evacuate now. Do not delay. This is a MANDATORY EVACUATION ORDER. Evacuate. Evacuate NOW.
 - What we mean when we say evacuate is: GET OUT OF ALL CANYONS, and get out of them NOW.
 - If you don't live in or aren't in an area below or near burnt slopes, you don't need to do anything.

WARNING MESSAGE (Cont'd)

- ▣ If you have CHILDREN IN A SCHOOL located in a canyon:
 - DO NOT GO THERE TO GET THEM. They won't be there when you arrive.
 - All school children in all canyon schools are currently being evacuated to (insert the name, address, and telephone number).
 - You can pick them up there once you have completed your own evacuation.

WARNING MESSAGE (Cont'd)

- ▣ There's **HIGH RISK** of catastrophic mudslides and debris flows due to rain on **BURNT SLOPES**:
 - Mudslides and debris flows could occur **NOW**, and they could be large enough to **COMPLETELY BURY** homes, roads, and lives.
 - They can occur **WITHOUT NOTICE**.
 - The amount of rain needed to start a catastrophic mudslide or debris flow is **SMALL**. Don't think you're safe because the rainfall you see is slight.
 - The risk of catastrophic mudslides and debris flows below all burnt slopes in all Yellow Country is **REAL**.

WARNING MESSAGE (Cont'd)

- ▣ If you LIVE IN or ARE IN an area BELOW or NEAR burnt slopes EVACUATE NOW.
 - Evacuate WITHOUT DELAY. Evacuate NOW.
 - This is a MANDATORY EVACUATION ORDER.
 - There's a Red Cross shelter at Monroe High School in the town of Yellow.
 - Bring your pets and keep them with you. Larger animals can be brought to the Yellow County Fairgrounds.
 - If you have questions or require assistance, please call 123-456-7890.
 - New information will be made available as it becomes available on this same station/channel.

SUMMARY OF AN “EVIDENCE BASED” WARNING

▣ **MESSAGE IS:**

- ▣ 1. **CLEAR** (simply worded)
- ▣ 2. **SPECIFIC** (precise and non-ambiguous)
- ▣ 3. **ACCURATE** (no error)
- ▣ 4. **CERTAIN** (authoritative and confident)
- ▣ 5. **CONSISTENT** (within and between messages)

▣ **ABOUT:**

- ▣ 6. **WHAT** (what to do)
- ▣ 7. **WHEN** (when to do it)
- ▣ 8. **WHERE** (who should & shouldn't do it)
- ▣ 9. **WHY** (hazard & consequences)
- ▣ 10. **WHO** (who's giving the message)

▣ **AND IS CONFIRMED:**

- ▣ 11. **REPEATED** frequently
- ▣ 12. over **MULTIPLE COMMUNICATION CHANNELS**

EVIDENCE BASED WARNING MESSAGE TEMPLATE

- ▣ **Message Label**
- ▣ **Who's Speaking**
- ▣ **Who Message is for (location)**
- ▣ **What they Should Do by When (who shouldn't)**
- ▣ **Why they Should Do It (risk/consequences)**
- ▣ **Repeat:**
 - Who message is for
 - What they should do by when
- ▣ **End: Message Label & Pending Information**

TOPIC 4: APPLICATION NEEDS

MAJOR APPLICATION NEEDS

- ▣ Guidelines, templates, standards, requirements, etc. (any or all of the above) related to mass notification messages
- ▣ Training/education/workshops for the locals who are relaying these message to the public
- ▣ A regional approach related to messages
- ▣ A metric to measure how well any message works
- ▣ Using the work that has already been done to further these efforts – at the federal level

CONCLUSION

- ▣ Extensive research has been performed in the area of public warnings and response (Mileti and Sorensen)
- ▣ Warning is a **System**:
 - There are four subsystems involved in a warning system
 - All four subsystems need to be present and integrated with exogenous factors
- ▣ Warning message factors have the largest impact on public response
 - People are different and their response to warnings can be very different
 - Overcome these differences with “well-crafted,” evidence-based messages
- ▣ Evidence-based warnings don’t happen naturally – but rather with message training and preparedness

Thank you

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Appendix B

Resources Provided by Workshop Attendees

Resources provided by Workshop Participants:

Ned Wright, NRC:

1) The NRC/FEMA regulation on Alert and Warnings and Public Information
(<http://www.nrc.gov/reading-rm/doc-collections/nuregs/staff/sr0654/sr0654r1.pdf>)

See document pages 43-46, 49-51, and Appendix 3

2) FEMA Course sponsored by the Emergency Management Institute (EMI)

G272 - Warning Coordination

This 1½-day field course is the latest in the hazardous weather series of courses produced in partnership with the National Weather Service (NWS). It is designed to be conducted jointly by NWS warning coordination meteorologists and state emergency management staff for an audience of local emergency managers. Every year the United States experiences more severe weather than any other country in the world. In order to reduce deaths, injuries, and property losses, emergency managers must work closely with the NWS and the news media to provide effective warnings that can be received and understood by people at risk. This course is intended to help facilitate that process.

Course topics include The Social Dimensions of Warning Response; Developing Effective Warning Messages; Developing an Effective Community Warning Process; and working with the news media to create a Weather Warning Partnership.

Marsha Vanderford, CDC:

CDC has developed content for initial alert messages on a number of likely public health threats on the CDC "First Hours" site:

<http://emergency.cdc.gov/firsthours/intro.asp>

It includes at all Category A bioterrorism agents [Anthrax](#), [Botulism](#), [Pneumonic Plague](#), [Smallpox](#), [Tularemia](#), [Viral Hemorrhagic Fevers \(VHF\)](#) ; chemical agents, radiation agents, and suicide bombs. Each one includes pre-approved and messages tested with the public for clarity, actionability, and comprehension. Long and short versions of each are available. You will also find reports about audience testing and profiles on the site.

In addition the National Public Health Information Coalition has an inventory of materials on hurricanes and pan flu produced by state and local health departments that can provide examples of alerting messages that might be repurposed by others. The pan flu inventory is found at

<http://www.nphicpanflu.org/> Hurricane messages can be found at

<http://www.nphic.org/hurricane.aspx>

Timothy Putprush, FEMA:

Web resources:

<http://www.fema.gov/emergency/ipaws/>

http://www.sbe.org/gov_eas.php (information on Common Alerting Protocol)

Herb White, NWS/NOAA:

Web resources:

