FEDERAL SIGNAL
Safety and Security Systems

Advancing security and well-being.

Addressing the Issues of Public Complacency and Apathy in Emergency Warning and Mass Notification

Federal Signal Corporation
Published: May 2013

The information contained in this document represents the current view of Federal Signal Corporation on the issues discussed as of the date of this publication. Because Federal Signal must respond to changing market conditions it should not be interpreted to be a commitment on the part of Federal Signal, and Federal Signal cannot guarantee the accuracy of any information presented after the date of publication.

This white paper is for information purposes only. Federal Signal makes no warranties express, implied or statutory, as to the information presented in this white paper document.

Federal Signal may have patents, patent applications, trademarks, copyrights or other intellectual property rights covering subject matter in this document. Except as expressly provided in any written license agreement from Federal Signal, the furnishing of this document does not give you any license to these patents, trademarks, copyrights or other intellectual property.

Unless otherwise noted, the example companies, organizations, products, domain names, e-mail addresses, logos, people, places, and events depicted herein are fictitious, and no association with any real company, organization, product, domain name, e-mail address, logo, person, place or event is intended or should be inferred.

If you have comments on this publication or would like additional information from Federal Signal Industrial Systems Division University Park, Illinois, please contact us at:
elp@fedsig.com

© 2013 Federal Signal Corporation. All rights reserved.

The names of actual companies and products mentioned herein may be trademarks of their respective owners.

Introduction

Sunday May 22, 2011, 5:34pm. The deadliest tornado to strike the U.S. in more than half a century begins its sweep across the city of Joplin, Missouri resulting in 159 fatalities, more than 1,000 injuries, and over $3 billion in property damage. Rated EF-5 on the Enhanced Fujita scale, the massive, multiple-vortex tornado measuring up to one mile in width and traveling a total of 22 miles along the ground was the first since the Flint, Michigan twister of 1953 to produce in excess of 100 fatalities.

At 1:40pm, more than three hours before the tornado reached Joplin, the initial Tornado Watch, a signal that favorable conditions exist for the development of tornadoes, was issued by the Central Regional Headquarters of the National Weather Service (NWS) in Kansas City, and broadcast on radio, television and other media. At 5:11pm, twenty-three minutes prior to the tornado touching down in the city, NWS issued a Tornado Warning which triggered the community's network of outdoor warning sirens as well as broadcast media alerts.

In terms of warning capabilities, everything went according to plan. Nevertheless, many still view the number of deaths and injuries that occurred in Joplin as unacceptable. Indeed, Jack Hayes, who served as director of NWS at the time of the Joplin disaster later said that the plan--and how it was communicated--was not effective enough. “We need to ask ourselves, what can we do to protect Americans? I have to say, it's not enough. We have to do more.”

While it may be impossible to calculate how many of Joplin's citizens heeded the warnings that preceded the tornado–and clearly many did–it is tragically apparent that far too many either dismissed the warnings until it was too late or ignored them altogether.

Was this failure to respond to emergency warnings unique to the population of Joplin? History would indicate otherwise, and there are plenty of examples where complacency, indifference, apathy and a lack of awareness to disaster risks have taken their toll. For instance, consider the dozens of people who were killed when Hurricane Ike struck Galveston, Texas in September 2008. These fatalities occurred despite the dire warnings to evacuate issued by weather forecasters and public safety officials not minutes but rather days in advance.

“And neither is this failure to respond to emergency warnings a phenomena unique to Americans,” notes Joe Wilson, President of the Safety and Security Group of Federal Signal Corporation's Industrial Systems Division. Wilson adds that there may be no better recent example of this than the 9.0 earthquake and subsequent tsunami that ravaged Japan's coastline in March 2011. He goes on to explain that though we

© 2013 Federal Signal Corporation. All rights reserved.

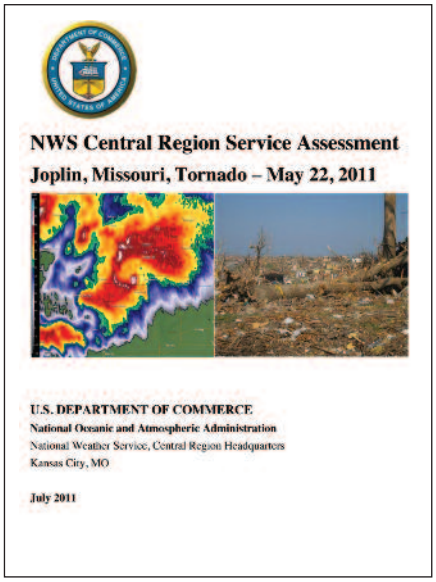
generally tend to think of the Japanese as being both more familiar and generally more personally disciplined than Americans when it comes to emergency response and preparedness, none the less, "...there were tragic stories of residents returning to their homes to search for valuables soon after the earthquake tremors ceased, and who were then overtaken by the ensuing tsunami."

Can the deaths and injuries that occurred during the Joplin tornado and other major disasters be attributed primarily to the lack of effectiveness of the warning systems or a deficiency in overall disaster planning and preparedness? Or are there perhaps other factors at work that have more to do with societal issues and human behavior? This white paper will address these and other questions while also offering possible solutions to counter the resulting complacency, apathy and general lack of awareness that impact the effectiveness of emergency warnings for incidents ranging from natural disasters (i.e., tornadoes, hurricanes, floods and earthquakes), to campus shootings, terrorist attacks and industrial accidents.

Searching for Insight Amid the Destruction of the Joplin Tornado Disaster

In September 2011 the Kansas City Central Region Headquarters of the National Weather Service (NWS), a component of the U.S. Commerce Department's National Oceanic and Atmospheric Administration (NOAA), offered its final assessment report on the tornado that devastated Joplin, MO the previous May.

Intended to identify best practices and offer recommendations to help save lives in the future, NWS Central Region Service Assessment, Joplin, Missouri – May 22, 2011 also provides important insight with regard to the issue of public complacency and, in the most extreme cases, indifference if not apathy displayed by many Joplin citizens to the warnings both hours and minutes preceding the tornado.



NWS Central Region Service Assessment

Joplin, Missouri, Tornado – May 22, 2011

U.S. DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
National Weather Service, Central Region Headquarters
Kansas City, MO

July 2011

According to this comprehensive study, there were several factors that contributed to the unusually high loss of life. Interviews with more than 100 of the city's residents revealed that, "...societal response is highly complex and involves a number of factors, such as risk perception, overall credibility of warnings, and warning communications."

In fact, many of the study's key findings center on societal aspects of warning response as it relates to risk perception.

© 2013 Federal Signal Corporation. All rights reserved.

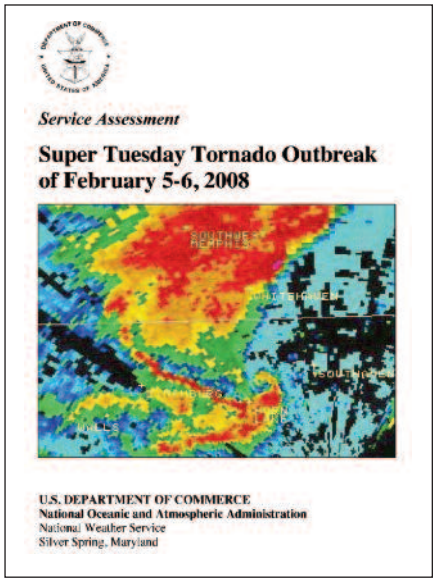
"Responding to warnings is not s simple act of stimulus-response, rather it is a non-linear, multi-step, complex process." Elaborating further, the Joplin assessment emphasizes that, "Relationships between false alarms, public complacency and warning credibility are highly complex as well."

The report ultimately concluded that, "...the vast majority of Joplin residents did not immediately take protective action upon receiving a first indication of risk [usually via the local siren system], regardless of the source of the warning. Most chose to further assess their risk by waiting for, actively seeking, and filtering additional information." Incidentally, accessing additional information includes everything from going outside to look at the darkening sky, to checking for a television or radio broadcast that confirms the urgency of the situation, to checking an internet weather site.

Analizing the Role of Human Behavior In Citizens' Failure to Respond to Emergency Warnings and Directives.

Assessing the Joplin disaster was not the first time NOAA initiated a study for the purpose of learning why people often fail to take protective action when given warning of an impending disaster. One example is the agency's previously issued report in March 2009 entitled Service Assessment of the Super Tuesday Tornado Outbreak of February 5-6, 2008. In this case the assessment team also directed much of its attention to understanding why some people take cover while others opt to ride out severe weather.

Labeled the "Super Tuesday" tornado outbreak because of the primary elections that were held that day, 82 tornadoes swept through nine states across the Mid-South and Tennessee Valley causing more than $400 million in property damage. In this case the assessment team found that warnings were issued, on average, 17 minutes in advance of the deadly tornadoes. Interviews with local media and citizens revealed that the affected communities had received the warnings, and were cognizant of the dangerous-weather threat. Additionally, people confirmed that they had received warning through multiple sources, namely television, NOAA All-Hazards Radio messages, outdoor sirens and word of mouth through relatives, friends and neighbors. However, despite the fact that all of fatalities occurred within the boundaries of the tornado watches and were preceded by tornado warnings, the result was a total of 57 deaths and more than 350 injuries.


Service Assessment

Super Tuesday Tornado Outbreak of February 5-6, 2008

U.S. DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
National Weather Service
Silver Spring, Maryland

Reference link: http://www.livescience.com/3370-people-heed-tornado-warnings.html

A similar societal-based study published in the April 2008 issue of the Bulletin of the American Meteorological Society interviewed evacuees of Hurricane Rita, which struck the vicinity of the Texas-Louisiana border in September 2005. It is worth noting that this was only weeks after Hurricane Katrina, one of the five deadliest hurricanes in the nation's history, had devastated vast areas of the South including the city of New Orleans. The report's author, Rebecca Morss of the National Center for Atmospheric Research in Boulder, CO, describes what she calls "hurricane fatigue" that often occurs when

© 2013 Federal Signal Corporation. All rights reserved.

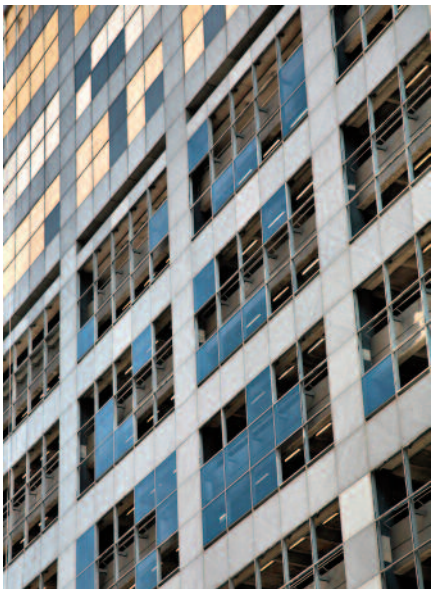
people experience storm after storm in a single season. Morss' contention is that after numerous warnings eventually people simply tire of disrupting their lives and evacuating their homes.

