

Coastal Zone
Information
Center

PERSPECTIVES ON HURRICANE PREPAREDNESS

TECHNOLOGIES IN USE TODAY

COASTAL ZONE
INFORMATION CENTER

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Cover photo: U.S. Coast Guard photo from the American Red Cross

Introduction

"We have a very serious hurricane problem . . . primarily a human one."

Dr. Neil Frank
National Hurricane Center
August 9, 1984

Experts estimate that 80 percent of the more than 40 million people who live in coastal areas along the Atlantic seaboard and the Gulf Coast have never experienced a major hurricane. Without adequate emergency planning, warning, mitigation, and public awareness programs, we could be headed toward a major hurricane disaster.

Public awareness activities are vital in fighting "hurricane-aware-less-ness" and in raising the level of citizen preparedness to deal with these violent storms. This monograph highlights the successful efforts of various state and local governments, and business and industry in innovative hurricane awareness/education programs. Stories focus on awareness techniques, public response, instructional programs, and private sector and community involvement in hurricane preparedness planning and awareness efforts that can be replicated or adapted by others.

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Using Broadcast Communication Techniques

When You Vacation . . . Take a Weather Forecaster Along

by
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Think how much better your vacation would be if you could plan your daily activities based on the latest weather forecast available. More important, think how much safer it would be if you had access to weather watches, warnings, and special weather advisories when severe conditions threaten.



AP Laserphoto

National Weather Service warnings can be especially critical to people camping in mountainous areas prone to flash flooding, or to boaters who might be caught on the water when a severe thunderstorm moves across the area.

NOAA Weather Radio, "The Voice of the National Weather Service," is a service of the National Oceanic and Atmospheric Administration (NOAA) of the U.S. Department of Commerce, and provides continuous broadcasts of the latest weather information directly from local National Weather Service offices. It's a service that virtually allows travelers to take a weather forecaster with them wherever they go, to constantly advise them of weather conditions and to alert them of possible weather hazards on the horizon.

Most NOAA Weather Radio stations operate 24 hours daily, giving information tailored to the needs of people within the receiving area. For example, stations along the sea coasts and Great Lakes provide specialized weather information for boaters, fishermen, and others involved in marine activities, as well as the usual airing of general weather information.

The stations repeat taped weather messages every four to six minutes, revising the information every one to three hours, or more frequently as needed.

During spells of severe weather, National Weather Service personnel can interrupt the routine weather broadcast and substitute special warning messages.

They can also activate specially designed warning receivers.

These warning receivers either sound an alarm indicating that an emergency exists or, when operated in a muted mode, are automatically turned on so the warning message is heard. This can be especially useful to travelers who have not had the opportunity to hear a local forecast.

NOAA Weather Radio broadcasts are made on one of seven high-band FM frequencies from 162.55 megahertz (MHz)--frequencies not found on the average home or automobile radio now in use. However, a number of radio manufacturers offer special weather radios to operate on these frequencies, with or without the emergency warning alarm. These radios are relatively inexpensive, ranging in price from \$20 to \$50. Also, there are now many radios on the market that offer

standard AM/FM frequencies plus the "weather band" as an added feature.

The National Weather Service operates over 370 stations, making up-to-date weather information available to approximately 90 percent of the nation within listening range (approximately a 40-mile radius of the transmitter) of a NOAA Weather Radio broadcast.

Contact your nearest National Weather Service office for more information on NOAA Weather Radio, or write to National Weather Service, National Oceanic and Atmospheric Administration, Silver Spring, MD 20910.

NOAA Weather Radio could enhance your vacation and possibly save your life during severe weather. So why don't you take a weather forecaster along when you travel this year?

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Using Weather Information For Emergency Management in a Small Coastal Community

by
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Emergency Management Coordinator
Taylor Lake Village, TX

Emergency management coordinators in small coastal communities where hurricanes are an annual threat may wish to consider some new and innovative sources of weather information this year. When a storm is threatening, there can be no substitute for timely, detailed information from the National Weather Service (NWS). Now, some alternatives are available for obtaining this information.

As a hurricane approaches land, weather radars are extremely valuable--not only for tracking the eye of the storm but also for showing the bands of heavy rain and squalls. Direct connection to the NWS radar can be made in an Emergency Operations Center (EOC), but these hook-ups are expensive and require some type of permanent arrangement. An alternative source of weather radar information is now available on many community cable television systems. These systems usually allocate one of the channels to show the display from the NWS radar; often the NOAA weather radio broadcast is placed on the audio portion. Sometimes, the franchisee in a community is willing to install a gratuitous drop in the local EOC for use when a storm emergency exists.

When NWS issues its regular advisories, it is often desirable to have a printed copy of the full text, including the new probability data. Also, the marine advisory--with data on the radius of gale force winds, wave heights, and the forecast storm track--is valuable. However, much of this information is presented in summary form by NOAA Weather Radio. The full text can be obtained only if a teleprinter and appropriate communications

circuits are available. The limited seasonal use of such equipment sometimes makes it difficult to justify installation in a small community where financial resources are limited.

Many small municipalities use micro-computers that can be used to access this information during the hurricane season. Since most of these computers are portable, it is easy to move one to the EOC when a hurricane develops.

The private vendors of the weather information obtain the advisories upon release by NWS and have them available for display or print-out for your use. Acquiring information in this way is dependent on having telephone service and power, but these services are usually reliable in the period when a storm is approaching and important evacuation decisions must be made.

In addition to having the current hurricane advisories, data vendors offer a selection of other weather information. This includes hourly weather reports from airport stations giving wind direction, wind speed, rainfall intensities, accumulated rainfall, and other valuable information.

The cost of hurricane advisories and other weather information via computer is usually nominal because hardware is already available for use in most communities. Typically, you can expect to spend about \$100 on data for a particular storm unless it stays for an unusual number of days.

For more information about these weather data vendors and services available, ask your local National Weather Service contact for a list of companies.

New computer software programs are available that use the storm coordinates

to compute the direction of movement and forward speed of a storm in addition to displaying a map showing its track. Most computer software catalogs list sources of these programs.

EBS/PIES Communications System Goes on the Air in Texas

When Hurricane Alicia hit the Texas coast on August 18, 1983, the community of Baytown was among the hardest hit. Located in the storm's path 45 miles northwest of Galveston on Galveston Bay, more than 500 Baytown homes were flooded and 100 people had to be rescued from the rising waters. Miraculously, no one in the city of 60,000 was killed or even injured. Ask Baytown Emergency Management and Preparedness Coordinator Fletcher Hickerson what saved Baytown and he will answer you with two words: Luck, and PIES.

The Public Information Emergency System (PIES) is a new radio communications network that is now operational and being expanded in the Houston/Galveston area. PIES is the first such disaster network of its kind in the entire country, and has so

impressed the Federal Communications Commission that it could become a model for other cities nationwide and along the Gulf Coast.

The system uses a special radio frequency (161.64 MHz) to link all of the participating Emergency Operations Centers (EOCs) in Houston's 41 suburban cities with the more than 60 media outlets (radio, TV, newspaper, wire services, etc.) in the metropolitan area. PIES receivers have already been installed at most of these media outlets, and transmitters have been operational in the Houston/Harris County and Baytown EOCs since 1982.

The system proved to be crucial when Baytown's local radio station lost its tower in 100 mph winds around 2 A.M. on the day Hurricane Alicia hit. A Houston radio



Photo courtesy KIKK-Radio Houston

station picked up the information Hickerson was broadcasting on PIES and relayed it back to Baytown residents.

Instant information proved to be the key in surviving Alicia, because the storm kept changing. As Hickerson got new information from the National Weather Service, he broadcast it over PIES, along with the latest tide and wind readings.