<http://www.weather.gov/warningworkshop/>

<http://www.weather.gov/os/hazcollect/>

<http://www.disasterhelp.gov/disastermanagement>

- 1) NWS Procedural Instruction 10-511, WFO Severe Weather Products Specification at <http://www.weather.gov/directives/sym/pd01005011curr.pdf>, is an example of how the NWS provides standard specifications to our forecaster staff that is dispersed across 122 Weather Forecast Offices (WFO) across the country including Issuance Criteria, content, format, and update/correction handling. For example, the content of a Severe Thunderstorm Warning is described as part of the overall product technical description in section 2.3.4 starting on page 4. Similarly, content for a Tornado Warning is in section 3.3.4 starting on page 7. Similar product specifications for all NWS watches, warnings, advisories, outlooks and followup statements for an array of warning programs are available on the NWS Directives website at <http://www.weather.gov/directives/010/010.htm>
- 2) Similarly, NWS Procedural Instruction 10-511, Non-Weather Related Products Specification, contains specifications for Non-Weather Emergency Messages (NWEM) in section 5 with definitions, examples, and additional Non-Weather Related Emergency Message Description Guidelines in the Appendices. A separate pdf file of NWSI 10-518 Appendix C is attached that is a primary reference for various civil warning authorities. (attachment 1)
- 3) Also online are Draft NWS Instruction 10-1701, Text Products Formats and Codes, section for CTA Markers at <http://www.weather.gov/os/ctamarker/> that has some general guidance for CTAs themselves.
- 4) Attached- the Goals and Objectives for the NWEM Training module currently in development for the HazCollect rollout in late April. This is to provide an idea as to some of the KSAs we feel are necessary for warning authorities and how we're developing training to address those at the same time as specific service-oriented training. At this time, the plan is to make the training a pre-requisite for approved HazCollect registrants. (attachment 2)
- 5) The PPW Report 2004-2, Protecting America's Communities: An Introduction to Public Alert & Warning (attachment 3), and the MSRC II Guide to Establishing Local Coordination of Emergency Communication Systems at <http://www.mediasecurity.org/documents/index.html>. The main docs are the first two listed at http://www.mediasecurity.org/documents/MSRC_Guide.pdf and http://www.mediasecurity.org/documents/EAS_Appendix.pdf.

APPENDIX C - Non-Weather Related Emergency Message Description Guidelines

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1. Introduction. This section provides descriptive guidelines used for the 17 non-weather related emergency events. These guidelines are adapted from documentation provided by a National Weather Service (NWS) working group and the Houston (TX) Local Emergency Communications Committee.
2. Background. The Federal Communications Commission (FCC) on February 22, 2002, adopted a Report and Order (FCC-02-64) giving local and state Emergency Alert System (EAS) committees the option of utilizing new event codes for non-weather related events. (The FCC Report and Order can be downloaded from the FCC's Electronic Document Management System (EDOCS) at: http://hraunfoss.fcc.gov/edocs_public/.)

The NWS adopted the EAS non-weather event codes as NWS Advanced Weather Interactive Processing System (AWIPS) Identifier product category codes for use in non-weather emergency text products (WMO heading WOUSii/WOAKii/WOHWii/WOMWii) to align the audio broadcast codes and text message identifiers to improve message dissemination.

3. Message Description Guidance. Most of the new event codes are self-explanatory. The NWS provides the guidance that follows in this appendix, until specific recommendations are provided by a group authorized by appropriate government agencies. Local and State Emergency Communication Committees (LECC's/SECC's) are encouraged to follow these guidelines to provide nationally consistent use of these codes across state borders. Use of specific, unambiguous code is preferred.

LECC's and SECC's can best determine which officials are authorized to request specific non-weather emergency messages and event codes. Such authority will vary by local ordinance, state law, and/or federal regulation, as will the agency names and titles of authorized officials. For example, in the State of Texas, only the governor of the state, mayor of an incorporated city, or county judge of an unincorporated area are authorized to recommend evacuation. However, in Texas any evacuation is voluntary, not mandatory or required, as may be true in other states.

A warning or watch is normally issued only once to provide initial notification (alert) of the event. A new warning or watch should be issued if the hazard or recommended public protective action(s) has expanded into another county or geographic zone, or if the valid time has been extended. All other updates or cancellations of the event should be sent as a non-emergency Administrative Message (ADR) or by other means (e.g., telephone, fax, e-mail, or media briefings) to local news media outlets.

4. Non-Weather Related Emergency Messages. This section provides the NWS recommended definitions of non-weather related events that are currently relayed by the NWS in text products and on NOAA Weather Radio (NWR) broadcasts which are available to LECC's and SECC's.

- 4.1 Administrative Message (ADR). A non-emergency message that provides updated information about an event in progress, an event that has expired or concluded early, pre-event preparation or mitigation activities, post-event recovery operations, or other administrative matters pertaining to the Emergency Alert System.
- 4.2 Avalanche Watch (AVA). A message issued by authorized officials when conditions are forecast to become favorable for natural or human-triggered avalanches that could affect roadways, structures, or backcountry activities.
- 4.3 Avalanche Warning (AVW). A warning of current or imminent avalanche activity when avalanche danger is considered high or extreme. Authorized officials may recommend or order protective actions according to state law or local ordinance when natural or human-triggered avalanches are likely to affect roadways, structures, or backcountry activities.
- 4.4 Child Abduction Emergency (CAE). An emergency message, based on established criteria, about a missing child believed to be abducted. A local or state law enforcement agency investigating the abduction will describe the missing child, provide a description of the suspect or vehicle, and ask the public to notify the requesting agency if they have any information on the whereabouts of the child or suspect.
- 4.5 Civil Danger Warning (CDW). A warning of an event that presents a danger to a significant civilian population. The CDW, which usually warns of a specific hazard and gives specific protective action, has a higher priority than the Local Area Emergency (LAE). Examples include contaminated water supply and imminent or in-progress military or terrorist attack. Public protective actions could include evacuation, shelter in place, or other actions (such as boiling contaminated water or seeking medical treatment).
- 4.6 Civil Emergency Message (CEM). An emergency message regarding an in-progress or imminent significant threat(s) to public safety and/or property. The CEM is a higher priority message than the Local Area Emergency (LAE), but the hazard is less specific than the Civil Danger Warning (CDW). For example, the CEM could be used to describe a change in the Homeland Security Alert System level in response to a terrorist threat.
- 4.7 Earthquake Warning (EQW). A warning of current or imminent earthquake activity. Authorized officials may recommend or order protective actions according to state law or local ordinance.
- 4.8 Evacuation Immediate (EVI). A warning where immediate evacuation is recommended or ordered according to state law or local ordinance. As an example, authorized officials may recommend the evacuation of affected areas due to an approaching tropical cyclone. In the event a flammable or explosive gas is released, authorized officials may recommend evacuation of designated areas where casualties or property damage from a vapor cloud explosion or fire may occur.

4.9 Fire Warning (FRW). A warning of a spreading wildfire or structural fire that threatens a populated area. Evacuation of areas in the fire's path may be recommended by authorized officials according to state law or local ordinance.

4.10 Hazardous Materials Warning (HMW). A warning of the release of a non-radioactive hazardous material (such as a flammable gas, toxic chemical, or biological agent) that may recommend evacuation (for an explosion, fire or oil spill hazard) or shelter in place (for a toxic fume hazard).

4.11 Law Enforcement Warning (LEW). A warning of a bomb explosion, riot, or other criminal event (e.g. a jailbreak). An authorized law enforcement agency may blockade roads, waterways, or facilities, evacuate or deny access to affected areas, and arrest violators or suspicious persons.

4.12 Local Area Emergency (LAE). An emergency message that defines an event that by itself does not pose a significant threat to public safety and/or property. However, the event could escalate, contribute to other more serious events, or disrupt critical public safety services. Instructions, other than public protective actions, may be provided by authorized officials. Examples include: a disruption in water, electric or natural gas service, road closures due to excessive snowfall, or a potential terrorist threat where the public is asked to remain alert.

4.13 Network Message Notification (NMN). Not yet defined and not in the suite of products for relay by NWS.

4.14 911 Telephone Outage Emergency (TOE). An emergency message that defines a local or state 911 telephone network outage by geographic area or telephone exchange. Authorized officials may provide alternative phone numbers in which to reach 911 or dispatch personnel.