An article authored by Andrea Thompson in Live Science (September 15, 2008) reviewed the failure of many citizens of Galveston, Texas to comply with the evacuation warnings that preceded Hurricane Ike in September 2008. "There are many reasons why some people don't heed evacuation notices–some think they can ride out the winds and surging waters, while others simply have nowhere to go and no way to leave. Still others remember unnecessary evacuations from botched forecasts, and enter a 'boy who cried wolf' mentality."

Professor Hugh Gladwin, a researcher at Florida International University (FIU), suggests that the 'boy who cried wolf' syndrome may not be as prevalent as is often depicted, at least in the case of hurricane evacuations. "Rather than inaccurate forecasts, in most of these cases the decision not to evacuate seems more likely to be a matter of people not feeling that they're facing a life-and-death situation."

To illustrate, Gladwin points to a comparison between the evacuations for Hurricanes Ivan (September 2004) and Katrina (August 2005). "In September '04 Hurricane Ivan threatened the Gulf Coast presenting a forecast of high risk that would be very similar to the forecast of Katrina just a year later. In Louisiana there was a very good evacuation rate [approximately 51%] from risk areas, despite the fact that Ivan ultimately veered east missing the Louisiana coast. Furthermore, for those who did opt to evacuate during Ivan, traffic congestion on evacuation routes resulted in delays up to 12 hours. It was seemingly a perfect setup for a 'cry wolf' situation the next year for Katrina. But that was not the case. In fact, the evacuation rate for Katrina [nearly 80%] was significantly better than it was for Ivan, and was very good when compared to other hurricanes." Gladwin says that a cursory look at the data suggests that, in updating their risk perception for Katrina, many people apparently looked at Ivan as a 'close call' as opposed to a 'false alarm'.

Reference link: http://www.livescience.com/7574-people-ignore-hurricane-evacuation-warnings.html



© 2013 Federal Signal Corporation. All rights reserved.

The rapid population growth in areas such as the Gulf Coast region has placed increasing numbers of people in the path of severe tropical weather over the past few decades. And many of these newly arrived residents and seasonal "snowbirds" are unfamiliar with the hazards posed by the Gulf's tropical storms. In the same Live Science article discussing Hurricane Ike, the aforementioned Rebecca Morss suggests that, "...some people just don't perceive the risk to be that high."

Thompson points out that, "New residents to the Gulf Coast may simply not realize the threat posed by a hurricane's storm surge, which often causes most of the damage associated with the storm." Concurring with that viewpoint, Gladwin stresses that, "...many people simply do not understand the degree of risk that exists at their particular location...and in many cases, neither has there been an adequate attempt to educate people to that potential risk."

In her Live Science article, Thompson concludes that, "Any or all of these reasons can combine to cause a few holdouts to decide to take their chances with the storm, instead of seeking safety." The estimated "holdouts" that failed to heed the evacuation instructions of public safety officials during Hurricane Ike were reported to number as many as 140,000 people. It is worth noting, however, that "holdouts" may be a bit of a mischaracterization in this instance since many of the island's residents actually intended to evacuate but had waited too long. Though Ike was still far from landfall, many people were unable to use causeways that were already impassable due to the wide extent of storm surge that preceded the hurricane.

Past personal experience with tornadoes, hurricanes, tsunamis, floods, etc., is often cited as another reason why people fail to heed emergency warnings and evacuation notices. Since they have survived previous disasters the tendency is to take inadequate precautions for the next one. In studying public response to hurricanes in Southern coastal states, the previously mentioned Hugh Gladwin has collaborated on several Florida International University research projects with social scientist and FIU emeritus professor Betty Morrow. Their work has consistently found that those people who have survived hurricanes in the past are less likely to follow evacuation orders unless they feel "a concrete personal sense of risk."

A commonly cited reason given for the failure to respond in a timely fashion to evacuation orders is peoples' desire to ensure the safety of other family members and pets, as well as take precautions to protect their property, such as boarding up windows. Additionally, there are the countless stories of incidents where people have risked the dangers of floods, wildfires, hurricanes and other disasters in order to retrieve or protect valuables and other personal property. "It isn't always a matter of failing to take shelter or comply with evacuation orders," says Gladwin. "Sometimes people underestimate how much time they need...they simply run out of time."

Another prevalent issue often cited is the false sense of security many people derive from technology. This was most recently illustrated in the case of the tsunami that struck the Japanese coastline in March 2011. Protected by the world's deepest breakwater--more than 207-feet deep--many people residing in the Kamsishi Bay area were undoubtedly confident that they were safe from the threat of a tsunami. At least that was their perception up until they watched the surging water overwhelm the recently completed barriers and roll over everything in its path in the space of just a few minutes.

© 2013 Federal Signal Corporation. All rights reserved.

The misleading sense of security provided by sea walls was again demonstrated in 1961 when Hurricane Carla struck the Gulf coastline in Texas. Residents of Galveston had felt immune to hazardous flooding from tropical storms since the construction of their sea wall was completed just after the turn of the century. However, and despite the fact that Hurricane Carla made landfall approximately 70 miles from the city, the storm's tides reached to within two feet of the island's highest point, and the primary roads offering access to the mainland were completely submerged and impassable

Ironically, it has even been suggested that technology, as reflected in the increasingly sophisticated forecasting capabilities of NWS's Storm Prediction Center, may play some role in the growing levels of public complacency and apathy. During mid-April of 2012 forecasters issued rare high-risk warnings several days in advance of an impending tornado outbreak for Oklahoma, Kansas, Nebraska and Iowa. In many respects the warning was deemed a success because only six lives were lost despite the severe nature of the weekend storms. However, the tornadoes only touched down in rural areas and mostly just in Kansas. This prompted several experts to subsequently suggest in a news report produced by the CBS affiliate WCCO in Minnesota that people who remained unaffected by those tornadoes may be inclined to dismiss future severe-weather warnings, or at least diminish the threat, especially when alerts are issued so far in advance and cover such widespread geographic areas.

Reference link: http://minnesota.cbslocal.com/2012/04/16/could-better-tornado-warnings-cause-complacency/

In Some Cases, Risks Are Not Accurately Conveyed to the General Public.

While FIU's Hugh Gladwin sees little evidence of complacency and apathy when people are faced with imminent life-threatening situations, he concurs with those who believe that the same type of urgency does not necessarily apply to how people view and assess the need to respond to emergency warnings. “Typically there are two reasons for this,” says Gladwin. “Either the emergency disaster warnings are not accurately communicating the magnitude of the risk, or people have not been adequately educated to understand the degree of potential risk in their location.”

Using the example of Hurricane Isaac, a tropical cyclone which caused severe damage along the U.S. Gulf Coast in the latter part of August 2012, Gladwin believes this is a instance localized risk of storm surge was not well communicated. “From Katrina most people were aware of the great risk that hurricanes present. But for Isaac, unfortunately, the warnings were not always effective in conveying the degree of risk people were exposed to at specific locations. As a result, many people who should have evacuated failed to do so. Conversely, we can look at a place like the Georgia coast where a major hurricane with high storm surge [typically the most hazardous facet of a hurricane] has not hit in over a century. Without prior education,“ stresses Gladwin, “people are likely to think the risk simply is not that great along the Georgia coastline.”

Gladwin says there are three areas that stand out where emergency/disaster warning communications could be more effective. “First, the information produced is both too complex for the general public to understand and not well focused on the risks at a particular location to a household.” Not only is the information complex, it comes from many sources. To illustrate this, Gladwin refers to a blog entry (see

© 2013 Federal Signal Corporation. All rights reserved.

link) he produced that shows the rapidly incoming data as Isaac approached and then made landfall in Louisiana. "Even though the storm surge forecast by the National Hurricane Center turned out to be very accurate, it could not also include the effect of rising floodwater and river levels from the heavy rain."

Link: http://worldmountain.com/risingwater/

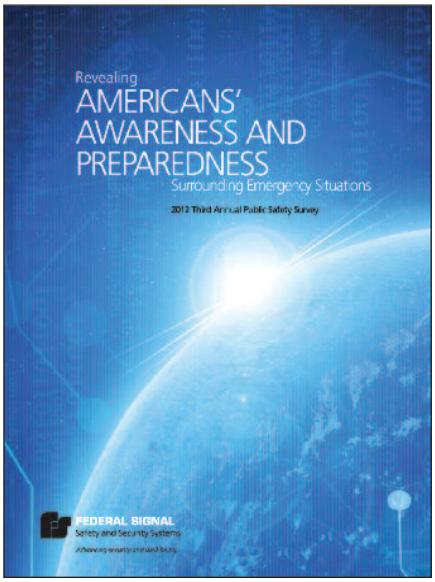
Secondly, Gladwin asserts that emergency warnings necessarily cover large geographic areas, but that make it difficult to convey local risk. "In the case of hurricanes, storm surge is the most serious life-threatening risk. However, these surges can be highly localized, affecting only a small area within the boundaries of the total area of the emergency alert." Gladwin notes that many companies serving the field of emergency communications are addressing this concern through development of products/systems that employ global positioning technology, such as Federal Signal's SmartMsg with GIS (Graphic Information System) tracking app, to more precisely define geographic parameters of an emergency alert.

The third problem relates to the differences between how scientists and the public measure and perceive risk. "The physical and natural science involved in modeling and forecasting natural hazards is necessarily quantitative and probabilistic," explains Gladwin. "This science communicates to decision makers and the public two quantitative measures: the magnitude of a potential hazardous event's impact, and the probability of the event affecting a particular place at a particular time. Disaster response decision making not only requires a clear understanding of both hazard magnitude and event probability, but also calls for the ability to apply them appropriately to make different kinds of response decisions."

Examing the Public's Views on Emergency Warnings and Notifications.

For the third consecutive year Federal Signal Corporation has called upon the heralded polling firm of Zogby International to take an in-depth look at Americans' attitudes and concerns with regards to emergency preparedness and response.

Released in July of 2012, Federal Signal's latest Public Safety Survey, Revealing Americans' Awareness and Preparedness Surrounding Emergency Situations, hones in on the emotional reactions of citizens to disaster and emergency scenarios, and evaluates the disturbing levels of insouciance, indifference–even apathy–with which many people view public safety in general and, more specifically, emergency warnings alerts and notifications.