"In spite of everything, we had people caught by the waters. We came through because of the good information we were able to get out. No one was even injured--because we had PIES, in our opinion," Hickerson said.

Since Alicia, the PIES network has been expanding in Texas. When completed, broadcast band two-way radios will be installed in each of the Emergency Operations Centers in the five-county Houston metropolitan area, so that mayors, county judges, and civil defense officials will have direct radio contact to primary and secondary Emergency Broadcast System (EBS) stations, as well as other news media outlets.

During an area disaster such as a hurricane, Houston's primary and secondary EBS stations act as EBS/PIES Net Control Stations, coordinating a series of "round robin" city-by-city, county-by-county reports, with break-in capability for any emergency update. With these reports coming directly from each city or county EOC, the information should be more reliable, timely, and would be shared equally with all the news media, which could disseminate the same accurate information to the public. This would minimize the possibilities of being misquoted, sensationalized, or in conflict with other reports. If a mistake is made, the EBS/

PIES would allow faster correction to all news outlets.

Instead of trying to communicate by telephone lines (which often become busy or go dead because of high winds, flooding or overloaded phone circuits), each city and county EOC would communicate by radio on the same frequency. This means they would also be able to communicate with each other and coordinate their activities. They would be aware of a nearby town's evacuation, for example, that could cause traffic problems for them.

John Caswell, Emergency Coordinator for the City of Houston and Harris County, calls PIES "the most valuable asset enabling us to get information to the public more expediently during a disaster." It was Caswell who pioneered the idea in 1979, when he purchased monitors for media outlets in the Houston area.

Not long after the Houston system became operational, Chuck Wolf, news director for KIKK Radio-Houston, became interested in expanding PIES areawide and took the lead in developing the Houston Area Emergency Broadcast System/PIES Plan, which has been approved by the Federal Communications Commission. Wolf reports that the FCC is very interested in expanding the system to other areas of the country. He believes the EBS/PIES could be an asset in many major metropolitan areas where there are a large number of media outlets. "With PIES, one message goes out to everybody at the same time, and everyone gets reliable information," he said.

For more information on the EBS/PIES, technical specifications, costs, and licensing procedures, contact Chuck Wolf at KIKK Radio-Houston, (713) 981-9600.

Developed by the Federal Emergency Management Agency with the cooperation of KIKK Radio-Houston, Baytown Emergency Management and Houston/Harris County Civil Defense.

Instructional Programs to Encourage Family Involvement

Teaching Preparedness: "Before the Hurricane Strikes"

The past 30 years have been marked by a demographic shift that has moved millions of people into coastal zones vulnerable to hurricane winds and floods. Many of these new coastal residents bring with them little or no experience or knowledge of the destructive potential of hurricanes.

John Sanders of Sanders Scientific Enterprises in Marina, California, has developed an approach to improving public awareness of the hurricane hazard based on fundamentals of how people learn and remember. While with the University of North Carolina Sea Grant College Program, Sanders put together an instructional package for schools. The kit, entitled "Before the Hurricane Strikes," includes an 18-minute videotape and a teacher's guide with selected hurricane readings and suggestions for a variety of educational activities and exercises.

In developing the educational program in North Carolina, Sanders considered the following features to be important:

- **Simplicity:** Any material developed for the public should be easy to comprehend and apply.
- Learning about the physical processes of the hurricane should take place.
- People should become familiar with appropriate preparedness measures.
- People should be able to retain and recall this knowledge with accuracy at a later time.

A hurricane safety checklist was devised to aid students in developing their own family hurricane preparedness plan. The checklist, which is in the form of a "dichotomous key," requires each student to make two yes/no decisions. When this is completed, the student is guided into a planning process. Each planning phase begins with a statement outlining the potential risk that the student and his family might face if a hurricane threatens. The student then uses the checklist as a guide in preparing a family hurricane preparedness plan.

The concept of the checklist and family plan was initially tested with 40 eighth-grade members of the Pamlico Junior High School Science Club in Bayboro, North Carolina, during the 1982-83 school year. To complete the exercise, students consulted with parents, teachers, and local officials, including the County Emergency Management Coordinator and the Soil Conservation Officer. Thirty-seven of the students traveled to Raleigh and slept on cots at Wake County Red Cross Headquarters, as they would if a hurricane forced evacuation of Pamlico County. The trip was the subject of several stories in newspapers and on television and radio. One cable TV station later produced a special based on the project, while the state's largest newspaper used it as a lead for a story on hurricane preparedness.

Dick Simmons was director of Pamlico County Emergency Management when the junior high school undertook the hurricane project. "So many people in rural areas like Pamlico County say, 'we're not going to get hit.' But when their kids come

home with knowledge about wind speeds and tide surge, they begin to realize what they need to do," he said. Simmons participated in a workshop with the students on County hurricane evacuation plans. In fact, as a result of working with Sanders and the Pamlico Junior High School project, he decided to revise the county's hurricane evacuation plan because it left unclear the point at which evacuation would be ordered.

While completing the hurricane safety checklist is a relatively simple task, the exercise is valuable because the students not only take a look at the checklist, but also involve their parents in the process. "One student learned for the first time that his grandparents' house had been destroyed during the 1933 hurricane and his father was carried from the house on his bed by the storm-induced tide," Sanders said. "These things had never been discussed until the son brought home the assignment to complete the family hurricane preparedness plan."

Sanders observed that bringing families into the discussion has an additional benefit. "People with pre-existing notions of how they would deal with a hurricane respond more effectively when a hurricane hits," he said.

Through his research, Sanders has found that parents will take the time to answer a child's questions about the checklist and to help make decisions about important elements of the family hurricane preparedness plan. "About 80 percent of the students who take home the assignment complete the plan with the help of their parents," Sanders indicated.

The core of the educational package is an 18-minute videotape that uses newsreel footage and interviews with an emergency official and a survivor of Hurricane Hazel in 1954 to illustrate the destructive force of a hurricane and to put the devastation in human terms. The kit, which also includes the teacher's guide, is available for purchase or rental from the Educational Media Center, 2318 D.H. Hill Library, North Carolina State University, Raleigh, North Carolina 27650.

Developed by the Federal Emergency Management Agency with the cooperation of John Sanders, Sanders Scientific Enterprises, Marina, California.

Educational Program Encourages Students to Seek Hurricane Precautions

A rate of growth equal to about seven times the national average has resulted in "hurricane-aware-less-ness" for 80 percent of South Florida's population. This growth rate, with the burgeoning of capital developments along South Florida's hurricane-vulnerable coasts and past coastal mismanagement practices, has stimulated the development of a two-phase instructional model designed to create an awareness of the area's hurricane problem. The model—identified by the acronym CALM, for Cognitive and Affective Learning Model—has been developed by meteorologist Howard A. Friedman of the National Oceanic and Atmospheric Administration's Atlantic Oceanographic and Meteorological Laboratory Hurricane Research Division, where it is undergoing proof-of-concept testing.

Improvement of the public's ability to respond to a call for action to survive a

landfalling hurricane is but one objective of the program. Increased hurricane awareness is expected to encourage an informed citizenry to participate in certain precautionary local, state, and national governmental processes. Such processes, for example, would be limiting the development of coastal and ecologically sensitive storm-vulnerable areas; strict enforcement of building codes, zoning, and setback requirements; and the provision of local facilities for disaster prevention and public safety.

The cognitive phase of the CALM model uses a simple computer-assisted instructional technique to guide each student through a series of learning units about hurricanes as a geophysical phenomenon, and about precautionary public policies that can be adopted to mitigate the effects of future storms. However, the self-paced program can be easily adapted for use without a computer.