4.15 Nuclear Power Plant Warning (NUW). A warning of an event at a nuclear power plant classified such as a Site Area Emergency or General Emergency as classified by the Nuclear Regulatory Commission (NRC). A Site Area Emergency is confined to the plant site; no off-site impact is expected. Typically, a General Emergency is confined to an area less than a 10-mile radius around the plant. Authorized officials may recommend evacuation or medical treatment of exposed persons in nearby areas.

4.16 Radiological Hazard Warning (RHW). A warning of the loss, discovery, or release of a radiological hazard. Examples include: the theft of a radioactive isotope used for medical, seismic, or other purposes; the discovery of radioactive materials; a transportation (aircraft, truck or rail, etc.) accident which may involve nuclear weapons, nuclear fuel, or radioactive wastes. Authorized officials may recommend protective actions to be taken if a radioactive hazard is discovered.

4.17 Shelter in Place Warning (SPW). A warning of an event where the public is recommended to shelter in place (go inside, close doors and windows, turn off air conditioning or heating systems, and turn on the radio or TV for more information). An example is the release of hazardous materials where toxic fumes or radioactivity may affect designated areas.

4.18 Volcano Warning (VOW). A warning of current or imminent volcanic activity. Authorized officials may recommend or order protective actions according to state law or local ordinance.

Audience

This training is intended for any state or local official who is authorized to issue EAS warnings in compliance with FCC rules and state and local EAS plans. As indicated above, responsible individuals may or may not be professional emergency managers. Other likely disciplines include Law Enforcement, Fire Services, Emergency Communications Centers (911), Public Information Officers, or elected officials. A wide range of knowledge and experience is anticipated, and the appropriateness of course design will be validated through a pilot test period.

Goals and Objectives

Goal: Following the completion of this course, the trainee will have the knowledge and skills to implement an effective warning program to ensure that appropriate, complete, and accurate warnings are issued to the public through the HazCollect system.

The course material will be organized into five units. The following objectives are organized by unit:

Unit 1: What is HazCollect? Who is authorized to use it?

Objective 1.1: The student will gain a general understanding of how the HazCollect system operates and the dissemination systems available.

Objective 1.2: The student will be able to determine whether he/she meets the necessary criteria for authorization to use HazCollect.

Objective 1.3: The student will be able to determine the geographical area for which he/she may be authorized.

Unit 2: NWEM Message Types.

Objective 2.1: The student will be able to apply knowledge of the most frequently used NWEM message types appropriately.

Objective 2.2: The student will be able to apply procedures for correcting, updating, or canceling NWEMS.

Unit 3: CAP Elements and Message Content Constraints.

Objective 3.1: The student will be able to apply knowledge of required and optional CAP elements in relation to entry fields in a “typical” NWEM authoring tool.

Objective 3.2: The student will be able to apply understanding of how CAP elements and HazCollect server post-processing results in the final NWEM.

Objective 3.3: The student will be able to apply knowledge of voice-to-text issues, including message length limitations and factors related to pronunciation.

Objective 3.4: The student will be able to apply knowledge of other message constraints, including allowable characters and formatting.

Unit 4: Alerting Criteria, Message Content Elements, Message Style Elements

Objective 4.1: The student will be able to locate the state EAS plan that pertains to his/her jurisdiction and use the criteria contained therein to determine under what circumstances EAS Alerts may be issued.

Objective 4.2: The student will be able to apply generic guidance to determine when to issue EAS Alerts via the HazCollect system.

Objective 4.3: The student will be able to apply knowledge of content elements of effective warnings (who, what, when, where, why, how) through use of a generic message template.

Objective 4.4: The student will be able to apply knowledge of style elements of effective warnings (specificity, consistency, certainty, clarity, accuracy, priority, source for additional information).

Unit 5: Implementing Effective Public Warning: Plan, Execute, Review, Improve

Objective 5.1, Planning: The student will be able to use an SOP Template for establishing local policy, requirements, and procedures, in collaboration with the local WFO and Local Emergency Communications Committee (LECC).

Objective 5.2, Execute: The student will be able to incorporate activation of local warning procedures into tests and exercises.

Objective 5.3, Review: The student will be able to participate in an after action review of HazCollect procedures.

Objective 5.4, Improve: The student will be able to identify and track implementation of Corrective Actions.



Protecting America's Communities

An Introduction to Public Alert & Warning

JUNE 2004

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FOREWORD

About the Partnership for Public Warning ...

“Every person will have the information needed in an emergency to save lives, prevent injury, mitigate property loss, and minimize the time needed to return to a normal life.” (The PPW Vision)

The Partnership for Public Warning is a not-for-profit, public-private partnership established to save the lives and property of people at risk from natural disasters, accidents and terrorism by improving the nation’s alert and warning capabilities. PPW provides a collaborative, consensus-based forum where all interested stakeholders – public and private – are working together to develop processes, standards, systems and strategies to ensure that the right people have the right information at the right time.

PPW’s objectives include, but are not limited to:

- Fostering communication, cooperation and consensus among key stakeholders:
- Promoting and conducting research and studies into alert and warning issues:
- Assisting and advising government officials on the development, implementation and operation of public warning systems, technologies, policies and procedures:
- Supporting the timely generation of standards, specifications, and protocols:
- Encouraging private sector investment in the development of new warning technologies and promoting the existence of such technologies to government decision makers;
- Fostering a knowledgeable public and informed decision making by establishing, maintaining and providing educational materials and other information on warning technologies and programs.

The Partnership is governed by an elected Board of Trustees representing local and state governments, private industry and the non-profit community. Federal agencies participating in PPW include the Department of Homeland Security, Department of Commerce and Federal Communications Commission.

PPW’s products include an assessment of the Emergency Alert System and a “*National Strategy for Integrated Public Warning Policy and Capability*”. The national strategy establishes a vision and roadmap for creating a more effective national alert and warning capability. In August 2003 the Partnership released a plan, “*Implementing the Vision*”, for implementing that national strategy. These reports, and more information about the Partnership, are available at www.PartnershipforPublicWarning.org.

Membership in PPW is open to any organization or individual who is interested in public alert and warning and shares our vision. Voting membership in the Partnership is available to federal, state and local government entities and to private organizations (for-profit and not-for-profit). Individuals may join the Partnership as non-voting, associate members.

PPW is a 501(c)3 organization and all dues and other payments are charitable tax contributions to the extent otherwise permitted by law.

For more information on the Partnership and to learn how you can get involved, visit the PPW web site at www.PartnershipforPublicWarning.org. You may also write or call:

Partnership for Public Warning
7515 Colshire Drive, MS N655
McLean, VA 22102
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INTRODUCTION

Effective and timely public warnings can save lives, reduce property losses and speed economic recovery when an emergency occurs. While public warning is primarily the responsibility of local governments, they require the cooperation and assistance of state governments, the federal government and the private sector. A partnership among these stakeholders is essential to the development and operation of an effective national public warning capability.

One of the objectives of the Partnership for Public Warning is to provide information to assist emergency managers and public officials in understanding the issues associated with public warning and to make informed decisions about how best to serve their community. This publication is provided for that purpose.

This document provides a brief overview of the many considerations that should be taken into account when developing or evaluating a public warning process and system.

PPW also provides an online directory of existing technologies, products and services that are available to warn the public during times of emergency. This directory identifies companies that manufacture or provide each product and service. The directory is located on the PPW web site at www.PartnershipforPublicWarning.org.