Reference link: http://federalsignal-indust.com/pdf/ANS104_2012_ Survey-lowRes.pdf

In 2011 the U.S. experienced an unprecedented number of federally declared disasters, which ranged from tornadoes and floods, to wildfires, mudslides and more, which in turn prompted many communities to re-examine their public safety strategies for times of crisis. In fact, the Federal Emergency Management

© 2013 Federal Signal Corporation. All rights reserved.

Agency (FEMA) issued 99 major disaster declarations throughout 2011 that were officially recognized by state governors, and declared official by the President of the United States. By comparison, the annual average number of federally declared disasters in the U.S. over the past half century is 37.

Yet despite this record-breaking year, not only do Americans remain largely unaware of critical emergency communication processes, they also display an alarming level of complacency if not outright apathy to emergency notification warnings and potential disaster scenarios. "Consequently, too many people fail to act with a sense of urgency in times of crisis," observes Federal Signal's Joe Wilson. "This not only makes the task of emergency management more complex, sadly enough it also leads inevitably to unnecessary injuries and fatalities."

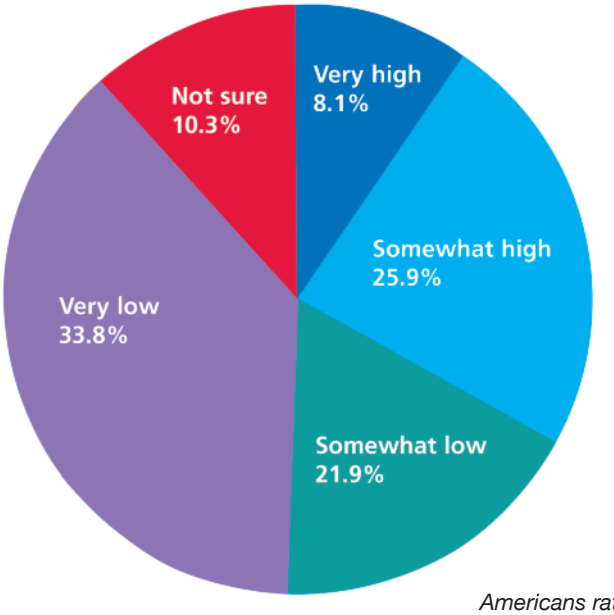
According to Federal Signal's 2012 Public Safety Survey, Americans are critically unaware of their local emergency alert and notification systems. To a large degree this lack of knowledge reflects the indifference and lackadaisical attitude with which so many citizens approach emergency communications and preparedness.

Though more than 56% of Americans believe they are aware of the steps they need to take should disaster strike, the survey results demonstrate a shocking lack of knowledge–and even indifference–with regards to emergency alerts and notification systems.

• Among age groups, respondents ages 65+ show the highest level of public safety awareness and preparedness (67% rate their level as somewhat to very high).

• More males than females rate their preparedness as very high, with 20% saying they are fully prepared and think about the issue all of the time vs. only 8% of women.

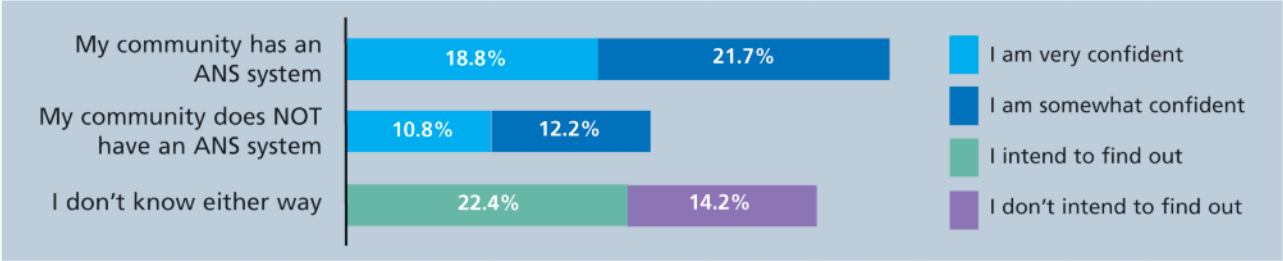
• Married respondents also rate higher for preparedness, with 64% claiming somewhat to very high awareness, compared with 46% of single respondents.



Americans rate their current level of public safety awareness and preparedness.

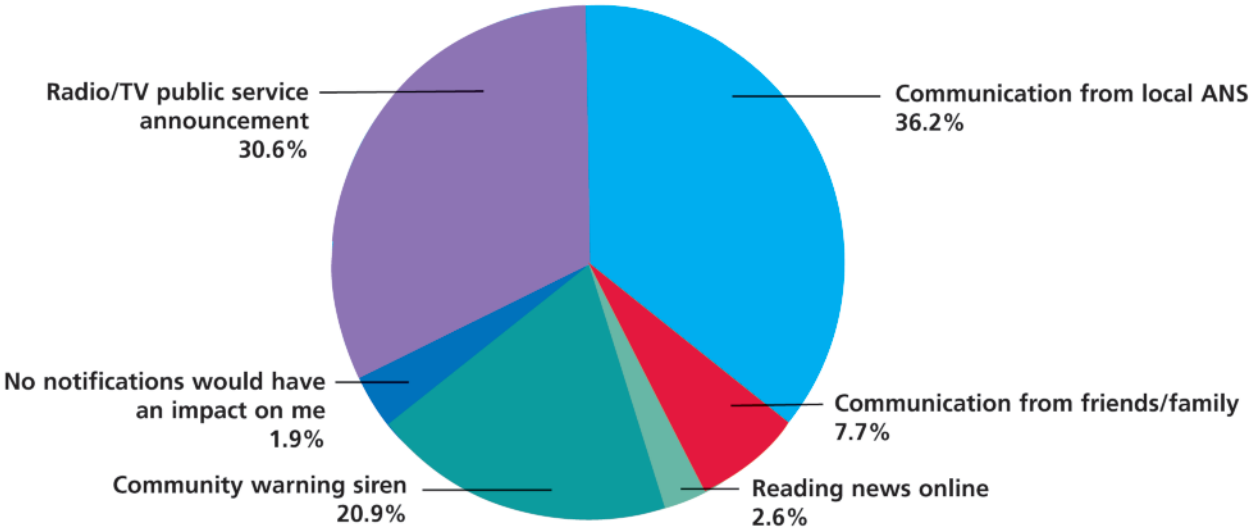
Revealing Americans' Awareness and Preparedness Surrounding Emergency Situations also discloses that a startling 71% of Americans are unsure if a community sponsored personal alerting and notification system (ANS) that includes a combination of options for phone, text and email message notification, is even available to them.

© 2013 Federal Signal Corporation. All rights reserved.



Americans' awareness of whether or not personal ANS systems are available to them through their local community.

By the same token, 36% of respondents said they would be motivated to take action in an emergency based on ANS alerts rather than any other mode of communication--ahead of traditional warning sirens, radio and TV public service announcement and even word-of-mouth communication from



What type of announcement or notification would motivate Americans to take action during an emergency?

Other findings of Federal Signal's most recent public safety study that further reinforce the view that Americans are for the most part either complacent or apathetic towards emergency warning communications and disaster preparedness include:

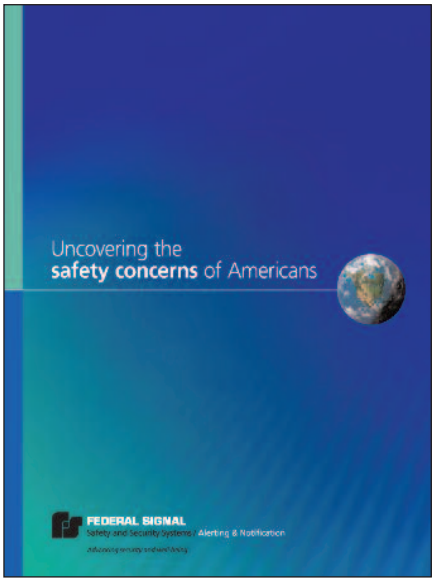
• More than one in four (27%) does not know whether their community has an emergency warning siren system.

• More than half (56%) do not know when the sirens in their area are tested.

• 70% are unaware of the sounds and sirens associated with warnings for various emergency situations.

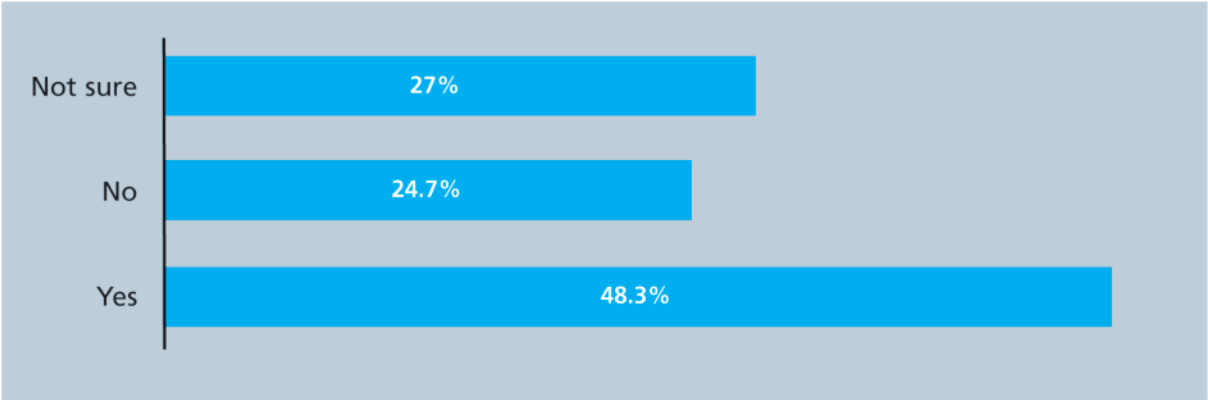
© 2013 Federal Signal Corporation. All rights reserved.

Further supporting the contention that an unacceptable number of Americans do not take public safety seriously enough are the findings of Federal Signal's previously published 2010 public safety survey, Uncovering the Safety Concerns of Americans, which was also conducted by Zogby International in cooperation with the Safe America Foundation. Here it was first confirmed that fewer than one-half of American citizens have bothered to develop a family/household emergency plan, with just over one-half confiding that they have a home emergency kit.