American Red Cross photo

Friedman uses actual newspaper editorials, news stories, and radio and TV tapes that trace the efforts of groups of local citizens who are fighting to limit development of storm-vulnerable areas. This "current events" material illustrates steps that can be taken to protect areas from hurricane-associated dangers before the threat is imminent.

Once students demonstrate mastery of the material in the cognitive phase of the instructional model, they are ready to progress to the affective phase, which explores the dynamics of the social and political processes at work when a community faces the prospect of a landfalling hurricane. Here, students assume the roles of some of the main actors in such a drama: the mayor; emergency management coordinator; police chief; a business leader or hotel/tourism industry representative; and a member of the media, to name a few.

During the simulation, they are presented with a realistic hurricane scenario and asked to react according to their perception of how the person whose role they are playing would act, given the information at hand. After the exercise, a teacher helps students process the information they have gleaned through participation in the simulation. Friedman says that one common misconception can be cleared up right away: "Students generally think that once a storm is detected, people first begin to make plans. Most students are unaware of the long-range planning that precedes the hurricane season, and that hurricane plans are already in place," Friedman explains.

The CALM model is intended for use primarily with students in secondary schools and above, and not just in science

classes. Friedman explains that the CALM model looks at the hurricane from a number of different perspectives. A social studies teacher could use the program as a bridge to demonstrate how local disaster preparedness decisions are made, or to explore interrelationships between local, State, and Federal governments. An English teacher could use the same exercise to look at the role of the journalist, and to fashion strategies for effective communications. A psychology class might focus on how people react in a crisis and discuss how they can be encouraged to take a threat seriously, and to take appropriate actions without panicking. And finally, the science teacher could use this geophysical event--a hurricane--as a window on science, mathematics, and technology.

While the material is written for use in South Florida communities, local information could be substituted for use in other areas. If proven to be an effective teaching tool, Friedman said the CALM model may eventually be adapted for use in awareness programs for other natural and manmade hazards. Right now, the program is still being tested by NOAA, and Friedman is working on a guidebook to accompany the instructional package.

"We want to enhance not only awareness, but we want students to think about things and participate in decisionmaking processes that can have a real impact on their routine way of life," Friedman said. The idea is that students will bring home new information about the hurricane danger and, with their parents, develop their own family hurricane action plans. That concept is central, Friedman says, because research in the behavioral and social sciences indicates that people are more likely to follow decisions they help to formulate.

Developed by the Federal Emergency Management Agency with the cooperation of the National Oceanic and Atmospheric Administration's Atlantic Oceanographic and Meteorological Laboratory Hurricane Research Laboratory.

Getting and Using Private Industry and Volunteer Support

Elevation Markers Remind Residents of Hurricane Danger

Residents of Key West, Florida, are reminded daily of how vulnerable to hurricanes their neighborhoods are, thanks to a simple, inexpensive, and effective awareness tool developed by the Key West Planning and Restoration Commission. Using data collected for a sewer project, the city stenciled highly visible elevation markers on utility poles at about 90 intersections throughout Key West. The markers show the elevation in feet above mean sea level in the eye of the standard hurricane symbol.

"By making people aware of how low their neighborhoods are, they know that in a hurricane they may have to relocate into the center of town, if not out of the county," explained Janice Drawing of Monroe County Civil Defense. Drawing coordinated the project a little over two years ago, when she was Key West's city planner. "I thought it was an important thing to do, especially because some areas of town are extremely low, just four feet above mean sea level," Drawing said.

The cost of the project was minimal because elevations had already been shot for a sewer project, and because Drawing was able to enlist the help of an engineer with Sea Grant funding at the University of Florida. He verified the elevations and prepared a map. The 478th Civil Affairs Company, U.S. Army, did the actual stenciling of the markers on utility poles.

Key West and Monroe County Civil Defense use the markers as a focal point in hurricane awareness campaigns. For instance, at the beginning of each

hurricane season, they place a newspaper article cautioning residents about the hurricane threat and alerting them to the elevations posted throughout the city. It is one way to get people thinking about what they need to do when a hurricane strikes.

"It's an excellent tool," Drawing said. "People see the markers every day, so they are constantly reminded of the hurricane danger."

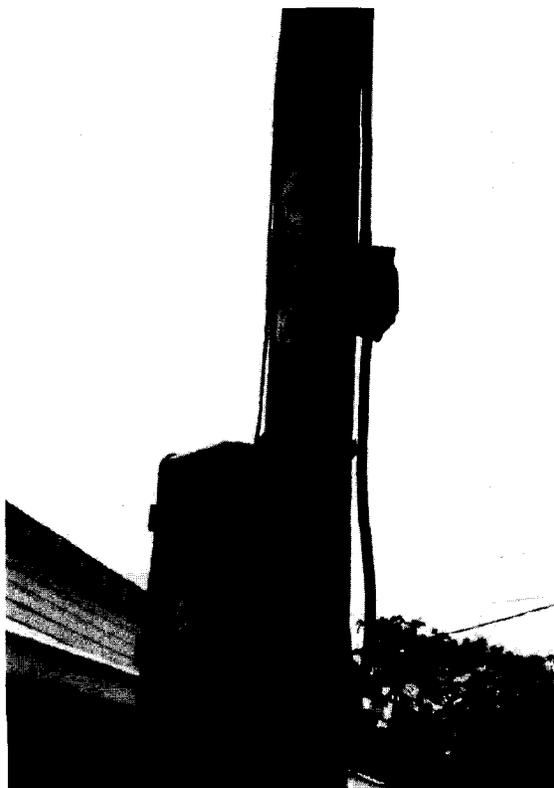


Photo by Janice Drawing

Developed by the Federal Emergency Management Agency with the cooperation of Janice Drawing, Monroe County Civil Defense, Key West, Florida.

Local Businesses Underwrite Awareness Effort

When the Board of Commissioners turned down a request for \$3,900 to print 77,500 evacuation maps for Charlotte County (Florida), Disaster Preparedness Coordinator John Derr had to look elsewhere for support. He did, and the project ended up costing the county absolutely nothing.

Derr knocked on a lot of doors and eventually found 20 Punta Gorda businesses willing to invest between \$50 and \$500 in exchange for advertising space in two corners of the attractive four-color maps. "We thought it would be a good community service project," explains Don Witter, president of First Federal Savings and Loan. The bank contributed \$500 to print 10,000 maps bearing its logo, and makes them available to patrons in each of its four branches. "Hurricanes are something everyone thinks about here, and a real concern every June through September," Witter said. He added that supporting the map project has made bank employees more aware of the hurricane danger. "We like to track the storms that may become a threat," he said. One side of the 11x14-inch map provides a grid for plotting movement along the Atlantic Coast.

The Office of Disaster Preparedness uses elevation maps supplied by the Southwest Florida Regional Planning Commission that utilize SLOSH (Sea, Lake, and Overland Surge from Hurricanes) data to identify vulnerable areas in the event of storms of various intensities. Major roads and local landmarks are added to the maps by an artist paid by the County, as are the locations of evacuee staging areas and Red Cross operated shelters. This year, even the artist's fee was paid for with advertising revenues.

Each participating business agrees to print a certain number of maps with only its own advertising on them. The 20 sponsoring businesses this year agreed to print between 500 and 10,000 maps each, for the total of 77,500--enough to supply each Punta Gorda household with a copy for each of the next two years. After that, the Office of Disaster Preparedness will update data and begin another reprinting campaign.

The maps are distributed by participating businesses and are also available in public buildings and libraries. The local Chamber of Commerce lends support to the project by mailing out maps to its 1,000 members.

Developed by the Federal Emergency Management Agency with the cooperation of Charlotte County Disaster Preparedness, Florida.

Public Information Plan Key in Utility's Response to Hurricane Alicia

It was Monday, August 15, when Alicia—the first named tropical storm of the 1983 Atlantic hurricane season—formed in the north-central Gulf of Mexico.