The Partnership for Public Warning believes that an effective public warning capability will employ multiple technologies for disseminating information. The specific technologies to be used will depend upon the requirements of the local community. PPW does not endorse or recommend specific technologies or products. Inclusion of a particular product or manufacturer should not be read as an endorsement by PPW.

PPW welcomes comments and suggestions on this directory. Comments may be sent to PPW at information@ppw.us. Providers of warning products and technologies that are not listed in this publication and wish to be should contact PPW at information@ppw.us.

AN OVERVIEW OF PUBLIC WARNING

Warnings Save Lives

Timely and effective public warnings can save lives, reduce property losses and speed economic recovery. Public warning empowers citizens by providing them with the information they need during times of emergency to make informed decisions. The objective of a public warning system is to capture the attention of people at risk, to provide them with relevant and accurate information regarding the nature of the threat and to provide such information in time for protective actions to be taken. A truly effective public warning capability will reach those at risk regardless of their location, the time of day or night or any disabilities or special needs.

The warning process consists of people with information communicating with people at risk and others, such as emergency responders, in advance of or during a hazardous event, with the intent that those at risk will take appropriate action to reduce casualties and losses. The goal of a warning is to prevent hazards from becoming disasters. -- the success of a warning is measured by what actions people take.

Warnings may be issued for all types of emergencies, from missing children and natural disasters to technological accidents and acts of terrorism. The emergency or hazard may be one that is days, weeks or months away; or it may be only minutes or hours. The type and content of the warning will depend upon the emergency. However, an effective public warning system will be able to respond to any and all types of emergencies. An all-hazard warning system suitable for all types of events is preferable to stand-alone, event-based systems.

An effective public warning system is one that does far more than just alert citizens to an impending hazard. An effective public warning system is one that provides the ability for government authorities to communicate with citizens prior to, through and after the emergency event. In addition to alerting citizens, an effective public warning system provides information on how to prevent and protect against disasters, and information to assist in recovery efforts.

Success Is Measured By The Actions People Take

A warning prompts people to take immediate actions that save lives, reduce injuries and protect property. Natural and manmade hazards create disasters when they kill and injure people, destroy and damage property, and cause further economic and emotional problems by instilling a sense of unease and uncertainty into society. Such losses can and have been reduced when people receive an alert of what is likely to happen soon, or notification of what is happening and advice about what to do in response to the hazard. With such knowledge, people can take appropriate action to get out of harms way, to reduce losses, to reduce uncertainty, and to speed recovery. Thus a warning must provide the information and motivation for people to take informed action.

Public Warning is a Local Responsibility

Disasters are local and local government has the primary responsibility to look after the welfare of its citizens. Thus local government has the primary responsibility to warn its citizens and to assist them in preparing, responding and recovering from disasters. Even though some warnings may originate outside the local community (e.g. hurricane warnings from the National Weather Service or terrorist alerts from the federal government), it is primarily the responsibility of the local authorities to ensure that citizens are provided with the information they need to protect themselves and their families.

Effective Warning Requires A Partnership

While warning is fundamentally a local responsibility, local governments must work in partnership with many other entities. As disasters generally do not respect geographic or political boundaries, communities must work together in close coordination. Moreover, state governments and various federal agencies have specific responsibilities for warning that will impact the local community. Many public warnings are disseminated thru NOAA Weather Radio and the Emergency Alert System. The private sector provides the communications infrastructure and the products (telephone dial-out, sirens, pagers, PDA's, etc.) over which warnings are disseminated. The media also plays an important role in disseminating warning information. An effective public warning capability requires that government and industry work in close partnership with one another.

Public Warning is a System – Not a Technology

Developing an effective public warning system is a complex process that requires the integration and management of many different elements. Selecting a technology to disseminate warnings is often the easiest issue to address, as there are many excellent technologies and systems available. Moreover, a comprehensive public warning system will employ a multitude of technologies.

The key elements of the public warning process include:

1. Data collection and analysis.

Development or collection of data regarding a potential hazard and the analysis of that data by experts as to the potential risk associated with the hazard.

2. Deciding to issue a warning.

Review of the data and the expert analysis by the appropriate authorities and the reaching of a decision to issue a warning to the public.

3. Framing the warning.

Creating a warning message for the public that includes pertinent information such as the nature of the hazard, the risk the affected area, and the protective actions that are recommended.

4. Disseminating the warning.

Distribution of the warning through all appropriate and available channels. This could include sirens, the Emergency Alert System, the media and specialized warning services such as telephone dial-out. The warning is also disseminated to those with special needs (e.g. blind, deaf, non-English speaking).

5. Public Reception

Members of the public at risk hear the alert and understand the warning.

6. Validation

Before taking action most members of the public will seek to validate the warning by going to alternate information sources to see if the same message is being sent.

7. Take Action

Members of the public take appropriate protective action to protect themselves, their families and their property.

The above is a very simplified overview of the warning process. Developing a successful warning strategy requires three things:

- **Planning**

Long before an emergency occurs the appropriate officials should develop plans for when and how to issue public warnings. Key elements in any plan include the criteria for issuing a warning, the officials with the authority to issue a warning, standard terminology and the methods of distribution.

- **Public Education**

Just as important as the plan is educating the public. Information needs to be provided to the public that explains how they will be warned, what do warnings mean (e.g. if a siren goes off is it calling the volunteer firemen to the station or signaling that citizens should stay in their houses?), and where to get additional information, especially if the power is off.

- **Testing and Evaluation**

An effective warning system will be tested on a regular basis; both to make sure the system works and that citizens understand the purpose and the message. Evaluation of the system by emergency managers, government officials, the media, private sector and the public can be invaluable in identifying ways to improve the communication of warning messages.

EFFECTIVE WARNING - LESSONS LEARNED

Over the past fifty years there has been an extensive amount of research done into how people respond to disaster warnings. Through this research and operational experience, a number of lessons have been learned. This section identifies some of the key lessons.

Warning System Context

Government authorities with public warning responsibility frequently think only of disseminating information to the “general public”. However, the target audience is much more complex in that it includes both intermediaries and a diverse citizenry. The context within which warnings are sent and received is shaped by the professional and personal experiences of those involved. This context must be understood and considered in developing a warning capability.

Intermediaries can include independent experts, the news media, institutional decision makers (e.g. public health officials, etc.) and even other government officials. These intermediaries will critically evaluate the warning information disseminated by authorities to determine if it is accurate, internally consistent, consistent with other sources’ messages, complete, specific, timely, relevant, and important. If a warning is judged to be inadequate in any of these respects, it will be challenged, supplemented with additional information, or ignored. The result is that the public rarely receives only the warning as issued by the authorities – it will frequently be accompanied by an interpretation or supplemental information provided by one or more intermediaries.

The general public will evaluate the warnings they receive from all sources in terms of their prior knowledge about the hazard and the recommended response actions. End-users also evaluate the warnings they receive about any given hazard in terms of their knowledge about other safety and health hazards and recommended actions for those other hazards. It is also important to remember that “the general public” is really “publics” since it involves:

- People with many different levels of education
- People with many different levels of financial ability and responsibility
- People of all races and beliefs
- People with many different primary languages
- People with widely varying experience with the hazard
- People with disabilities

In developing and disseminating a public warning it is important to consider who will hear the warning, who will interpret and explain the warning, and the characteristics and experiences of those in the public who will receive the warning.