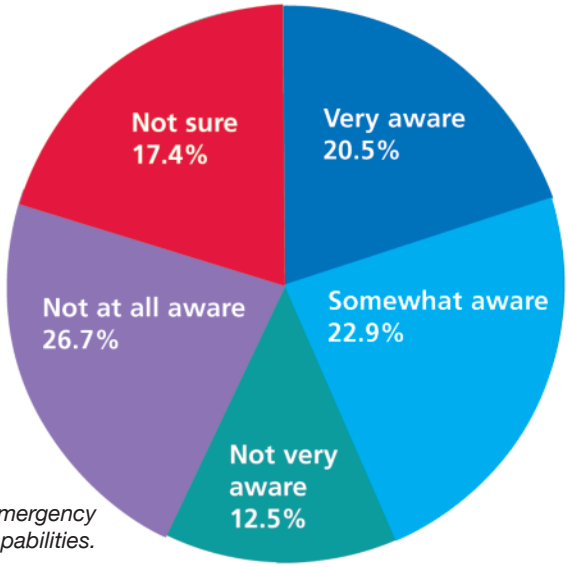


Reference link:
http://www.alertnotification.com/pdf/federal_signal_public_safety_survey.pdf

Less than 50% of Americans have an emergency plan.



Additionally, just 51% of Americans say that they know that their city or town is able to alert them in the event of an emergency, while 31% say they do not know and 18% are unsure.



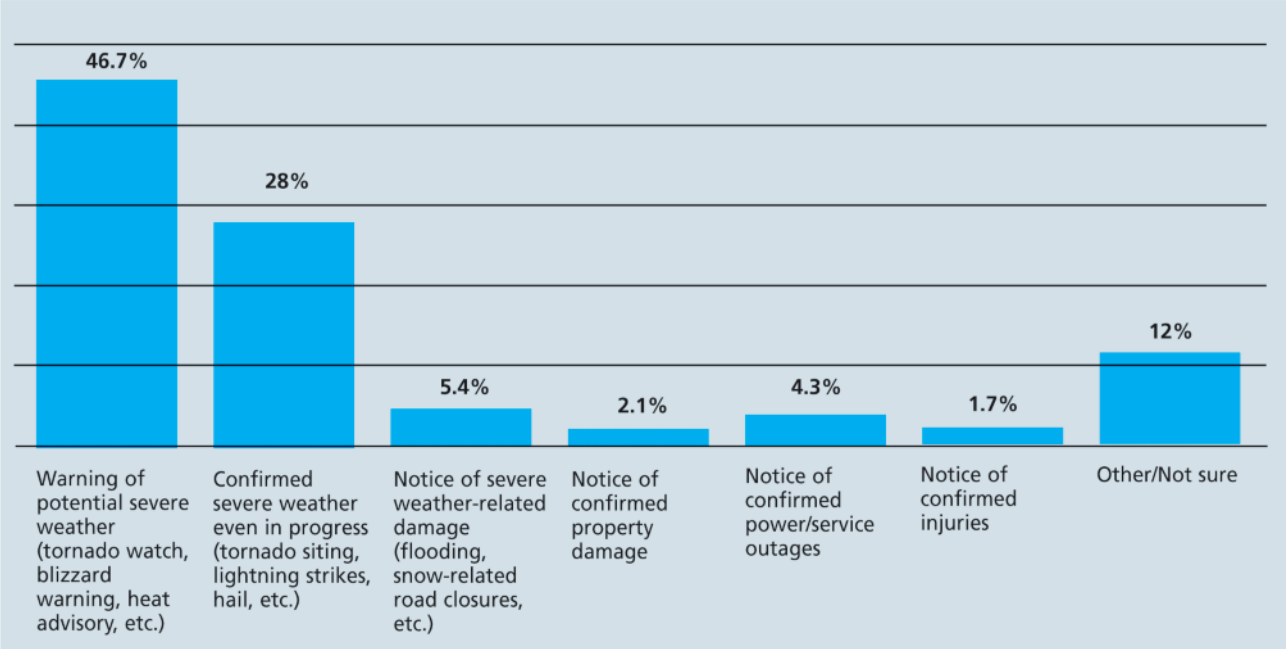
Only half of the population is familiar with local emergency alerting and notification capabilities.

© 2013 Federal Signal Corporation. All rights reserved.

Even the Threat of Severe Weather Does Not Motivate Americans to Take Action.

The findings of Federal Signal's 2012 Public Safety Survey serve to support much of what has been learned in previous studies such as the NWS/NOAA assessments for the Joplin and Super Tuesday tornado disasters. "At the same time," stresses Federal Signal's Wilson, "the survey results provide hard statistical evidence that supports the countless number of media reports and personal stories of tragedies that occurred because people simply failed to heed official emergency warnings, alerts and notifications."

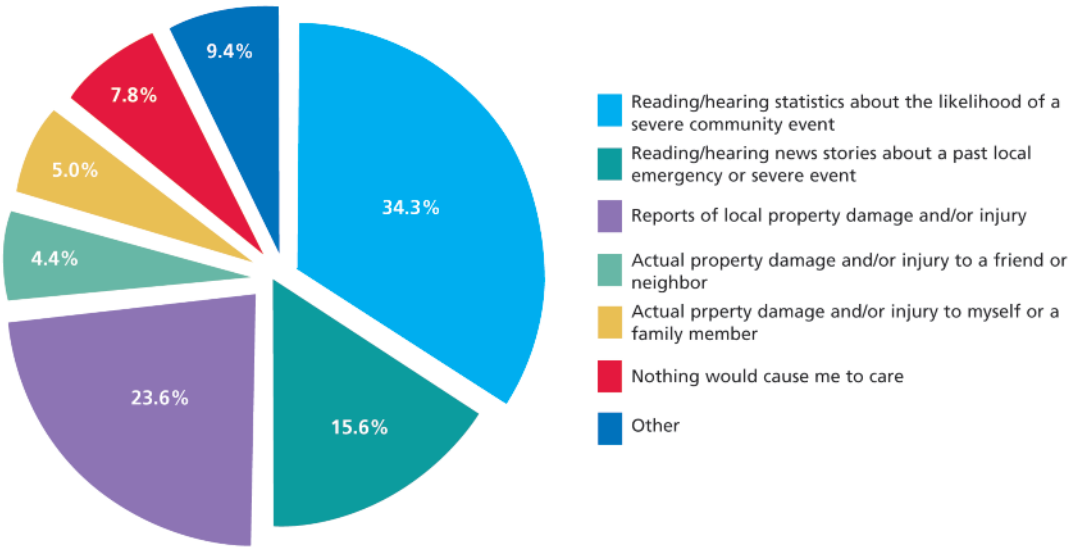
When it comes to taking action, despite receiving an official notification, just under one half (47%) of Americans would be motivated to take action during a warning of potential severe weather.



What would it take for Americans to take immediate action if notified of an emergency?

The survey also records that 33% of respondents would require actual property damage or injury before taking a stronger stance with regard to public safety awareness, with one in 12 people saying nothing would cause them to care more.

© 2013 Federal Signal Corporation. All rights reserved.



What would it take for Americans to care strongly about safety awareness in general?

More than one in four respondents (28%) would require confirmation of severe weather, such as an actual tornado sighting, flood waters, or a visible fire in order to take immediate action.

• By a sizeable margin, more Americans in the Great Lakes Region (38%) would require a confirmed severe-weather event such as a tornado sighting to take immediate action.

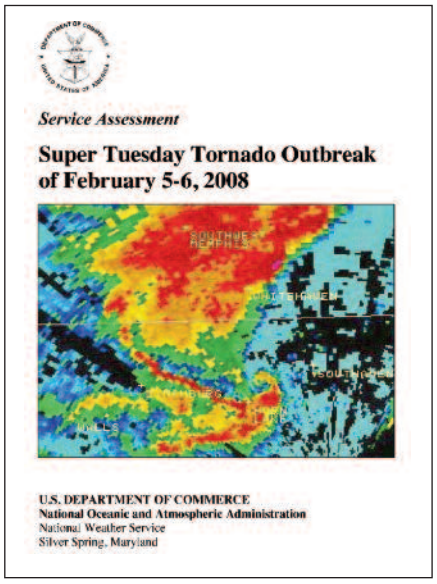
• Men are less likely than women to take immediate action based on a warning of severe weather (42% vs. 51% respectively).

Are people actually dismissing and ignoring warnings and alerts? Or does it come down to a matter of perception?

As previously mentioned, the NWS/NOAA assessments of the Super Tuesday tornado outbreak of 2008 and Joplin tornado disaster of 2011 both provide valuable insight to the problem of the public's complacent and apathetic views with regards to emergency communications and preparedness.

In the section entitled “Perceptions and Decisions” in the NWS assessment of the Super Tuesday event, it was noted that many people were surprised by and unprepared for the February tornado outbreak because it occurred much earlier than they were accustomed to expecting. In describing those who were interviewed, the study says, “A majority of the people indicated they associate tornado outbreaks with the springtime (i.e., March or later) or summer months. Although several people noted the potential for severe weather, many people minimized the threat of this early February outbreak because they perceived it was outside the 'traditional' tornado season.”

© 2013 Federal Signal Corporation. All rights reserved.


Service Assessment

Super Tuesday Tornado Outbreak of February 5-6, 2008

U.S. DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
National Weather Service
Silver Spring, Maryland

Reference link: http://www.nws.noaa.gov/om/assessments/pdfs/super_tuesday.pdf

The NWS Super Tuesday assessment also makes the connection between how people respond to severe weather alerts with how they personally perceive the threat. "Several people specifically noted the need to seek confirmation of a warning [such as from broadcast TV and radio bulletins], most notably through their visually spotting the tornado or hearing sirens."

Illustrating how people incorporate multiple information sources into their decision-making process as a way to assess personal risk, the NWS Super Tuesday study uses the example of a woman in Atkins, Arkansas, "...who initially heard about the tornado from the local television news and then from a local radio station. The siren sounded approximately an hour before the tornado occurred, but she opted not to shelter at that point. Fifteen minutes later, the siren sounded again and, at that point, her son-in-law spotted the tornado, and only then did they make the decision to move to a private storm cellar a couple of hundred feet away." This and other examples compiled by the NWS assessment team leads to the contention that, generally speaking, a single source of information rarely prompts people to take appropriate action.

There has long been a concern about the many people who fail to attach a commensurate amount of urgency in responding to emergency alerts and notifications. This concern is also recognized in the NWS Super Tuesday assessment, which suggested emergency warnings, "...should be definitive with wording that has the greatest potential to elicit an immediate response, during tornado outbreak situations." (In addressing the issue of using more descriptive language, the NWS Super Tuesday study foreshadowed its widespread incorporation into emergency warnings during severe-weather alerts in the spring of 2012, a development which will be discussed later in this white paper.)