"It's kind of like a gorilla with a machine gun. It goes where it wants to," said the meteorologist in charge of the weather service for the Houston area.

The slow-moving Alicia finally made up its mind and came ashore about 3 a.m., Thursday, August 18, at San Luis Pass, with winds of up to 135 mph. It proceeded northward on a path of destruction that left approximately three-quarters of a million Houston Lighting & Power (HL&P) customers without power.

When the fury of Alicia had passed, it was painfully obvious that the hurricane had caused the greatest damage to HL&P's electric system in the company's 102-year history.

Seven hundred and fifty thousand customers lost electrical service—more than the total number of customers HL&P had when Hurricane Carla struck in 1961. All power to Galveston Island was lost. Six hundred miles of line—the distance between Houston and Birmingham—were blown to the ground.

Service was restored to over 80 percent of customers within four days, and to all affected customers in 16 days.

Maintaining the flow of information to customers, federal, state, and city officials was a major responsibility. The company provided daily updates of restoration progress to the Public Utility Commission of Texas and the mayor of Houston. Company officials also contacted the Department of Energy's Office of Energy Emergency Operations in Washington the day after Alicia struck to apprise them of the status of HL&P's system. Public Affairs personnel worked



AP photo

around the clock making sure that critical information was made available to news media as it came into the company's Emergency Evaluation Center.

Public Affairs' storm preparations is renewed at the start of hurricane season each year by updating large wall maps in the media center and by installing storm phones with direct lines to service centers. Communications to news media were distributed by Western Union TWX as well as by telephone and direct delivery. Special storm telephone numbers were also given to news media outlets at the onset of the storm. As a result, communication was never a problem.

Besides providing damage and repair updates throughout the days and nights before and after the storm, Public Affairs worked to make sure that particularly important messages got priority. All news media, particularly radio stations, gave excellent cooperation in relaying current information out to customers.

For example, a serious safety concern for linemen and customers from portable generators was publicized. If these machines are wired directly into a home's electrical system, current can flow back through the HL&P wires, with transformers boosting the voltage to dangerous levels. Effective communication was needed to warn customers of this hazard.

Public Affairs personnel also assisted news media representatives in providing information on downed wires. Passengers who found themselves in cars with lines down on them were advised on how to leave the vehicle safely.

Customers trimming trees were advised to stay clear of power lines. In recently restored areas, customers were reminded not to drop trimmed limbs on power lines lest the service be lost again. One newspaper declined to name an individual who accidentally caused his subdivision to lose power in this way due to fear for his personal safety if his neighbors found out.

News media interviews were also arranged with work crews and company officials. Rumors were quelled and questions were answered. Frauds were reported. For example, as tree trimming crews worked through a neighborhood, a man went ahead of the crews to collect a fee for their services. With news media help, customers were quickly advised that the company was seeking no fees and that the police should be notified if someone sought to collect for HL&P's tree trimming work.

Over 500 calls were received from news media outlets seeking information--some from as far away as England--and a large number of calls were initiated to local news media. Thirty-nine storm damage and restoration progress reports were distributed by the department during storm repair efforts.

Excerpted from "The Alicia Story: How Houston Lighting & Power Company responded to Hurricane Alicia," August 1983, by Houston Lighting & Power. Used by permission.

Red Cross and Union Partnership: Local Unions Assist in Coastline Disaster Project

by
W. M. Lawbaugh
Editor, The Ironworker

Hurricanes . . . a fire . . . flooding . . . earthquake . . . explosions . . . a tornado. For more than a century, whenever disaster strikes, we have counted on the American Red Cross to come into the stricken area to coordinate evacuation, emergency health care, and temporary housing and food, and to mobilize community and volunteer relief services.

Typically, during a major disaster, the American Red Cross can send in 200 to 500 paid staff and volunteers to set up and coordinate emergency services. But if we depend so much on the Red Cross in a disaster, who can the Red Cross depend on to make their vital disaster services easier and more efficient?

Human lives and property are in the balance during a disaster. In the past, the American Red Cross would dispatch those 200 to 500 experts to a disaster area with nowhere specific to go. First, they would have to find a place for crisis administrative control. Often such facilities would have to be repaired on the spot. Then emergency vehicles and equipment would have to be located and moved in, including generators if the power were out. Finally, a reliable communication system would have to be installed, including telephones (and now satellite systems), to receive and place calls for more help to specific stricken areas.

All this set-up and coordination could take several days, even a week. Precious time is lost as the disaster claims more lives and property which could have been

saved if the Red Cross could have hit the disaster scene running.

However, in some Gulf and Atlantic regions, local trade union halls are now ready to serve as administrative disaster headquarters, thanks to a remarkable partnership between organized labor and the American Red Cross. The story of this partnership has been called "the best project the labor movement has ever been involved in" and yet another example of the community-minded spirit of union members who often are either volunteers in Red Cross rescue and emergency efforts, or, sadly, victims of a hurricane, tornado, flood, or fire.

"We hope this union hall is never to be used as a Red Cross emergency center," says one local union official, "but if disaster strikes, we're ready."

Fifty local unions are now equipped and ready to turn their hall keys over to the American Red Cross with a minute's notice, from Lake Charles, Louisiana, to Norfolk, Virginia--more than 2,000 miles of coastline.

Now, when disaster strikes anywhere along the Gulf or South Atlantic Coasts, the American Red Cross has a place to go, with the Coastline Disaster Project. In the halls, telephones drop from the ceilings; there may be an emergency generator out back; and plenty of room for parking and emergency work. Instead of several days for mobilization and set-up, these facilities are ready for emergency operation in less than half a day. This unique partnership between organized

labor and the American Red Cross did not just spring up overnight or automatically. The story actually begins during Hurricane Frederick, September 1979, in Mobile, Alabama.

Death, destruction, injury, and homelessness surrounded the scene as the Red Cross scrounged around Mobile for an administrative center to coordinate emergency services. They had to find a shelter, telephones, and a generator before staff and volunteers had something they could call a headquarters. It was the same story 78 years ago when an earthquake and fires killed 600 people and leveled 30,000 buildings in San Francisco. Ditto a few years later when a hurricane whipped through Tampa. Ditto virtually every year since: when disaster strikes, the American Red Cross often has nowhere to go to set up an emergency administrative headquarters.

In Mobile, Chuck Johnson got to thinking: Can we ever be ready to go during a disaster? Johnson is Director of Labor Participation for Regions 3 and 4 of the Eastern Operation Headquarters of the American Red Cross and National AFL-CIO Community Services Liaison. The Boy Scout motto ate away in Johnson's mind over and over until 1981, the centennial anniversary year for both the AFL-CIO and the American Red Cross. Then he met with Ralph Barlow, disaster director for the Red Cross in the Southeast, and outlined a plan whereby local union halls would be retrofitted and equipped to serve as emergency administrative headquarters all up and down the Atlantic and Gulf.

Barlow, now deceased, was enthused by the idea--Coastline Disaster Project--and immediately Johnson began contacting state federations and central labor councils for the best locations of union meeting halls for prospective Red Cross disaster relief centers. In spite of recession, declining membership, and tight finances, without exception the response of organized labor was generous, cooperative, and enthusiastic. After all, union members, as volunteers or victims in

the past, knew and appreciated the American Red Cross.

The local union halls selected had to be on high ground but near an airport and motels. Some had to be pre-wired, altered, and equipped with emergency telephones and diesel emergency generators. Generators and communications equipment were donated by Southern Bell, South Central Bell, General Telephone of Florida, United Telephone Service, and Chesapeake and Potomac Telephone. Installing and retrofitting, as well as building insulated sheds for the generators, were performed by volunteer union construction workers.

