PPW Report 2004-2

PARTNERSHIP FOR PUBLIC WARNING

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
Phone: (703) 883-2745
Fax: (703) 883-3689
Email: information@ppw.us

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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 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 publics 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

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 with 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.