© 2013 Federal Signal Corporation. All rights reserved.

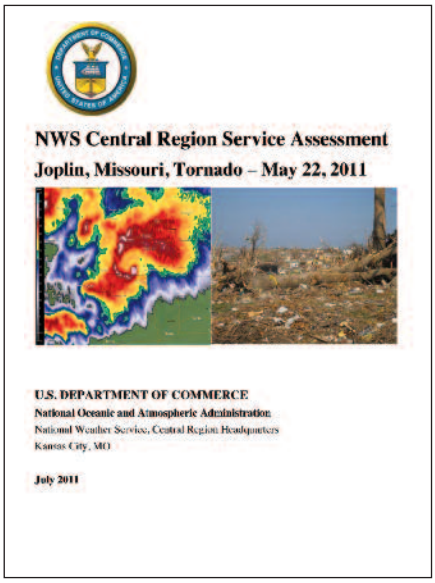
They say that tornadoes only affect other people.

The NWS Super Tuesday assessment also notes a tendency of people to “minimize their personal risk due to the perception of tornadoes always affecting someone else.” In describing comments from many of the people that were interviewed, the assessment team uses the term ‘optimism bias’ which is commonly used in the field of risk perception, and refers to the psychological phenomenon where people believe their risk from a particular activity is less to themselves than to others. In summarizing the typical responses of many of those interviewed, the study cites a family from Hardin County, Tennessee who said that they had heard on the radio that the tornado had touched down in their county, and in a town just upstream of where they lived “...but we didn't think it was going to be here.”

Along with the “it won't happen here” rationalization must be the equally exasperating “what will be will be” or “if it happens it happens” train of thought. Though not mentioned in the NWS assessments cited here, fatalism, the belief that there is nothing a person can do to protect themselves in the event of hazardous weather or other crisis, is no less harmful a way of thinking than the tendency of people to dismiss a potential disaster as something that “will never happen here.” In truth, the “Que Sera, Sera” outlook is probably just as prevalent as the biased thinking that leads people to believe "that will never happen here."

The NWS Super Tuesday assessment's focus on societal issues leads to the conclusion that the extensive loss of life in the Super Tuesday disaster, “...is not entirely dependent on the quality of outlooks, watches and warnings.” In other words, peoples' interpretations, perceptions and decision making also play important roles in the number of fatalities that may occur in a severe-weather event. If nothing else, the Super Tuesday service assessment stresses the importance of ensuring that societal impact research and analysis remains a major component of future post-disaster studies.

Many of the key findings reported in the NOAA's NWS Central Region Service Assessment, Joplin, Missouri, Tornado – May 22, 2011 again focus heavily on the societal aspects of warning response and risk perception. Interviewing residents in the aftermath of the tornado, the assessment team learned that, “The vast majority of Joplin residents did not immediately take protective action upon receiving a first indication of risk (usually via the local siren system) regardless of the source of the warning. Most chose to further assess their risk by waiting for, or actively seeking, and filtering additional information.” This finding would seem to support Zogby's findings as documented in the aforementioned Federal Signal 2012 Public Safety Survey indicating that people often require confirmation of severe weather, including actual sighting of tornadoes, floodwaters, etc., before taking immediate action.


NWS Central Region Service Assessment
Joplin, Missouri, Tornado – May 22, 2011

U.S. DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
National Weather Service, Central Region Headquarters
Kansas City, MO

July 2011

Reference link: http://www.nws.noaa.gov/os/assessments/pdfs/Joplin_tornado.pdf

© 2013 Federal Signal Corporation. All rights reserved.

When it comes to the type and severity of the threat, sirens do in fact lack specificity, and are limited to merely announcing the presence of a threat. Also, unless equipped with accompanying public address capabilities, sirens are unable to provide any type of instruction with regard to what action should be taken. However, though they are unable to personalize the threat for the individual–which is generally considered prerequisite for prompting people to take immediate action–siren alerts do in fact virtually always motivate people to check other information sources for confirmation.

The Joplin report explains that the reasons for putting off protective action spanned a broad range, but largely depended on an individual's "worldview," which in this case focuses primarily on past experiences with severe weather. Of particular significance is the study's finding that the perceived frequency of siren activation led many survey participants to become "desensitized or complacent" to siren warnings. "This suggests that the initial siren activations in Joplin (and severe-weather warnings in general) have lost a degree of credibility for most residents--one of the most valued characteristics for successful risk communication."

Ultimately, a majority of Joplin citizens failed to take action to protect themselves until they had assessed, "...additional credible confirmation of the threat and its magnitude from a non-routine, extraordinary risk trigger." This additional information was gathered by people in a variety of ways, including: visual observation of the tornado, confirmation by radio or television warning bulletins, and communication with a friend or family member. Post-disaster studies consistently point out that hearing or seeing repeated emergency alerts is instrumental in prompting citizens to take protective action, especially when those warnings emanate from different sources.

The NWS Joplin study acknowledges that an individual's worldview or previous tornado experiences did in fact influence the way those surveyed perceived their risk, and responded to the warnings of May 22nd. "Similarly, familiarity with seasonal weather in southwest Missouri played a major role in risk perception and warning response. Most individuals commented that severe weather in southwest Missouri during spring is common; however, tornadoes never affect Joplin or themselves personally." Interviewers commonly heard residents refer to "storms always blowing over and missing Joplin," or suggesting that there was a "protective bubble" around Joplin, or that "there is rotation all the time, but never in Joplin." One city employee summarized things this way: "...don't think it can't happen in your community,

© 2013 Federal Signal Corporation. All rights reserved.

because that's what I thought." Again, this impression that makes people believe their personal risk from a hazard is less than the risk faced by others nearly always promotes diminished perception of the threat. And even more troubling is the adverse effect this optimism bias has with regard to the delay in taking protective action.

On the other hand, "Although not as common, social networks as mechanisms for warning dissemination were found to generally amplify perceptions of risk and lead to more effective warning response. For example, one woman reported eating dinner with family, receiving a text message about the tornado, and then receiving a phone call shortly after informing her of a storm traveling through Joplin." The NWS Joplin survey further imparts that not only did this series of warning signals heighten the woman's belief that a threat existed, it also prompted the woman and her family to take shelter in the restaurant.

That social networks are a valuable tool in disseminating emergency warnings is also reflected in the reviously cited FIU research conducted by Gladwin and Morrow, who found that people living in hurricane evacuation zones–after making their own assessment of personal risk based on the orders, suggestions and instructions of public safety officials–are indeed more likely to take shelter after confiding with friends and neighbors.

False alarms continue to provide a major excuse for failing to heed emergency warnings.

As is often the case, the perceived frequency of false alarms in Joplin contributed significantly to the number of people who became desensitized to siren warnings. Though hardly a revelation to many professionals in the field of emergency management, the explanations recorded by interviewers of those residents who failed to heed the siren warnings included:

- "We hear sirens all the time."
- "They [sirens] go off for dark clouds."
- "[We are] bombarded [with sirens] so often that we don't pay any attention."
- "The sirens have gone off so many times before."
- "The sirens are sounded even for thunderstorms."
- "All sirens mean is there is a little more water in the gutter."

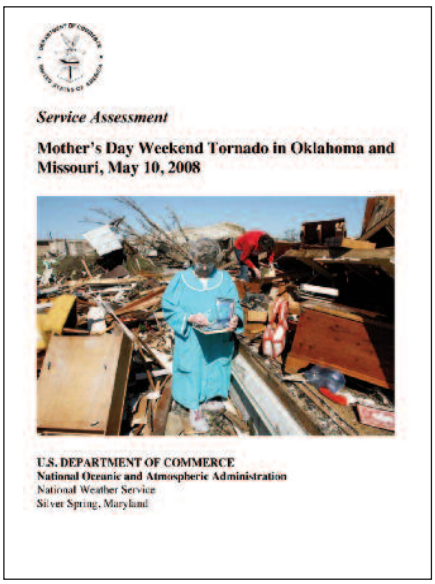
A key finding of the Joplin assessment is that, "Familiarity with severe weather and the perceived frequency of siren activation not only reflect normalization of threat and/or desensitization to sirens and warnings, but they also establish that initial siren activation has lost a degree of credibility for many residents." Credibility, of course, is critical to conveying increasing levels of risk, and also mitigating complacency to emergency warnings and the need for urgent response.

The Joplin report takes notes that, "...76% of all NWS tornado warnings are false alarms, which means that 24% of all tornado warnings are eventually associated with an observed tornado–indicating limited skill in differentiating between tornadic and non-tornadic events; however, 68% of all EF0-1 tornadoes receive advance warning of near 12 minutes, while 94% of EF3-5 tornadoes receive advance warning of near 18 minutes, indicating an ability to better detect strong/violent tornadoes. Just over half (54%) of all severe weather warnings coincide with a severe weather event, indicating moderate skill in distinguishing between severe and non-severe thunderstorms."

© 2013 Federal Signal Corporation. All rights reserved.

Of the Joplin residents surveyed for the assessment most confirmed that they relied on sirens as their first risk signal for imminent severe weather. The assessment then concluded: "As a result there was a significant degree of ambiguity associated with the first alert regarding the magnitude of the risk, the seriousness of the warning, and its potential impact."

Overall, much of the indifference concerning emergency warnings can be readily traced to the high incidence of false alarms that tend to desensitize the public. Beyond just outdoor sirens, these warnings can be initiated from a number of sources–everything from regional agencies of NWS/NOAA to the severe-weather apps found in many of today's smartphones that too often seem to be issuing alerts on a near-continuous basis.


Service Assessment

Mother's Day Weekend Tornado in Oklahoma and Missouri, May 10, 2008

U.S. DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
National Weather Service
Silver Spring, Maryland

Throughout a third NWS Service Assessment, the Mother's Day Weekend Tornado in Oklahoma and Missouri, May 10, 2008, emergency managers often mention the word "fatigue" in ad hoc terms and phrases such as watch fatigue, warning fatigue, and siren fatigue. The constant use of the word fatigue has been interpreted to mean that the NWS issued too many watches or warnings during which no significant weather occurred.

Reference link: http://www.nws.noaa.gov/os/assessments/pdfs/mothers_day09.pdf

Elaborating further on the issue of false alarms, the NWS Mother's Day assessment indicates that, "Despite residents' knowledge that tornadoes occur in this area and their previous experience receiving tornado watches and warnings, people did not always personalize the threat. The residents did not perceive themselves to be at serious risk based solely on a NWS watch or warning. Many of those interviewed, including emergency managers and other public officials, mentioned that they have been under numerous tornado watches and warnings where 'nothing happened'."