Warning System Design

Warning sources often seem to assume that there will be immediate reception of the warning, unlimited attention to the warning message, perfect comprehension of message content based upon accurate prior knowledge about the threat, and perfect compliance with the recommended actions. None of these conditions will occur, even though reception, attention, comprehension, and personalization increase when there is an imminent threat. Consequently, warning systems and warning strategies must be carefully designed to make it more likely that warnings will be as effective as possible.

The first step in warning system design is to define the desired message effects, especially the behavioral objectives of the system—what actions do authorities want the end-users to take? The second step is to identify any distinctively different segments of the target population—how do people differ in terms of their abilities to receive a warning, attend to it, comprehend its content, personalize the threat, choose an appropriate protective action, and implement that protective action? The third step is to identify the channels through which warning messages will be transmitted—what technologies and what intermediate sources are needed? Finally, warning system designers must define who the initial message sources will be and develop their perceived credibility by taking steps to ensure their expertise and trustworthiness.

The Mass Panic Warning Myth

It is extremely important to note that “mass panic” is commonly expected by civil authorities but is almost never found, even in cases such as the 1993 and 2001 World Trade Center bombings. People generally engage in rational adaptive action even when they are very frightened. When people take inappropriate actions, it usually is because they had inadequate information about the situation or were not provided instructions on

what actions to take. Timely and effective public warnings can do much to diminish the risk of panic in an emergency situation.

The Cry Wolf Warning Myth

Another common assumption is that warnings not followed by the anticipated hazard will cause people to ignore future warnings. If false warnings are a regular occurrence, the public may begin to pay less attention to future warnings. However, there is no solid research that shows relatively rare false warnings have such an effect. The objective is to educate the public about uncertainty so that they can comprehend that false warnings arise from inherent uncertainty rather than from poor professional practice. One implication of this lesson is that warning systems should be designed to only alert and warn those at risk. A warning system that continually warns many people not at risk may lose credibility and the public will pay less attention.

Withholding Information Is Typically Not In the Public Interest

Officials are sometimes reluctant to communicate information to the public until the situation becomes clearer, out of a fear that public knowledge may make things worse. Experience and research show that when there is a credible threat, it is better to get information to people who can do something about it rather than to withhold it. Opening up an ongoing information flow as incident unfolds -- literally telling the story of the emergency as new facts disclose themselves -- allows initial directives to be modified as circumstances change. No one would expect directives for protective action to remain static when the emergency itself does not remain static. The public will listen to the emergency story unfold and will modify their actions as facts become clear and situations change. In many after action reviews of major emergencies, the economic, political and moral costs and liabilities of not providing information when it could have been released are often assessed as being very high.

The Too-Much Information Myth

If information is accurate, it is impossible to give the public too much information that applies directly to their safety. Warning, especially of uncertain events, is a dialog for the purpose of helping people deal constructively with that uncertainty. Fear of the known is better than fear of the unknown. An abundance of accurate information can cut down on speculation. The issues are to be direct, clear and relevant. In our free and information-rich society, people are used to processing information; they have demonstrated a desire for information. They often assume someone is trying to hide information if it is not available.

36 Things to Consider about Public Warning

1. Identify the appropriate actions that those at risk *should* take, as well as inappropriate actions that they *might* take based upon their experience with

similar hazards. This is especially difficult but nonetheless vital when information is incomplete or there are conflicting recommendations.

2. Identify and plan for the incentives and disincentives for taking the alternative actions, as well as the constraints that prevent people from taking appropriate actions (e.g. people typically want to look out for their children or pets before they take action for themselves).
3. Develop programs to make sure the public can comply with recommended actions (e.g. if evacuation is recommended – make sure there are buses or other transportation so those without personal vehicles can evacuate) and provide mechanisms for communicating the availability of these resources and programs to those who need them.
4. Recognize that “the public” is not a homogeneous entity. Households, businesses, government agencies, and non-governmental organizations vary in size, demographic composition, geographic location, and economic resources.
5. Identify and consider the ways in which population segments differ in their perceptions of the credibility of different sources, their access to different warning channels, their reactions to warning message content, and the incentives, disincentives, and constraints they are likely to experience in attempting to take protective actions.
6. Warning alerts must be distinct, attention grabbing, and not appear to be another common occurrence. Ideally the alert will provide an indication of the hazard threat level.
7. Provide individuals with the opportunity to test the system themselves. For example: Call a 1-800 number and have an alert message sent to their receiver only.
8. Be as specific as possible about the nature of the threat (e.g. explosive, chemical, nuclear/radiological, or biological), the anticipated impact location, and the expected time of impact. The general public and decision makers in business, government, and non-governmental organizations need to have as much information as possible so they can weigh the consequences of alternative actions (including inaction) before expending significant resources on protective measures.
9. Recommend one or more specific protective actions so that those at risk will know what they can do to protect lives and property. Describe the hazard with sufficient specificity that it motivates people to take protective actions.
10. Explain to those who are *not* at risk why they are not believed to be at risk and why they do not need to take protective action.

11. Recognize that protective actions are most likely to be taken by those at risk when there is a *change* in threat condition. Develop a plan and systematic procedures for elevating and lowering the threat condition. The longer a given threat condition is maintained, the less effective it will be.
12. Use terminology in warning messages that is consistent across time for a given hazard and, to the greatest extent possible, compatible with the terminology that is used for other hazards. Avoid the confusion that can be created when similar terms or symbols have different meanings in different events (e.g. Although school districts and the Homeland Security Advisory system both use a Code Blue, it means something different in each case.).
13. Let people know when the threat has ended so they can resume normal activities as soon as possible.
14. Be prepared to disseminate specific warnings even if there is a high level of uncertainty about the threat because the information needed to reduce that uncertainty might arrive only shortly before the incident occurs. In such cases, casualties could occur because an official warning could not be received and acted upon in time by all of those at risk. The old saying “forewarned is forearmed” applies.
15. Do not withhold information because of concerns about “panic” (which is commonly anticipated by authorities but almost never occurs). If authorities do not provide information, people will seek it from other—usually less reliable—sources.
16. Repeat warning messages at regular intervals so those who missed an earlier warning will have another chance to receive it and those who ignored an earlier warning will have another opportunity to pay attention to it. Repetition also will give those who did not understand an earlier warning another opportunity to comprehend it and those who did not believe an earlier warning another opportunity to personalize it.
17. Update information when conditions change significantly so that people can adapt their responses to the new situation.
18. Identify all the communications channels to which different segments of the population have access. It is especially important to identify the channels that people monitor routinely, as well as those that can reach people rapidly during emergencies.
19. Use multiple methods and channels to disseminate messages. These include print and electronic media, the Internet, and even face-to-face presentations from credible original and intermediate sources.