The 50 local unions involved agreed to turn their meeting halls over to the American Red Cross during a disaster, often lasting up to two months until the emergency administrative headquarters is shut down. Unions so far involved in the Coastline Disaster Project are the IBEW Electrical Workers, Communications Workers, Steelworkers, Longshoremen, Tobacco Workers, Government Employees, Bricklayers, Carpenters, Plumbers, Operating Engineers, Auto Workers, Boiler-makers, Textile Workers, Machinists, Paperworkers, and Ironworkers.

Cooperation continues between the Red Cross and strategic local unions to extend the Coastline Disaster Project from Texas to Maine, and eventually out west and inland. After all, similar Red Cross disaster relief centers are needed in Utah for mudslides, in Missouri for floods, and elsewhere for explosions, fires, tornadoes, earthquakes, and potential nuclear accidents. But with the hurricane season approaching, the Gulf and South Atlantic coastlines are better prepared as a result of this partnership between organized labor and the American Red Cross.

So far, in the two-year development of the Coastline Disaster Project, only three union halls have been used by the Red Cross, and one was in Jackson, Mississippi, last year during that region's second worst flood on record. The worst was in 1978, and the Red Cross had to scramble for

several days to set up an administrative headquarters.

Last year, however, Red Cross officials flew into Jackson, drove to a CWA local union hall on high ground, cranked up the emergency generator, and dropped all the necessary telephones out of the ceiling tiles. In an unprecedented 30 minutes, the Red Cross had an emergency administrative headquarters from which staff and volunteers could begin mobilizing rescue efforts and coordinating all the thousand-and-one details of a disaster operation.

"Unless you've been through something like this," says Jackson Mayor Dale Danks, "you don't know how comforting it is to see people, maybe strangers from out of town, who care about you and your community." He applauds the unions, phone companies, and Red Cross for the Coastline Disaster Project.

So far, the value of the Coastline Disaster Project tops \$10 million in equipment, machinery, and manpower, every cent of it donated and voluntary. As such, the partnership strengthens the ties between the American Red Cross and AFL-CIO unions, but more importantly, the 50 retrofitted local union halls dotted all along the Gulf and Atlantic provide faster emergency services meeting human needs during a disaster.

Today, Chuck Johnson and Lucious Webb are running up and down the East Coast trying to get more local union halls retrofitted for emergency Red Cross use as the hurricane season approaches. Running interference for them, especially in right-to-work (for less) states, is E.T. "Al" Kehrer, southern director for the AFL-CIO Civil Rights Department. You'd be surprised to find pockets of resistance to what the Southern Field Office Advisory Council of Red Cross calls "a truly remarkable example of responsible citizenship on the part of organized labor" in the Coastline Disaster Project.

Nevertheless, while commercial media continue to hammer away at the AFL-CIO as a "special interest" of "labor bosses,"

Chuck Johnson finds nothing but cooperation and good will from state federations and central bodies of the AFL-CIO for the Coastline Disaster Project. The quiet, generous work of 50 local unions, until now, has gone unheralded, hardly noticed—but greatly appreciated by Jackson, Mississippi, and presumably wherever disaster strikes next.

Ironworkers Take the Lead in Coastline Project

Three Ironworker local unions were among the first to sign over their facilities to the American Red Cross for emergency headquarters under the Coastline Disaster Project.

In the event of a major disaster, Ironworker halls in Savannah, Charleston, and Norfolk are ready to go for the coordination and administration of Red Cross disaster relief services. These halls were selected for their location in disaster-prone areas, convenience to airports, accessibility to lodging, and relative safety such as high ground during flooding.

Local 601 in North Charleston, South Carolina, was selected, for example, because of its location. The Coastline Disaster Project facility is not located in Myrtle Beach because it would be under water if a major hurricane hit.

Coastline Disaster Project coordinator Chuck Johnson first approaches the State AFL-CIO federation and then the appropriate AFL-CIO central labor council. In the case of Local 79 in Norfolk, Virginia shares a meeting hall with the central labor council on the highest hill around. During a flood, the local Red Cross chapter and the blood center would both be underwater.

Local 709 headquarters in Savannah, Georgia, is a back-up to the main Coastline Disaster Project facility operated by the Boilermakers, which could suffer extensive damage during a severe disaster. In that case, Local 709 would become the

administrative disaster headquarters from which the Red Cross would operate.

"Ironworkers have been among my top supporters," Johnson said in an interview recently. His Coastline Disaster Project

has been endorsed by top Red Cross and AFL-CIO officials who are now encouraging nationwide cooperation between the two organizations in order to expand the project to every major hit area in the nation.

Reprinted by permission from The Ironworker magazine.

Leveraging Community/ Regional Participation

Hurricane Preparedness: "The Georgia Plan"

Nearly 350,000 people reside on or near the 112-mile stretch of Georgia coastline—a coastline affected by one out of every seven hurricanes in the Atlantic region. In 1980, Georgia's Coastal Area Planning and Development Commission (CAPDC) began studying the needs of local governments in disaster preparedness planning. The study resulted in a model storm preparedness program that is both comprehensive and innovative.

What began as a prototype storm program funded under FEMA's Comprehensive Cooperative Agreement was continued through successful local initiatives. Federal funding totaled \$133,000 and was awarded to the CAPDC in 1981-82. Money to continue the project was obtained through a voluntary tax of 50 cents per capita in the 29 coastal and host counties involved.

The key to the success of "The Georgia Plan" is found in this introductory statement to the Storm Preparedness Guide developed by the CAPDC and published last April: "A storm preparedness program is more than just a set of documents containing response procedures. It is an ongoing, coordinated effort to prepare the general public for emergency situations. It is also an effort to prepare responsible public and private agencies and groups that direct, control, and support operations in emergency situations. In short, it is the difference between having a written plan and active planning."

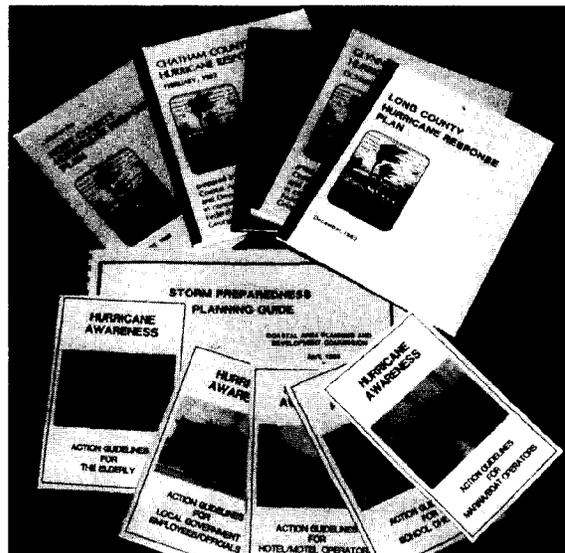
Fully implemented in the coastal Georgia area by 1983, the program incorporates several critical elements: the intergovernmental coordination process guided development of the overall program followed by the development of major functional areas including planning, public education, and mapping.

Planning

A unique element of the plan is the designation and participation of inland or "host" counties. In addition to the six coastal counties designated as evacuation areas, 23 host counties participated in planning and preparedness efforts. Uniform plans were developed for reception and care of evacuees in host areas, with routes mapped, shelters identified, and emergency personnel designated for both response and recovery phases. Evacuation planning began with a telephone survey of households in the designated evacuation areas. Survey results indicated that the least likely residents to evacuate were those with the longest period of residency. Obviously, an effective public information/education program was needed, as well as a reliable network to inform residents of the dangers of "riding out" a storm.