James Spann, the highly regarded television meteorologist from ABC's affiliate station in Birmingham, Alabama, has even suggested on his blog that the NWS might cut down on the number of false tornado

© 2013 Federal Signal Corporation. All rights reserved.

alarms by forgoing warnings for small spin-ups within a quasi-linear convective system (QLCS), commonly referred to as a squall line. He notes that these tornadoes rarely last more than a few minutes, and are virtually impossible to detect in advance. Additionally, they typically result in widespread, and somewhat less hazardous straight-line winds rather than tornadoes.

For the record, in an apparent attempt to counter the adverse affects of false alarms, the Emergency Management Agency for Alabama's Calhoun County no longer sounds its sirens for severe thunderstorms. Instead, this agency now only activates its outdoor siren system for tornado warnings and other non-weather-related emergency events.

Weighing in on the subject of desensitizing the public to emergency warning signals, Federal Signal's Joe Wilson cautions against the temptation of sounding sirens and other warning signals for anything other than alerting the citizenry to an emergency. Citing the sounding of the city's siren network when the Chicago White Sox became World Series champions in 2005, Wilson used the example to illustrate how activating the sirens–even in cases such as this–serves to further desensitize the public to their importance, and may even cause unnecessary confusion and panic.

Taking count of the number of threat signals from the initial warning until protective action is taken.

In broad terms, warnings can be defined as the number and combination of risk signals people receive and process before electing to take protective action. In compiling information from those surveyed, NWS interviewers for the Joplin tornado study learned that residents received between two and nine risk signals from the time they initially became aware of a severe-weather event until they took steps for their personal safety. “This drastic difference [between as few as 2 and as many as 9 risk signals] is explained by a.) the differing length of time that passed from the first indication of threat to taking protective action, b.) the differing ways individuals received risk signals and interpret the situation as threatening, and c.) the effect of conflicting risk signals.”

The Joplin study substantiates that the number of signals from the initial threat recognition leading to taking protective action increased significantly as information became conflicted or unclear. In the most extreme example, one resident cited nine risk signals before taking protective action:

1. Awareness that thunderstorms were a probability
2. Noticed a significant change in weather conditions
3. Heard the first siren
4. Restaurant shut doors and disallowed entry
5. Drove to second restaurant where business was carrying on as usual
6. Noticed the weather changing
7. Noted tornado reports on TV and radio
8. Patron informs restaurant diners that a tornado had touched down in Joplin
9. Management instructed protective action

In the above list of risk signals, note how number 4 heightens the individual's perception of risk and number 5 diminishes it.

© 2013 Federal Signal Corporation. All rights reserved.

Taking protective action often hinges on accessing "Credible Confirmation" from a non-routine trigger.

Of the Joplin residents who were interviewed by the NWS assessment team, a majority did not take protective action until they had received and processed credible confirmation of the threat and its magnitude from a non-routine trigger (i.e., a source other than a siren, TV bulletin, etc.) or risk signal.

Put simply: Risk signals elevate awareness. And certain risk signals, in particular the actual sighting of the tornado or confirmation from family and friends, stand out more than others. These risk signals add important credibility to the warning, which in turn emphasizes the danger of the threat, and consequently prompts immediate action.

Clearly many of the actions taken by residents do not qualify as the immediate life-saving measures that would be expected following a tornado warning. The decision-making process that leads to taking shelter generally calls for "extraordinary risk signals." These signals included physical observation of the tornado's approach; seeing or hearing radio or television confirmation of the threat; and hearing a second, non-routine, siren warning.

It should be emphasized that all of the NWS service assessments recognized that people commonly depend on multiple sources of information before taking action, and that they typically seek confirmation of an alert received from the initial warning source. Unfortunately, and in far too many instances, post-disaster studies have concluded that the additional time required for these confirmations simply was not available, and all-too-often resulted in unnecessary casualties.

Recent research stresses that trust is critical to compliance with emergency instructions.

In their studies of campus-related shootings, University of Buffalo School of Management researchers Dr. Raj Sharman, associate professor, Dr. H. Raghav Rao, SUNY Distinguished Service Professor, Dr. Joseph Brennan, Vice-President for University Communications, and collaborating research scientists Dr. Serkan Ada, Assistant Professor, Kahramanmaras Sutcu Imam University, Turkey, and Wencui Han, doctoral degree candidate at the State University of New York at Buffalo, hope to uncover ways to encourage students to comply with alert messages sent during a campus emergency. It is clear, however, that much of their research can be applied across a much broader spectrum of emergency warning and mass notification applications.

© 2013 Federal Signal Corporation. All rights reserved.

With the goal of identifying and analyzing critical factors that influence student responses to on-campus emergencies, the researchers targeted communication channels that were most effective in reaching students. Additionally, they examined student attitudes toward emergency alerts, such as what students expect from alert notifications, and what factors influenced their compliance with instructions.

Surveys of 600 students and a dozen focus groups demonstrated that students are more likely to immediately comply with emergency alert instructions (e.g. "shelter in place," or "evacuate the building") when they know and trust the source of the warning. In the absence of that trust the students felt compelled to verify the information with either peers or known official sources before complying with the alert.

"To summarize, if students believe the information is coming from a trustworthy source [e.g., close friend, parent, professor or administrator such as the campus police chief] they are more likely to follow the directions given in the emergency alerts," explains Sharman.

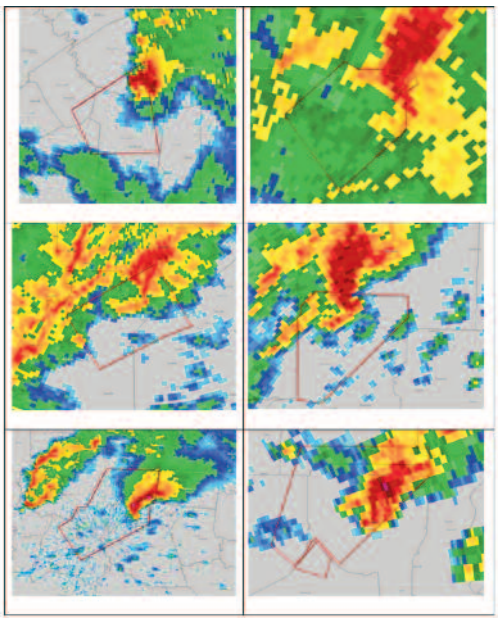
The researchers were somewhat (and pleasantly) surprised by the finding that vertical forces including parents and school administrators were actually more influential in prompting students to follow alert instructions than horizontal forces such as personal friends and fellow students. This finding correlates closely with a key conclusion of the NWS Mother's Day tornado outbreak assessment that family and social networks had a positive effect on disseminating the tornado watches and warnings, and subsequently encouraging people to take protective action. By the same token, this finding also serves to support a similar conclusion of FIU researchers Gladwin and Morrow who learned that people who have received official notification to evacuate the path of a hurricane will still seek the counsel of neighbors and friends who have also been notified.

The research demonstrated that campus alert notifications are the best way for students to find out about an incident and what they should do, and that campuses should use a variety of communication channels to reach students: text, email and social media. Sharman stresses that colleges and universities should continually work to improve their reach in these channels. "Once students become accustomed to receiving official notifications through these channels, they are more likely to acknowledge emergency alerts and take action as directed." Elaborating, he points out that students' risk perceptions do not affect their choice of media–either social networking services (SNS) or short message services (SMS)–forreceiving emergency notifications. Also worthy of note is the finding that students' media preferences remained largely consistent across the full range of emergency scenarios.

The study also confirmed that students who are receptive to emergency alerts prefer receiving warnings/notifications via social networking services that not only put them in contact with other people and information sources they trust, but are capable of offering much richer media options including graphic images and video.

© 2013 Federal Signal Corporation. All rights reserved.

Confirming the researchers' conclusion that richer media has a positive impact on how people respond to emergency communications, is a similar finding in the previously cited NWS service assessment of the Super Tuesday tornado outbreak of February 2008. Rather than focusing on social media, however, in this case the recommendation was to encourage broadcast TV stations to fully develop their capability to display the graphic-intensive NWS polygon warning images that indicate as precisely as possible the region for which the alert applies. In addition to attracting viewer attention with more eye-catching graphics that impart a much greater sense of urgency, the polygons also provide more precise detail in identifying those geographic areas that are in the most danger. Of course, and as was pointed out by FIU's Gladwin, it is important to ensure that graphic depictions in warnings can be easily understood and interpreted by the general public.

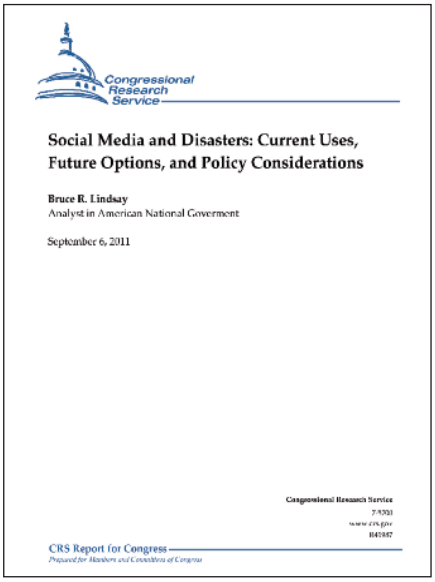


From a technology perspective, the University of Buffalo researchers cite the importance for campus public safety officials to have a Twitter presence. Emphasizing this point, Professor Rao explains, "That should become a trusted source for such emergency information. The number of followers for such a Twitter account would increase enormously during a rapidly unfolding crisis situation, and allow for trusted word-of-mouth dissemination."

As evidenced by the University of Buffalo's research, the growing use of social media by official sources responsible for dispersing and disseminating emergency information is clearly a positive trend that goes well beyond merely taking advantage of a communications medium highly popular with younger age groups. By providing users of social media networks with a credible source for accurate information, emergency managers and other public safety officials are able to effectively counter the misinformation and rumors that are common to social media, especially during crisis situations. Consequently, it should come as no surprise that the emergency management information arms of many municipalities and government agencies have already opened accounts on social media networks such including Facebook and Twitter to counter this issue.

In 2011 the U.S. Congress issued a report citing the increasing impact social media is having on disaster response and preparedness. The report breaks down social media into two major categories for emergency communications. The first of which focuses on the “passive” dissemination of information and receipt of user feedback. The much broader second category includes but is not limited to social media's systematic use as a tool to conduct emergency communications, and issue warnings; receive incoming requests for victim assistance; monitor user activities and establish situational awareness; and evaluate uploaded images for damage assessment.