20. Encourage people to tune to reliable sources of local broadcast news.
21. Recognize that no single source has complete credibility regarding all aspects of the threat and protective actions. Federal, state, and local government agencies vary in their credibility, as do news media, business, and nongovernmental organizations.
22. Identify in advance which organizations (and individuals within those organizations) will be responsible for communicating with those at risk, as well as with other population segments that are not at risk.
23. Identify procedures by which information from different sources can be combined to ensure that each individual source's messages are consistent with all other sources' messages and that, together, all official sources' messages are accurate, complete, specific, internally consistent, timely, novel, and relevant.
24. Recognize that source credibility can be established initially by credentials such as agency mission and educational degrees, but is enhanced by preparing objective ("transparent") procedures in advance rather than improvising during an incident, by obtaining endorsement by external experts ("peer review"), and establishing a satisfactory record of performance over time.
25. Build credibility and understanding that the warnings are based on the best available professional practice. Develop credible, articulate authorities to use consistently. Develop and utilize trusted personalities who the public know and respect. This is especially important for warnings of terrorism. Politicians are not credible authorities
26. Even the most carefully designed warning system requires continual maintenance to ensure that it will be effective. Critical phases of maintenance include training, evaluation, and development. Core elements must be used every day.
27. Educate the public and provide for regular tests of the system – tests in which the public can participate.
28. Provide training about the hazard and protective actions if those at risk must respond to unfamiliar situations. Be aware that few people will spend very much time and effort learning about a hazard before an incident occurs. Nonetheless, those who learn about the hazard and protective actions will have the necessary information to pass on to friends, relatives, neighbors, and coworkers, and serve as leaders within their local communities.

29. Adapt the scope of the training effort to the training motivation and capabilities of each target audience—personnel within emergency-relevant organizations, personnel within hazardous facilities (e.g. chemical plants), critical facilities (e.g. hospitals), critical infrastructure (e.g. ports), news media, and households.
30. Recognize that pre-incident planning and training will reduce uncertainties in actual emergencies, but improvisation will be necessary because events will differ in many ways from practice scenarios. Thus, training must be designed to promote adaptation and creativity rather than just rote response.
31. Make basic training about the hazard and appropriate response actions readily accessible to end-users, especially small business and households that cannot afford to hire specialized assistance in preparing for the threat.
32. Emphasize the common elements of emergency preparedness for all hazards. Emphasizing these common elements will enhance the transfer of training from one hazard to another. Moreover, significant expenditures of money, time, and effort will be more acceptable if the knowledge, skills, tools, and equipment can be used in response to multiple threats.
33. Actively promote continued evolution of warning system design to accommodate changes in hazard risk assessment, our understanding of the hazard and all its risks, communication technologies, and constantly changing demographic characteristics of populations at risk.
34. Recognize that one method will not reach all, and that an infrastructure is needed to support all channels.
35. Conduct careful pre-implementation evaluations to ensure that all new emergency response technologies meet user needs and are compatible with other systems in use.
36. Conduct post-incident and post-exercise assessments of all plans, procedures, staffing, training, facilities, and equipment so revisions can be made to improve response to future incidents.

THE WARNING MESSAGE

The first issue in warning is getting peoples' attention -- getting them to realize that something is happening (or about to happen) that is important enough to be worthy of some of their time and thought. This is easiest when there is a clear, perceivable threat such as an approaching tornado or hurricane. When the threat is less perceptible, such as a toxic cloud or a potential terrorist attack, sufficient information must be provided just to get peoples' attention. Once you have peoples' attention, they will seek information in order to decide whether the event will affect them and what, if any, action to take. If official information is not available, they will get it from less authoritative sources. The public wants specific information and details upon which to base decisions. The more detail that is provided, the better the chance that they will pay attention and consider options. It is important to remember that a warning is intruding into people's lives, seizing their attention, and urging them to modify deeply embedded behaviors.

Intermediaries and the general public will be seeking as much information about an event as possible. While not every piece of information will be equally relevant to every person, among the information that should be considered as part of any public warning is the following:

- Hazard information
 - What type
 - When
 - Where
 - Intensity
 - Duration
 - Source that identified the hazard
- Vulnerability
 - Demographic characteristics (static and dynamic)
 - Population density
 - Population profile
 - Access to escape routes
 - Environmental characteristics
 - Infrastructure
- Risk
 - Probability
 - Projected numbers of individuals affected
 - Types of impacts
- Possible actions
 - Ways to reduce impact
 - Protective actions
 - Recovery actions
- Additional Information
 - How to obtain

As noted above, not every member of the public will need all of the above information. Provided below is an example of the type of information that might be sought by a homeowner threatened by an approaching hurricane.

Hurricane Warning Information for Households

Threat Information

Type of event	Hurricane
Type of threats	Storm surge, wind, inland flooding, tornadoes
Target location	What are the threats at their location
Impact area	Where else are there threats, should they change locations Width of threatened coastline; Inland extent of surge, wind, and flooding
Magnitude (Intensity)	What is the impact to them Saffir-Simpson scale; Depth of surge/flooding and wind speed at critical locations
Time of onset	Estimated arrival time of tropical storm winds and surge
Duration	How long tropical storm winds and surge will last
Probability	Expected landfall location and radius of hurricane winds, storm category, arrival time, duration
How vulnerability varies by structure and location	For single family structures, multi-family structures, mobile homes

Recommended Actions

Protection for persons	Evacuation Sheltering in-place Access controls
Protection for property	Strengthen building envelope (install shutters) Secure contents (bookcases, refrigerators) Turn off utilities (gas, electric power, water)
Further information	Contact point for further information (EAS station, NOAA Weather Radio) Contact point for assistance in protective response Environmental cues Social sources/conditions

Clearly, the warning process for a hurricane, or any other hazard, requires communicating a great deal of information quickly and concisely. This is best achieved when the population has been given previous training and education.

Consistent Messages are Essential

One essential characteristic of an effective public warning system is the use of uniform terminology for all hazards and consistent messages. Disasters have many similarities whether from natural causes, accidents or acts of terrorism. This is true because the mechanisms that harm people and property such as fire, building collapse, toxic chemical release, or floods are the same regardless of how these mechanisms are triggered. Alerting people at risk to impending disasters or notifying them about ongoing disasters involve the same kinds of activities no matter what the cause of the disaster. The goals in each case are to get peoples' attention, to advise them about what is happening, and to get them to take appropriate action. Effective warnings must be communicated clearly and succinctly. Unfortunately, there is frequently little similarity in the warning terminology used by different government organizations. Even at the community level, it is not uncommon to find that each type of emergency event employs different terms and warning scales. As a result, people at risk may not recognize or understand a warning when it is heard. It is far more effective to use consistent terminology and warning scales. People at risk would understand warnings much better if the terminology were standard for all types of hazards.

In developing standard terminology it is important to use:

- Easily understandable “trigger words”
- Words that are simple, memorable, to the great majority of people
- Words that are transferable across different hazards
- Words that translate into other languages with similar meanings
- Words that can be used in many different mediums such as a 10-character pager, a 12-character cell phone, a 60-character short messaging appliance, a newspaper article, a half-hour television documentary.

By using standard words, training can be standard, and people would get used to them. This would then alleviate problems associated with scales that people rarely hear about. For instance, on September 10, 2002 Robert Siegel of National Public Radio interviewed tourists at the Washington Monument about that day's increase in the Homeland Security Advisory Scale to level “Orange.” Few of them knew that the level had changed and none could identify what it meant. One man stated, “No, I'm not [aware of the HSAS change or level]. I mean, I barely get the pollution and the heat colors. Last week the kids were talking about purple. Like, I've never heard of purple.” Another commented, “I'd rather see it high, low, medium, you know? It'd be easier to understand.” Using different terminologies for each warning system makes it difficult for the end user to remember how each system uses the terms and prevents them from transferring knowledge of one system to another.

Common Alerting Protocol

An important step towards standard warning terminology has been taken with the development of the Common Alerting Protocol – a standard message format for public warnings.