Public Education

Public education efforts began with the identification of target audiences—local



government employees/officials, the elderly, school children, hotel/motel operators, and marina/boat operators. Then a series of formal action guidelines were prepared and distributed. Each guideline provides preparedness and safety information designed for a specific target group. An ongoing educational program, including seminars and other "hands-on" public contacts, was initiated and made an important part of the public information program.

CAPDC staff also worked with the local news media to ensure a uniform program of communication and warning for the general public. In cooperation with the National Weather Service, a five-phase storm condition/preparedness/response activity was put into operation. Beginning with "Condition 5," which identifies the development of a tropical storm disturbance, the public is made aware of the various stages of hurricane development. At "Condition 1" (a declaration that a hurricane will probably strike an area of the Georgia coast within 12 hours), a full-fledged emergency is declared and hurricane response plans are implemented.

Mapping

Perhaps the most time-consuming aspect of developing the storm preparedness program was the mapping procedure. Two types of maps were developed: Emergency Operation Center maps to be used by civil defense and other emergency managers and simple maps for use by the general public. Maps outlining evacuation routes, shelter locations, and other pertinent information were published in local phone books.

"The Georgia Plan" illustrates how regional planning agencies can be an effective mechanism to help groups and agencies coordinate their emergency preparedness planning efforts. The Georgia experience also shows how a little "creative financing" can go a long way at the local level.

Information about "The Georgia Plan" can be obtained from: The Coastal Area Planning and Development Commission, P.O. Box 1917, Brunswick, Georgia 31521.

Improving Regional Cooperation: The Southeast Louisiana Hurricane Study

The Jefferson Parish Office of Civil Defense has put together a tabloid telling residents how to prepare for a hurricane, with help from the Louisiana Office of Emergency Preparedness (OEP), local elected officials, meteorologists from the National Weather Service, public utilities, and local businesses. Jefferson Parish's hurricane preparedness tabloid will eventually be adapted for use by eight other parishes in the New Orleans area that are part of the Southeast Louisiana Hurricane Study. It is one example of the resource-sharing and cooperation that have grown out of this two-year-old hurricane study and preparedness planning project, which involves the Louisiana OEP and the parishes (or counties) of Jefferson, St. Bernard, St. Charles, St. James, St. John the Baptist, St. Tammany, Lafourche, Plaquemines, and Orleans.

"Usually the state produces a massive report with hazard analysis on a broad scale, throws it at the parishes, and tells

them to read it when they have a chance," explained Hurricane Study Program Manager Madhu Beriwal of the Louisiana OEP. This time, the individual parishes are working together with the state and with each other on virtually every aspect of a coordinated hurricane survival study and plan for the area.

The hurricane study relies on SLOSH (Sea, Lake, and Overland Surge from Hurricanes), a sophisticated computer simulation model available through the National Hurricane Center, to facilitate evacuation planning. The State OEP has provided the parishes with SLOSH data showing the rise and fall of surge levels and wind speeds for 12 different hurricane scenarios. The SLOSH model makes it possible to show tide surge differentials in minute detail and in areas as small as one-quarter square mile.

The parishes use the SLOSH data to develop evacuation zone maps and to



American Red Cross photo

determine evacuation routes and time-frames for the 12 hurricane scenarios. Each parish also updates data on shelters and community facilities at risk, and identifies households requiring special assistance. To aid in evacuation planning, the State OEP coordinated a behavioral study with the parishes in which people responded to questionnaires about what they had done and would do during a hurricane.

Improving regional cooperation has been a special challenge in the New Orleans area effort, where the nine parishes involved are autonomous political jurisdictions, each with its own form of local government. Jefferson Parish Civil Defense Director Paul Connick says that the civil defense directors in a few of the parishes had met together to discuss common problems before the State OEP organized the Southeast Louisiana Hurricane Study, but that the study has broadened and solidified regional relationships. "We know each other and we know each other's politics," Connick explained.

All nine parishes in the area now participate in regular regional meetings and are working on a number of projects con-

nected with their overall goal of coordinating emergency response efforts and developing generic plans for all hazards. The group is negotiating with an airborne traffic monitoring company that provides daily traffic reports to radio stations. They are planning an aerial monitoring and reporting system with ties to the Emergency Broadcast System to aid traffic flow during evacuations. The nine parishes have also agreed in principle to work with the University of New Orleans on development of course materials on emergency management issues.

Because of their close economic and social ties, geographic situation, and mutual interests, the nine parishes present an ideal subject for a comprehensive emergency management project. In August 1983, FEMA Region VI, the Louisiana Office of Emergency Preparedness, and the nine parishes agreed to build upon the foundation laid by their participation in the Southeast Hurricane Study. The hurricane study forms the nucleus of a project enlarged to include all hazards and a wider scope of activities, and is designed to use Integrated Emergency Management System (IEMS) concepts and methods to improve the region's overall emergency management systems.

Developed by the Federal Emergency Management Agency with the cooperation of the Louisiana Emergency Preparedness Association, Jefferson Parish Civil Defense, and the State of Louisiana Office of Emergency Preparedness.

Hawaii's Hurricane Week Campaign Spurs Interest in Preparedness

The Hawaii experience is another example of how it often takes a disaster before people start to think seriously about preparedness. When Hawaii State Civil Defense (SCD) offered awareness materials for its 1983 hurricane season campaign, public response trickled in. Then came Iwa, the most damaging hurricane ever to enter Hawaiian waters. Between November 19 and 25, 1982, Hurricane Iwa caused an estimated \$234 million damage to the Islands.

The storm also caused a surge of public interest in the hurricane hazard, reports Hawaii SCD Public Information Officer Marilyn Kali. The next time SCD promoted hurricane preparedness, there was an attentive audience for its message. Hawaii Hurricane Preparedness Week (July 17-23, 1983) was successful mainly because SCD sparked the interest and active participation of public officials, the private sector, news media, and Hawaii residents in a variety of activities designed to increase awareness and offer ideas for preparing for the next Pacific hurricane.

Sponsored jointly by state and county civil defense agencies and the National Weather Service (NWS), the campaign was kicked off by Governor George Ariyoshi, who signed the Hawaii Hurricane Preparedness Week proclamation and urged the public to become more aware of how to prepare for an eventual hurricane.

Kali pointed out that SCD had originally scheduled only one activity to mark 1983 Hurricane Preparedness Week--a Hurricane Conference sponsored by NWS, to which the general public was not invited. Instead, SCD decided to expand the scope of the week's events. "A proclamation

from the Governor declaring Hurricane Week is not a newsworthy event unless it can be built around activities that will include the public and the media," Kali explains.

To publicize the week, SCD prepared and distributed 80 press kits for the media, issued 25 press releases, 19 public service announcements (PSAs) for radio, and produced two PSAs for television with the Hawaiian Electric Company (HECO). As a result of the effort, newspapers provided a total of 1,601 column inches of publicity along with editorials in three major newspapers.

"Electronic media also generously supported the program, which is noteworthy because Hawaii Hurricane Preparedness Week was not 'hard news' but more in the line of a public service feature," Kali said in a summary of SCD's Hurricane Week effort. Two of the three networks attended a kick-off press conference and ran news features. Later in the week, each ran a feature story on the "Hurricane Guide" prepared by SCD. All three networks covered Governor Ariyoshi's tour of the NWS Forecast Office at Honolulu International Airport, where he received a personal briefing from the meteorologist-in-charge.

Radio coverage included live and taped interviews with civil defense and NWS staff. Many radio stations also used the PSAs that SCD had provided.

Almost 500 people attended open houses and took tours of the state and Oahu Emergency Operating Centers and NWS forecasting offices. More than 1,200 people viewed a 20-minute slide show put together by SCD and shown in public

libraries and other locations throughout the state.