© 2013 Federal Signal Corporation. All rights reserved.


Congressional Research Service

Social Media and Disasters: Current Uses, Future Options, and Policy Considerations

Bruce R. Lindsay
Analyst in American National Government

September 6, 2011

Congressional Research Service
7-5700
www.crs.gov
R41987

CRS Report for Congress
Prepared for Members and Committees of Congress

Concurring with a prevalent conclusion mentioned elsewhere in this white paper, the University of Buffalo researchers strongly caution against using warning and notification systems for anything other than "...important, urgent extreme events that directly affect the safety of students on campus." In addition to desensitizing the students to potential urgent alerts in the future, employing the notification system for routine communications or non-emergency purposes may diminish the trust students will have in the importance of the information, and the subsequent need to take immediate action.

Possible solutions to the issue of public complacency and apathy to emergency warnings and notifications.

As evidenced by the recent increase in the volume of research on the subject, efforts to address the complacent, disinterested and lackadaisical attitudes people have towards disaster warnings have definitely been stepped up considerably over the past few years. But as hard as it may be to believe, there are examples of the problem being addressed that actually go back centuries. Take, for instance, the still standing ancient stone tablets (some as old as 600 years) that warn residents along the Japanese coastline of the dangers of tsunamis, as related in an Associated Press story by Jay Alabaster (April 7, 2011).

On one tsunami tablet located near the town of Aneyoshi, Iwate Prefecture, on the northern coast of Japan the inscription reads: "High dwellings are the peace and harmony of our descendants. Remember the calamity of the great tsunamis. Do not build any homes below this point." Alabaster notes that this advice was indeed heeded by the dozen or so households of the tiny hamlet during the tsunami of March 2011 whose "... homes emerged unscathed from a disaster that flattened low-lying communities elsewhere and killed thousands along Japan's northeastern shore."

Coincidentally, a McClatchy News Service story in the St.. Augustine (FL) Record reported that while attending the Governor's Hurricane Conference in Ft. Lauderdale, Florida (May 13-18, 2012), Sally Bishop, Pinellas County (FL) Emergency Management Director, offered a recommendation remarkably similar to Japan's foresighted ancestors. Bishop suggested painting traffic posts at intersections with high-water lines as a way to help people visualize just how high water levels can rise in a storm surge.

Reference link: http://staugustine.com/news/local-news/2011-05-20/residents-heed-friends-more-officials-hurricane-evacuations#.UE5dqFH-mSq

NWS/NOAA assessments offer a number of recommendations to prompt compliance with emergency alert directives.

Mentioned previously in this paper is the use of more descriptive language in broadcasted TV and radio alert bulletins, a suggestion first made in the NWS's March 2009 report, Service Assessment of the Super Tuesday Tornado Outbreak of February 5-6, 2008.

© 2013 Federal Signal Corporation. All rights reserved.

Designed to convey a greater sense of urgency to the dangerous and life-threatening risks posed by approaching severe weather, the proposal employs more descriptive language such as “unsurvivable,” “mass devastation” and “catastrophic” to motivate the public to take immediate protective action. In the face of imminent and extreme severe weather, for instance, the study recommends that warnings urge citizens to take “immediate, life-saving action.”

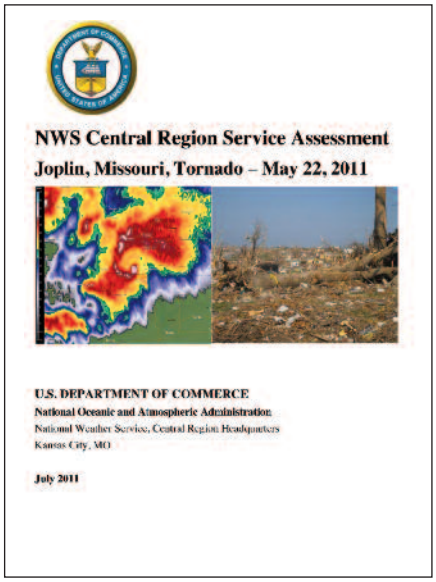
The alerts are divided into two tiers of warnings for thunderstorms and three tiers for tornadoes, each based on severity. The weather service bulletins are intended to be read by TV and radio on-air broadcasters, as well as emergency management agencies in charge of activating outdoor sirens equipped with public address capabilities.

Testing of the more descriptive language in alert bulletins began in April 2012. Although Kansas and Missouri were originally identified as the subject sites for testing, it is worth noting that the new language has already been incorporated into NWS severe-weather bulletins for other regions of the Midwest and South. Most notably this was evidenced when TV and radio stations in the Dallas-Ft. Worth area broadcast warnings employing similar language to citizens threatened by the tornadoes that swept through the region on April 2nd.

Among the many recommendations proposed by NWS Central Region Service Assessment Joplin, Missouri, Tornado – May 22, 2011 to improve the publics' severe-weather response and decision making as well as mitigate complacency is the development of a “simple impact-based, tiered information structure that promotes warning credibility and empowers individuals to quickly make appropriate decisions in the face of adverse conditions.”

According to the assessment, the goals of this information structure include:

- Lessen the number of risk signals processed before protective action is taken.
- Provide a non-routine warning mechanism that prompts people to take immediate life-saving action in extreme events like strong to violent tornadoes.
- Be impact-based more than phenomena-based for clarity on risk assessment.
- Achieve compatibility with NWS technological, scientific, and operations capabilities.
- Promote compatibility with external local warning systems and emerging mobile communications technology.
- Be easily understood and calibrated by the public to facilitate decision making.
- Maintain existing “probability of detection” for severe weather events.
- Diminish the perception of false alarms and their impacts on warning credibility and response.



NWS Central Region Service Assessment

Joplin, Missouri, Tornado – May 22, 2011

U.S. DEPARTMENT OF COMMERCE

National Oceanic and Atmospheric Administration

National Weather Service, Central Region Headquarters

Kansas City, MO

July 2011

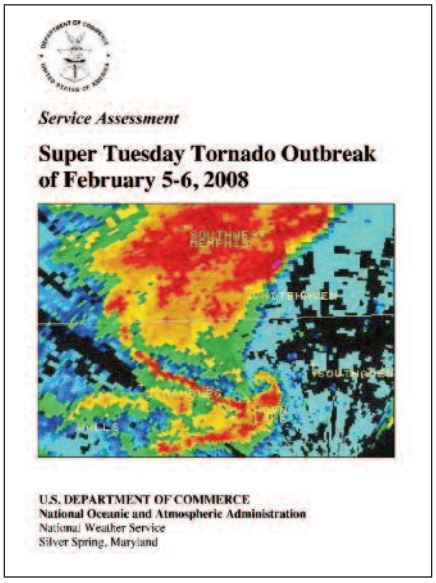
Reference link:http://www.nws.noaa.gov/os/assessments/pdfs/Joplin_tornado.pdf

© 2013 Federal Signal Corporation. All rights reserved.

With regard to a warning's ability to accurately convey the magnitude of risk, several people interviewed by the NWS assessment team in Joplin expressed "...a desire for different levels of warning (applied to local siren policies) as a means to clarify the seriousness/magnitude of the threat. Specifically, these comments spoke to some desired differentiation in warnings and siren tones between life-threatening emergencies and threats to property." In one instance an interviewee opined, "Maybe there should be two levels of warning...a regular warning and a panic button warning for when it will be really bad."

Another recommendation made in the NWS/NOAA Super Tuesday Tornado Outbreak Assessment targets a reduction in the incidence of confusing or mixed messages. The report suggests that NWS collaborate with partners throughout the weather enterprise with the goal of providing a more coordinated warning message that is readily understood by the general public. "Guidance should be developed to assist partners in the development of local warning system and siren strategies that work in conjunction with NWS warnings rather than independent of them."

Reference link: http://www.nws.noaa.gov/om/assessments/pdfs/super_tuesday.pdf


Service Assessment

Super Tuesday Tornado Outbreak of February 5-6, 2008

U.S. DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
National Weather Service
Silver Spring, Maryland

Of no surprise is the recommendation common to all the NWS/NOAA assessments that highlights the need for a more structured approach to collecting information on the societal aspects of warning response to support future studies on the effectiveness of emergency warnings and notifications.

Deploying Technology to Counter the Complacent and Apathetic Human Behavior that Adversely Affects Emergency Communications.

Comparatively speaking, it was not that long ago that emergency managers and safety officials depended almost exclusively on outdoor sirens and broadcast TV and radio bulletins for issuing warnings and alerts to the general public. Then came the benchmark event of the 9-11 terrorist attacks. Suddenly emergency communications and preparedness was being impacted by a myriad of new technology and messaging formats--everything from cell phones, two-way radios and texting, to public address and intercom systems, to outside LED signage, message boards and strobe lights, to the entire spectrum of IP-based technologies including email, instant messaging, smartphones and social networking sites such as Facebook and Twitter.

In numerous instances the deployment of new technology has energized significant changes in emergency warning and mass notification. Such has been the case with the widespread use of text messaging for personal alerting. In other cases, however, the incorporation of technology can be remarkably subtle and yet still very effective. Take for example a recommendation found in the University of Buffalo research that suggests color coding text messages to distinguish between slow-moving emergencies such as a snowstorm, and fast-moving emergencies such as a campus shooting or tornado.

© 2013 Federal Signal Corporation. All rights reserved.

Narrowing down emergency warnings for more targeted alerts and improved citizen response.

The NWS Central Region Service Assessment Joplin, Missouri, Tornado--May 22, 2011 strongly emphasizes that GPS (global positioning system) technology and NOAA Alerts need to be more fully deployed. Not surprisingly, this recommendation focuses heavily on ensuring the full utilization of GPS across multiple agencies as a positive measure to increase the overall effectiveness of severe-weather emergency alerts and notifications.

While predicting and tracking the paths of hurricanes and tornadoes may never be described as an exact science, major technological developments have indeed improved the process dramatically over the years. In producing the assessment for the Super Tuesday tornado outbreak, NWS notes that this event marked the first time warning bulletins were storm-based rather than county-based. This represented a positive step towards reducing the geographic areas encompassed by severe-weather warnings, to both improve public responsiveness, and eliminate premature and misdirected alerts.

Never the less, despite the transition to warnings that emphasize forecasted storm tracks as opposed to arbitrary geographic boundaries, residents in locations relatively unaffected by the actual storm are oftentimes still included within the warning boundaries. This was exactly what happened across remote areas of Jasper County that were unaffected by the May 22nd tornado that swept through the metro-Joplin area. The need for narrower, more tightly targeted geographic alerts is also a significant contention cited previously by FIU's Hugh Gladwin.