The Common Alerting Protocol (CAP) is a simple but general format for exchanging all-hazard emergency alerts and public warnings over all kinds of communication and information networks.

- CAP allows a consistent warning message to be transmitted simultaneously over many different warning systems, thus increasing warning effectiveness while simplifying the warning task.
- CAP also can facilitate the detection of emerging patterns in local warnings of various kinds, such as might indicate an undetected natural hazard or a hostile act.
- In addition, CAP offers a template for effective warning messages based on best practices identified in academic research and real-world experience.

CAP implements the National Science and Technology Council's call in November, 2000 for "a standard method ... to collect and relay instantaneously and automatically all types of hazard warnings and reports locally, regionally and nationally for input into a wide variety of dissemination systems."

The Common Alerting Protocol (CAP) specifies an open, non-proprietary digital message format for all types of alerts and notifications. The CAP format is fully compatible with existing formats including the Specific Area Message Encoding (SAME or WR-SAME) used for NOAA Weather Radio and the Emergency Alert System, while offering enhanced capabilities that include:

- Flexible geographic targeting using latitude/longitude "boxes" and other geospatial representations in three dimensions;
- Multilingual and multi-audience messaging;
- Phased and delayed effective times and expirations;
- Enhanced message update and cancellation features;
- Template support for framing complete and effective warning messages;
- Digital encryption and signature capability; and,
- Facility for digital images, audio and video.

The chief benefit of CAP will be reduction of costs and operational complexity by eliminating the need for multiple custom software interfaces to the many warning sources

and dissemination systems involved in all-hazard warning. The CAP message format can be converted to and from the “native” formats of all kinds of sensor and alerting technologies, forming a basis for a technology-independent national and international “warning internet.” Distributing warning messages in a machine-readable format can also facilitate the automatic triggering of events that must be taken when a disaster threatens (e.g. automated water intake and air ventilation closures, water level adjustments, train stoppages, etc.)

The CAP has undergone rigorous technical review within the OASIS standards process and final approval as a standard was received in early 2004.

For additional information about the Common Alerting Protocol project, see:

- OASIS Emergency Management Methods and Messages Subcommittee: http://www.oasis-open.org/committees/tc_home.php?wg_abbrev=emergency-msg
- Common Alerting Protocol Working Group: <http://www.incident.com/cap/>

Or contact Mr. Art Botterell acb@incident.com, Chair of the CAP Working Group and the OASIS Emergency Management Notification Methods and Messages Subcommittee.

WARNING IS A CONTINUOUS PROCESS

Warning is not a single instantaneous action. It is an ongoing process that peaks every once in a while. For the scientists, intelligence experts and emergency managers who will issue a warning, there is continuous collection of data and information that is either analyzed routinely by computer or by experts. Ultimately the experts either make an interpretation of what is likely to happen or observe what is happening and decide to issue a warning perhaps with recommended actions based on scenarios previously agreed to by emergency managers. For emergency managers, business continuity experts, and others there is the need to develop plans for reacting to any likely disaster. These plans based on assessments lead to scenarios that can be used for education, training, and procedures used during actual events. Training exercises are ideal times to network with the people developing the warnings and with others preparing to respond so that when the real warning comes, there is personal knowledge of all the different people involved. While the real event will never be just like an anticipated scenario and originality in response will be necessary, during an actual emergency people fall back to their level of training. With planning, training, and exercising comes analysis of recommended actions that might be given to the publics and a chance to pretest message content. Development of such recommended actions can be very useful when a technical warning must be issued immediately. Events that disrupt infrastructure may require special preplanning and information systems. For example it may be necessary to assure that doctors can get to the hospital.

For various groups that respond to warnings, education and training are very important so that they are better prepared for what is likely to occur. This is also the time when family and community plans can be developed and integrated with overall planning. It is the time to create networks among and between business leaders, community leaders, first responders, and people who issue warnings. The media play a key role here, providing relevant news and in-depth stories. Dramatization on entertainment channels may provide appropriate education.

Such activities should take advantage of an increase in public interest because of major events elsewhere or recovery from an event at home. This is the time to communicate alternatives, potential resources, possible actions and likely consequences. When a warning is being developed, there may be a significant range of specific information available over a significant period of time. In this case, communication with the public may take place over an extended period of time. There may be some “trigger event” that leads to a preliminary warning: a hurricane moving into the Caribbean, the first case of smallpox or anthrax, the type of weather that usually leads to tornadoes, and such. As the threat is assessed, we begin to understand the hazard. As the specificity of the hazard increases, we begin to understand our vulnerabilities and ultimately understand the risk. Involvement of the public in this learning experience is essential if they are to take informed action. It gives them time to think about options and alternatives.

WARNING METHODS, TECHNOLOGIES AND SYSTEMS

Once the appropriate authorities have decided to issue a public warning and drafted the message, the challenge is deliver the message to the public. There are many alternative methods for delivering public warnings and related information. There is no single best system that fits all jurisdictions. An effective public warning system should use as many information dissemination channels as possible. Moreover, the specific channels and technologies to be used will depend upon the requirements of the local community. The local authorities must develop a system that is tailored to the needs of the community.

In developing a warning system, there are a number of factors that must be considered. These factors include, but are not limited to who you are trying to reach, where they are, what they are doing, special needs and the time of day.

Audience

Elderly	Children
Emergency Responder	Elected officials
Tourists	Locals
Hospitals	Factories
Schools	Shopping Centers
Parks	Beaches
Marinas/boaters	Transient workers
Aviation	

Location

In a car	In a boat or plane
Home	Work
Shopping center	Outside
School	Hospital
Prison/jail	Theatre
Restaurant	

Activity

Driving	Talking on the phone
Sleeping	Playing
Watching TV	Listening to the radio
Shopping	Walking/running
Working at a desk	Working in a factory
Cooking	Camping/hiking

Special Needs

Blind	Deaf or hard of hearing
Bed-ridden	In a wheelchair
Don't speak English	Illiterate

Time

Day	Night
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Another factor to consider is redundant methods of communicating when parts of the infrastructure are not available. For example, how will warnings be communicated when there is no electricity?

In developing a warning capability, consideration should be given to achieving a total capability that meets the following criteria:

- Doesn't put message provider or recipient at risk
- Always on, always ready to warn
- Reliable, redundant, secure
- Available in the absence of electricity
- Fast transmission and delivery
- Accurate
- Individually addressable to at risk locations
- Addressable to persons in affected locations or areas
- Reaches all persons within a threatened location or area (including transient population)
- Scaleable to provide timely mass notification
- Assured delivery designed in
- Delivery confirmation capability
- Supports strategies for emergency response and evacuation plans
- Provides location for obtaining more information
- Accessible to people with special needs and various languages
- Cost effective and high perceived value
- Understood and accepted by citizens
- Supports multiple types of hazards
- Ensure that only authorized officials may enter alerts and warnings;
- Be based on an open, non-proprietary architecture;
- Employ uniform alert and warning terminology that is clearly understood by recipients regardless of geographic location;
- Support multiple distribution channels employing multiple technologies (e.g. telephones, cell phones, PDA's, personal computers, TV's, radios and other consumer electronics);
- Involve all public and private stake holders in its development and operation.

Note that the above criteria describe the ideal warning capability. No single technology or service can satisfy all of the above criteria. However, with the proper selection of a multiplicity of services and products it is possible to develop a capability that meets most of the above.