Perhaps the most dramatic measure of how much interest the hurricane preparedness campaign generated was in the public demand for more information on how to prepare themselves for a hurricane. SCD produced a special edition of its newsletter, Civil Defense Report, that included an eight-page insert, "Hurricane Guide for Hawaii Residents." Based on past demand for this type of publication, SCD decided to print and distribute 2,000 copies on a by-request basis. That wasn't nearly enough: at last count, Kali said, more than 30,000 copies of the Hurricane Guide had been distributed, and requests still come in.

Major retailers were invited to support Hawaii Hurricane Preparedness Week through special promotions. Foodland, Sears, Pay 'N Save, A. L. Kilgo, and Honsport purchased newspaper advertising during the week to advertise survival kits. Kilgo's radio advertising featured hurricane preparedness. The Army-Air Force Exchange Service set up special displays

of survival kits in all exchanges and distributed hurricane preparedness brochures.

At SCD's request, Foodland printed hurricane preparedness messages on grocery bags and distributed 960,000 of them during July.

HECO promoted Hawaii Hurricane Preparedness Week in its "Consumer Lines" insert and on electric bills. HECO also produced a brochure, "Setting Up Your Hurricane (and Power Outage) Survival Kit," and received 1,620 individual requests.

SCD also produced a brochure, "Hurricane Preparedness Information for Boaters," that was distributed by the State Harbors Division to all registered boat owners in the state, marinas, yacht clubs, and boat dealers. Total distribution was 20,000 copies. Survival kits were featured on a bus poster developed by SCD and printed by Oahu Civil Defense. The poster was displayed on 600 Oahu buses from July through October.

Developed by the Federal Emergency Management Agency with the cooperation of Hawaii State Civil Defense.

Measuring Public Response to Shape Your Program

Hurricane Watch . . . Hurricane Warning - - Why Don't People Listen?

Why do some people respond to hurricane warnings while others do not? What specific types of information are most conducive to timely response? These questions were the focal point of a research study completed in the spring of 1980 at Texas A&M University which tried to determine what motivates people to respond to hurricane warnings.

The researchers knew that many long-time residents have been conditioned to hurricane watches or warnings and no longer consider an approaching storm a threat to safety until it often is too late to respond appropriately. Many other residents are newcomers and have never experienced a hurricane.

Psychological experiments were conducted with residents of Galveston, Texas, an island 75 miles southeast of Houston that last experienced a major hurricane (Carla) in 1961. While some conclusions relate essentially to the

uniqueness of Galveston, all are applicable to any coastal area that could experience a hurricane.

The experiments were grouped into five subject areas:

1. Simulated hurricane variables;
2. Consequences of exposure to hurricane fury via television;
3. Influence of other residents, authority figures, and events;
4. Response as a function of media presentation; and
5. Response to fear, information, and testimony in current hurricane material.

Subjects were selected at random from the local telephone directory and were

Ed. Note: This article first appeared in 1980. Hurricane Alicia hit Galveston in August 1983.



American Red Cross photo

either interviewed in their homes or participated in group experiments at Galveston Community College or Texas A&M University at Galveston.

Twenty variations of a simulated hurricane, Karen, were developed, and booklets containing 28 weather bulletins and advisories were prepared for each. Each bulletin or advisory was designed to measure the influence of one aspect of the storm—direction, movement speed, stationary status, wind speed, distance from Galveston, issuance of a watch,* issuance of a warning,** amount of anticipated storm surge, and an evacuation warning.

The study involved 381 people who were interviewed in their homes. For each bulletin or advisory, the subject was asked to choose a response ranging from "wait for further bulletins" to "evacuate immediately" and to indicate his or her perception of danger on a furnished scale.

Scoring was based on statistical probability. An item was considered statistically significant only if there was less than a five percent probability that the pattern of scores could have occurred by chance.

Only two items, distance from Galveston and evacuation warning, proved to be statistically significant. It should be noted that neither issuance of a "watch" nor a "warning" were statistically signifi-

***Watch--**The first alert when a hurricane poses a possible, but as yet uncertain, threat to a certain coastal area. Small craft advisories are issued as part of a hurricane watch advisory.

****Warning--**Notice that within 24 hours or less a specified coastal area may be subject to (a) sustained winds of 74 mph or higher and/or (b) dangerously high water or a combination of dangerously high water and exceptionally high waves, even though expected winds may be less than hurricane force.

cant. Those interviewed seemed unable to distinguish adequately between the two, even though definitions for each were given prior to the experiment.

It also may be significant that people do not differentiate between Force Two, Three, Four or Five type of hurricanes.* They tend to group everything beyond Force One into a single category; this could impair sound judgments and correct responses.

Consequences of Exposure to Hurricane Fury Via Television

The chief experiment in the second study involved 32 residents who were evenly divided into control and experimental groups. Each group heard six tape-recorded items of hurricane information on a developing storm and was asked to indicate its responses. The experimental group then viewed a video tape of the most destructive scenes from several hurricane films, while the control group saw a film on other psychological experiments. All 32 again were asked to respond to six tape-recorded messages relating to a developing hurricane, and these responses were compared with the original six.

There were more than three times the number of increased positive responses among the group exposed to the hurricane fury videotape than among those who saw the other film. The probability that such a response pattern occurred by chance was less than one in 100. It can be concluded that a more positive response to hurricane information does occur after examples of hurricane fury are shown on television.

Influence of Other Residents, Authority Figures, and Events

Twenty-four people participated in the primary experiment in the third study, which was designed to determine the effect of outside influences on response. In one phase of the experiment, each

*See definitions at end of article.

subject could see a master display panel and was told it indicated others' responses to hurricane information. Each individual was led to believe that others were making more or less extreme responses than his or her own. It was learned that the mere knowledge of others' actions was insufficient to influence response patterns significantly. At the same time, it was discovered that a statement from an authority figure, such as a National Weather Service spokesman, did have a significant positive effect on those with no prior hurricane experience. There was a less significant effect in this regard for persons with prior hurricane experience, but they were influenced more by surrounding events such as plant closings. This latter group probably was aware of the actions taken by surrounding industrial plants during previous storms, and the people focused on these events as an indication of the severity of the impending hurricane. There was less than five percent probability that these results could have occurred by chance.

Response as a Function of Media Presentation

The fourth study involved radio and television presentations viewed by 30 Galveston residents. The chief finding resulted from comparing two series of five specially prepared sequential television presentations that related to development of a simulated hurricane. The two series of presentations were identical, except that one used a point or dot to locate the hurricane on a map and the other used a saw-like satellite representation to locate the storm. The saw type normally is shaped like a circular-toothed saw blade, covers a broader area of the map, and indicates more clearly the extensiveness of the hurricane.

It was found that the saw-type video representation led to a more positive response pattern than the point or dot type because it indicates the magnitude of a hurricane more effectively. There was less than a three percent probability that this response pattern could have occurred by chance.

Response to Fear, Information, and Testimony in Current Hurricane Material

Fifty-two persons were divided into four groups of 13 to record their responses to six items of pre-recorded information that depicted a developing hurricane. Each group then received currently available hurricane-related material, such as television and radio spots and programs, films, and printed material, and was asked to rate its responses to each. Each group's material emphasized a different element or theme. One group, for example, received material on the destructiveness of a hurricane which potentially would produce fear. Another received testimonial-type material, such as an interview with a survivor, and the third was given information-oriented material. The fourth group's material represented a combination of the themes.

Following this, all 52 again responded to six items of hurricane information. It was found that the combination approach had the greatest influence on positive responses. The next most effective was fear. Information alone or testimony alone had little effect. There was less than a one percent probability that the resulting differences occurred by chance.

Conclusions

These studies indicate that certain things can be emphasized during hurricane awareness programs to increase responsiveness during actual threatening conditions.