No one would deny that 'it's better to be safe than sorry.' On the other hand, the research examining why so much of the general public either dismiss or ignore emergency warnings clearly concludes that there are potential consequences to 'crying wolf,' not the least of which are needlessly panicking the population, and desensitizing the public to future emergency alerts/notifications.

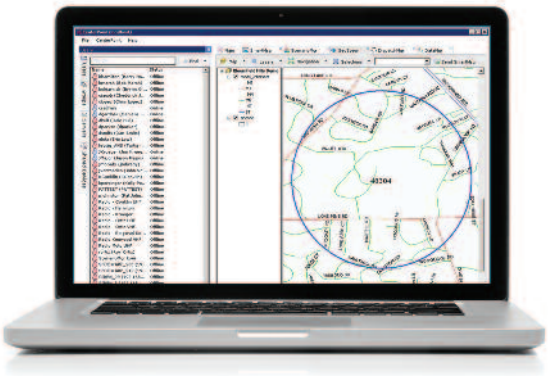
“Geo-targeting can play an important role in defining more accurate and more compact geographic regions....and this ultimately results in better targeted emergency alerts,” says John VonThaden, vice president and general manager, Alerting and Notification Systems, Federal Signal Corporation, which markets SmartMsg™, a network-based, multi-device communications software platform for emergency warning and mass notification.

“With software such as GeoSpear™, the ESRI-based GIS [Graphic Information System] app that was developed for the SmartMsg platform, EMs and public safety officials can send alerts and notifications to points on a map by just drawing circles, rectangles or free-form polygons. They can also select zip codes, towns, counties--even power grids and water supply lines--from pre-defined map layers,” explains VonThaden.

Relying on latitude-longitude coordinates, the Windows-based GIS console allows for specific addresses to be pinpointed so that alerts can be issued to all recipients within a defined radius of that point on the map. “This can be extremely valuable in emergencies where a very specific set of residents who, for sake of example, are in close proximity to a gas leak, and need to be notified immediately,” says VonThaden. “The message targets only those people who are affected--those that are directly in or near the path of a

© 2013 Federal Signal Corporation. All rights reserved.

tornado, for instance. And no time is wasted notifying those who do not need to be notified, so the message reaches the intended audience sooner."



The County of Abbeville, South Carolina provides an example of a municipality that decided improved targeting of alerts as an effective means of eliminating citizens' hesitation when it comes to taking immediate disaster precautions. In 2007 the county deployed a Federal Signal SmartMsg mass citizen alerting system along with the GIS application to issue urgent alerts and notifications to precisely designated geographic areas as well as its first responders and specific members of its 25,000 citizens.

From SMS to SNS...taking advantage of new media to increase the Publics' responsiveness to emergency alerts and notifications.

New technology has clearly had a significant impact on emergency communications and mass notification. Perhaps nowhere is this more evident than in the dramatic expansion of communications options that have, relatively speaking, suddenly become available to those responsible for public safety and emergency management.

Commonly referred to as text messaging, Short Message Systems (SMS) offers a number of advantages over cell phones, text-enabled pagers and other wireless devices. SMS does not rely on voice channels nor does it piggyback on enterprise email servers. Calling for substantially less bandwidth than voice messages, text messaging is transmitted in small packets of data on wireless carriers' control channels. This ensures the dependable transmission that encourages peoples' trust, and promotes usage. SMS also offers users greater convenience because, unlike voice messaging that requires manual re-dialing, text messages remain in queue, thereby increasing the likelihood that they will be transmitted.

SMS has displayed its value as an emergency communications tool on a number of occasions, and emergency managers have clearly taken notice. For many who were affected by Hurricane Katrina, the mega-quake/tsunami that devastated Northern Japan in March 2011, and the earthquake that struck the Eastern Seaboard of the U.S. in August 2011, SMS was a primary source for up-to-the-minute disaster information and instructions until cellular and landline phone service was restored.

Of course, and as was prominently noted in Federal Signal's 2010 Public Safety Survey as well as various studies on personal communication preferences, SMS is now clearly preferred among younger age groups than other modes of communication such as phone and email.

Do you Twitter? Maybe it's time to consider it?

Facebook and Twitter stand out as a testament to the continually growing acceptance of Social Networking Services (SNS), and are now considered to be a source for information during an emergency. Additionally, they are dependable backup for landlines and cell phones that become inoperable when infrastructure is damaged during a disaster.

© 2013 Federal Signal Corporation. All rights reserved.

When the mega-earthquake and tsunami struck the Japanese coastline in 2011, spike in demand virtually shut down mobile phone voice service. Facebook and Twitter subsequently became the only means of communication for many people. Later, when the tsunami raced eastward towards Hawaii, the County of Maui's Facebook page recorded a 700% increase in the number of "fans," again illustrating how people will become proactive in seeking emergency information and instruction if they know a source is available to them.

Like Facebook, Twitter is also being employed by a growing number of emergency agencies. For example, during the tornado outbreak of the spring of 2012, Twitter was incorporated into the emergency response efforts of the local Red Cross and the Dallas-Ft. Worth International Airport.

The previously mentioned University of Buffalo researchers studying campus shooting incidents credit social networking as a significant factor in energizing students to comply with emergency instructions. Among those students surveyed social networking media surfaced as the most effective channel for communicating instructions in the event of an emergency. Professor Sharman explains that their research strongly suggests that this is because social networking is capable of putting students in immediate contact with those whom they most trust, namely school administrators and parents. Also, social media is capable of supporting the more robust content such as graphic images and real-time streaming video that students prefer.

Improving emergency communications and preparedness through community education and outreach.

Education and outreach programs are among the most important tools emergency managers have at their disposal to combat indifference and encourage the public to proactively participate in matters concerning the safety of themselves and their families. As was pointed out in the FIU research conducted by Gladwin and Morrow, one of the two biggest reasons for complacent attitudes toward emergency warnings has been consistently traced to a general population that often remains uneducated as to the potential risks.

Pointing to a specific example as documented among the recommendations in the NWS Service Assessment of the Super Tuesday Tornado Outbreak of February 5-6, 2008, many people were caught off guard because the tornado outbreak arrived several months earlier than people of the region are typically accustomed to. Consequently, the study strongly suggests the need to increase public education and outreach on the subject of winter-season tornadoes, and the increased risk they pose in terms of fatalities for the Southeastern U.S. Moreover, in addition to the outreach programs conducted in the spring, the report specifically recommends emergency management agencies in Arkansas, Louisiana, Tennessee, Georgia, Kentucky and Florida to sponsor additional "Severe Weather Awareness" campaigns in the fall in order to remind people of the possibility of tornado-related fatalities throughout the winter.

Of course, many states have long sponsored awareness programs designed to prepare citizens for emergency situations. Alabama, Minnesota, Nebraska and other states across the Midwest and South annually conduct awareness campaigns for the spring tornado season. Likewise, states along the Gulf Coast, including Texas and Louisiana promote awareness programs for the fall hurricane season. In addressing the issue of complacency the goal is to make people more proactive when it comes to their own well being. Such outreach programs designed to remind people of the dangers posed by severe weather such as tornadoes and hurricanes offer excellent examples of how public education can be successfully employed to offset complacency and increase public awareness.

© 2013 Federal Signal Corporation. All rights reserved.

Here are a few more examples of government and emergency management agencies engaging in reaching out to the public through education programs, outreach and awareness campaigns:

• The Iowa Security and Emergency Management department collaborated this year with the NWS on a state-wide tornado drill, as well as a series of podcasts covering a variety of severe-weather safety issues, including flash flooding precautions, different ways to receive hazardous-weather warnings, and tornado safety at home and on the road.

• Coinciding with the spring of 2012's Tornado and Severe Weather Awareness Week, the Emergency Management office of Kenosha County (Wisconsin) sponsored a Basic/Advanced Tornado and Severe Weather Spotters Class, which was developed to inform citizens (especially first responders, public works employees and amateur radio operators) what they need to know to identify potential hazardous weather.

• The website for Stearns County Minnesota features a brief, highly informative and easy to understand video presentation on its Severe Weather Warning System that covers everything from a description of the county's outdoor siren network, to interpreting siren warning signals, to providing instruction on precautions to take in the event of a weather emergency.

With regard to education and outreach, it is also important to acknowledge that taking advantage of technology such as text messaging, social media and intelligent smartphone apps that use wireless broadband does in fact require some effort on the part of individual users. For instance, in order to receive recorded voice and text emergency alerts people must make an effort to "opt-in" to the system. This may require as little as a phone call or an email, or it may call for an in-person visit to the local municipal offices. More importantly, it often requires emergency managers to reach out and encourage the public to take advantage of such communication channels.

Gaining the trust of the public calls for a sustained effort by EMs and public safety officials to actively and consistently promote emergency preparedness. As was pointed out in the recommendations of the University of Buffalo's recent research on campus shootings, unless school officials encourage faculty and other influencers to actively promote subscription to dedicated emergency Facebook and Twitter accounts to students then they risk sacrificing much of these media's potential effectiveness. The research further suggests that, in promoting these emergency communication channels, university officials stress the benefits of subscription and compliance as opposed to merely echoing the risks and dangers.

© 2013 Federal Signal Corporation. All rights reserved.

Bibliography

http://www.noaanews.noaa.gov/stories2011/20110920_joplin.html

http://www.nws.noaa.gov/os/assessments/pdfs/Joplin_tornado.pdf

http://www.nws.noaa.gov/om/assessments/pdfs/super_tuesday.pdf

http://www.nws.noaa.gov/os/assessments/pdfs/mothers_day09.pdf

http://www.noaanews.noaa.gov/stories2009/20090309_tornadoreport.html

http://www.livescience.com/7574-people-ignore-hurricane-evacuation-warnings.html

http://www.livescience.com/3370-people-heed-tornado-warnings.html

http://minnesota.cbslocal.com/2012/04/16/could-better-tornado-warnings-cause-complacency/

http://www.timesfreepress.com/news/2011/apr/07/tsunami-hit-towns-forgot-warnings-ancestors/?print

http://staugustine.com/news/local-news/2011-05-20/residents-heed-friends-more-officials-hurricane-evacuations#.UE5dqFH-mSq

http://www.fas.org/sgp/crs/homesec/R41987.pdf

http://www.joplinglobe.com/dailybusiness/x1488642463/Storm-sirens-draw-criticism-for-wide-ranging-warnings

© 2013 Federal Signal Corporation. All rights reserved. ANS105