Factors to Consider in Developing a Warning Capability

A public warning includes two key components...an alert and a message. Alerts and messages may or may not be delivered using the same method. While some methods offer the ability to do both alerting and messaging, many do not. As an example, many locations use sirens to alert the public, and to direct the public to tune to a local radio or TV station to receive a corresponding message.

Alerts and messages can be broadcast to all:

- who are tuned into the specific medium
- who are programmed to receive it (tone alert radio with location or list identifier)

Alerts and messages can be delivered to:

- specific locations (telephone network based)
- specific devices, wherever they may be (pager services)
- specific lists of people using multiple methods/channels (unified messaging: phone, email, pager, etc.)
- specific lists of people falling within a specific area (all schools within the flood plain)

An alert can be:

- audible
- visual
- physical (vibrate device, bed, etc.)
- distinctive (specific alarm)
- non-distinctive (telephone ring, short message notification)

A message can be:

- audible (spoken, tones)
- visual (text, lights)
- physical (Braille)
- distinctive (crawler across a TV screen)
- non-distinctive (embedded in the nightly news)

Some methods are specific to:

- the range of a transmitter
- a man made geographic boundary, such as a political boundary
- an event driven geographic shape, such as plume cloud or flood plain
- an individual location
- a specific person

Some methods include the ability to confirm a message has been delivered to:

- a person or device at a specific location
- a person or device wherever they/it may be currently located
- a specific person

With respect to the timing of the message delivery, some methods offer alert and or message delivery:

- to all recipients at the same time
- to recipients over a period of time
- to recipients within specific geographic areas (ex. flood stage areas), or on specific lists, at specific times or during specific periods of time

With respect to capacity, some methods:

- have an unlimited capacity of recipients
- have a capacity of recipients they can reach within specific time frames
- have capacities that by other uses of the networks they utilize
- are affected by other sources of interference

When it comes to security and reliability, some methods are more or less:

- vulnerable to hacking than others
- easily mimicked than others
- able to perform under the challenges associated with various hazardous events
- dependent on electrical grids being operational

And after all these considerations, we must look at where people are located and what they are doing. What matters is does your system effectively reach people:

- indoors
- out of doors
- at home
- at work
- at play
- in their cars
- in rural areas
- in urban areas
- in public places
- when they are awake
- when they are asleep
- when they are in their home district
- when they are out of their home district

The Partnership for Public Warning has come to the conclusion that no one method will ever cover all considerations, and that a truly effective public warning "system" includes multiple methods of alerting and message delivery.

Warning Options

There are many different methods for warning the public. This section provides a brief introduction to some of these methods.

The most common type of warning method is that of **mass notification**. A mass notification warning will (or should) reach every person in a geographic area, regardless of whether they are at risk or not. These systems are not individually addressable and generally provide the same alert or message to every recipient. The most basic systems will merely alert people that there is a problem – it will not provide details regarding the nature of the problem. More sophisticated mass notification systems can provide specific details. At the other end of the spectrum are systems that can be individually addressed – i.e. a message can be sent to only those people at risk. The most sophisticated systems include GIS addressability. For example, if a person enters a high risk area a message can be sent to their cell phone or pager.

There are a wide variety of warning methods and options available to the local community. The most basic type is the **knock on doors** approach, where police or public safety officials go door to door to warn citizens. Another method is to use **mobile loudspeakers** while driving through the neighborhoods at risk. **Flares and explosives** are valuable for attracting the attention of citizens to an emergency. **Tell the media** is another popular approach that can be easily initiated with a telephone call or press release. Manual **telephone trees** can also be established to notify citizens when there is an emergency. Some communities have used **aircraft with banners** or **helicopters dropping leaflets** to provide emergency information, especially to rural areas. Another way to reach remote locations is the use of **amateur radio operators**.

The next step up in mass notification is the bell or siren. Some communities still use a **loud bell** to alert citizens to an emergency. A more popular method is the **outdoor siren**. Sirens can transmit different sounds or voice messages depending upon the action required. Sirens can be fixed or rotating and they can be triggered locally or automatically by a distant sensor or source.

Television and radio are perhaps the most popular means of disseminating public warnings. Contacting the local station or issuing a press release is often sufficient to generate some type of notice. Local authorities can also use the **Emergency Alert System** to issue a more formal warning. These warnings will reach the at risk population if they are listening to the radio or television and if the broadcasters agree to transmit the message. **NOAA Weather Radio** can be used to disseminate warnings to those who have special receivers.

Another possible mass notification method is the use of **electronic billboards** and **highway signs**. These can be used to relay a warning message to those traveling on the highway. Some communities have considered **local, low-wattage radio stations** for disseminating emergency information. Another option is available from **digital television**

stations such as those of public television. These stations are able to dedicate portions of their signal for special uses such as warnings and emergency information. With the proper receivers a digital signal can be individually addressed to only those at risk.

The next level of alert and warning involves sending individually addressable messages to only those at risk. A number of systems can provide such messages over the **telephone**. There are **dial-out (called reverse911)** systems that can place calls to those at risk. There are systems to reach both hard-wired telephones and cell phones. Some alerts and warnings are delivered via **fax messaging**. There are also systems available to send data messages to **PDAs, pagers and other mobile devices**. Some alert and warning systems use **special receivers**. These are often available when the need is to alert someone with a special need (e.g. blind or deaf) or a person who doesn't speak English.

Alerts and warnings can also be transmitted over the **Internet**. There are “push” systems that will send a **pop-up message** or **email** to those at risk.

It is important to note that many of the systems currently available will permit alerts and warnings to be sent to multiple devices. It is possible to obtain a system that will deliver an alert or warning to the telephone, PDA, cell phones, Internet, etc.

WARNING PROVIDERS AND SERVICES

The Partnership for Public Warning provides a directory of organizations that provide state-of-the art alert and warning products and services to serve the public. This directory is available for free over the Internet at www.partnershipforpublicwarning.org.

REPORTS ISSUED BY PPW

April 25, 2002 – Comments provided to the Director, Federal Bureau of Investigation, regarding the proposed Homeland Security Advisory System

July 5, 2002 – Comments provided to Governor Tom Ridge, Director, Office of Homeland Security, regarding the proposed Homeland Security Advisory System

November 25, 2002 – “Developing A Unified All Hazards Public Warning System”, A Report by the Workshop on Effective Hazard Warnings (PPW Report 2002-2)

May 16, 2003 – “A National Strategy for Integrated Public Warning Policy and Capability” (PPW Report 2003-1)

May 2003 – “Accessing And Originating Warnings from Consequence Management Tools” (PPW Report 2003-2)

September 2003 – “Public Alert and Warning: A National Duty, A National Challenge: Implementing the Vision” (PPW Report 2003-4)

December 30, 2003 – Letter to DHS Undersecretary Frank Libutti with summary of public comments received on the Homeland Security Advisory System

February 2004 – “The Emergency Alert System: An Assessment” (PPW Report 2004-1)

March 16, 2004 – “The Homeland Security Advisory System: Threat Codes & Public Responses”, PPW testimony before the House Subcommittee on National Security, Emerging Threats and International Relations

June 2004 – “Protecting America’s Communities: An Introduction to Alert and Warning” (PPW Report 2004-2)

June 2004 – “Alerting America: A Directory of Public Warning Products, Services and Technologies” (PPW Report 2004-3)

Copies of the above reports may be obtained from the PPW web site at:
www.PartnershipforPublicWarning.org.