1. People need to be told specifically what they should do during a watch and during a warning.
2. People should be informed of the differences in severe hurricanes; they tend to perceive all hurricanes beyond Force One as "bad."
3. People need to be informed about the amount of tidal rise that will block evacuation. In Galveston, for example, only about one-fourth of

those interviewed were aware of the small tidal rise needed to halt egress.

4. People should be told how long it takes to evacuate. Again in Galveston, nearly 30 percent of those interviewed believed the entire island could be evacuated within six hours while the most recent studies have indicated a minimum of 12 hours.

When a threatening condition exists, there are several emphases that can be made, particularly by the mass media, to enhance a warning message's ability to elicit maximum safety responses.

1. When the position of a hurricane is indicated by television weathercasters, a saw-type satellite location indicator conveys the massiveness of the storm better than a point- or dot-type indication.
2. Persons without hurricane experience are best motivated by respected authority figures, such as someone from the National Weather Service.
3. To motivate persons with hurricane experience, emphasis should be placed on surrounding events, such as plant closings, which they use to confirm the severity of the hurricane.

4. Hurricane warnings and evacuation notices are more effective in stimulating safety responses when there is a combination of fear, information, and testimony themes in the media presentation.
5. Television exposure to the destructive consequences of previous hurricanes also helps stimulate maximum safety responses. This becomes particularly effective if the films are shown just before an evacuation notice is issued.
6. This study found that the distance of a hurricane from land and evacuation notices were most effective in stimulating safety response patterns. Consequently, the media should emphasize these in its hurricane messages.
7. Media presentations should establish the connection between hurricanes and tornadoes. In Galveston, 72 percent of the residents indicated they feared hurricane-spawned tornadoes more than the hurricanes themselves.
8. Special efforts should be made to make advisories, bulletins, and local statements bilingual. In most areas, radio and television news presentations are only in English but many of the residents may be Spanish-speaking or Oriental.

Hurricane Categories*

Force One--Winds of 74 to 95 miles per hour. Damage primarily to shrubbery, trees, foliage, unanchored mobile homes, and, possibly, poorly constructed signs. OR--Storm surge four to five feet above normal. Low-lying coastal roads inundated, minor pier damage, some small craft in exposed anchorages torn from moorings.

Force Two--Winds of 96 to 110 miles per hour. Considerable damage to shrubbery and tree foliage, some trees blown down. Major damage to exposed mobile homes and poorly constructed signs. Some damage to roofs, windows, and doors. No major damage to buildings. OR--Storm surge six to eight feet above normal. Coastal roads and low-lying escape routes cut by rising water two to four hours before arrival of hurricane center. Considerable damage to piers. Marinas flooded and small craft in unprotected anchorages torn from moorings. Evacuation of some shoreline residences and low-lying island areas required.

Force Three--Winds of 111 to 130 miles per hour. Foliage torn from trees, large trees blown down. Practically all poorly constructed signs blown down and mobile homes destroyed. Some damage to roofs, windows, and doors and some structural damage to small buildings. OR--Storm surge nine to 12 feet above normal. Serious flooding at coast and many smaller structures near coast destroyed. Larger structures battered by waves and floating debris. Low-lying escape routes cut by rising water three to five hours before hurricane center arrives. Flat terrain five

feet or less above sea level flooded eight miles inland or more. Evacuation of low-lying residences within several blocks of shoreline possibly required.

Force Four--Winds of 131 to 155 miles per hour. Shrubs and trees blown down, all signs down. Extensive damage to roofs, windows, and doors. Complete destruction of mobile homes. OR--Storm surge 13 to 18 feet above normal. Flat terrain 10 feet or less above sea level flooded as far as six miles inland. Major damage to lower floors of structures near shore due to flooding and battering by waves and floating debris. Low-lying escape routes cut by rising water three to five hours before hurricane center arrives. Major erosion of beaches. Massive evacuation of all residences within 500 yards of shore possibly required, and of single-story residences on low ground within two miles of shore.

Force Five--Winds greater than 155 miles per hour. Shrubs and trees blown down, all signs down and complete destruction of mobile homes. Extensive shattering of glass in windows and doors and complete failure of roofs on many residences and industrial buildings. Small buildings overturned or blown away. OR--Storm surge greater than 18 feet above normal. Major damage to lower floors of all structures less than 15 feet above sea level within 500 yards of shore. Low-lying escape routes cut off by rising water three to five hours before hurricane center arrives. Massive evacuation of low-lying residential areas within five to 10 miles of shore possibly required.

*Developed by Herbert Saffir, Dade County, Florida, consulting engineer, and Dr. Robert H. Simpson, former National Hurricane Center director.

This is a summary of Sea Grant report TAMU-SG-80-202 entitled "Hurricane Message Enhancement." The full technical report is available for \$5.00 from Marine Information Service, Sea Grant College Program, Texas A&M University, College Station, Texas 77843. Reprinted from Marine Advisory Bulletin, May 1980.

Public Response in Hurricane Alicia: Probabilities and the People of Galveston

by
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At 5 p.m. CDT on Monday, August 15, 1983, the residents of Galveston, Texas, were told that Hurricane Alicia had a 17 percent chance of affecting their city within the next 72 hours or less and that hurricane warnings might be posted for the Texas coast on the following day. This marked the first time the public had ever been advised of the probability that a hurricane or tropical storm would strike their area. In the ensuing 60 hours before Hurricane Alicia eventually made landfall on Galveston Island, the public neither disregarded the threat due to "low" probabilities nor panicked. Public response to Alicia was pretty much the same as response has been to past hurricanes without probabilities. Evacuation from high-risk areas was extensive and timely, and the citizenry generally evacuated upon the advice of public officials or failed to do so in its absence.

Alicia did not, however, provide an acid test for public response to probabilities because the issuance of probabilities was discontinued before Alicia became a dangerous storm. The bulk of the population of Galveston was never told by public officials to evacuate, and when people were receiving probability messages, Alicia was not expected to be severe enough to pose a major threat to the safety of most Galveston residents.

Why Did People Evacuate?

Several weeks after Alicia struck Galveston, a telephone survey was conducted with approximately 200 randomly selected residents of the island.* Forty-four percent said they left their homes to go

someplace they believed to be safer, but of those who left their homes, almost 40 percent stayed on the Island. As in most hurricane evacuations, the plurality went to the homes of friends or relatives (47 percent in this case). Most of the evacuees said they left in part due to advice from friends and relatives, the National Weather Service, or the media. Only five percent specifically mentioned probabilities as being a reason for their decision.

*The Immediate Response Project is funded through the Natural Hazards Research and Applications Information Center, Institute of Behavioral Science, University of Colorado, Boulder, Colorado.



Why Did People Stay?

Those who stayed generally indicated that they did so because they felt safe where they were, or they wanted to stay behind to protect their property from the storm or looters. No one mentioned low probability values as a reason for staying. When asked directly, 87 percent of the total sample said they heard no advice from public officials that they should leave, but about half said they heard advice from unofficial sources such as friends.

Did People Hear or See the Probability Information?

Eighty-two percent of the respondents said they remembered hearing or seeing probabilities, and about 85 percent of those indicated that they saw or heard probabilities for other locations as well as Galveston. Probabilities were discontinued 20 hours before landfall of the storm and were never greater than 51 percent. About 80 percent of the respondents, though, recalled hearing probabilities "just before" or "a few hours before" landfall, and 42 percent remembered seeing probabilities higher than 60 percent. These apparent inconsistencies with the actual issuance of probabilities could result from use of imprecise terms ("just before"), memory lapses, recall of "old" probability information, or recall of erroneous information. Over 70 percent of the respondents correctly indicated that Galveston's probabilities were higher than at other places.

Where Did Probabilities Come From?

Almost 80 percent said they received their probability information from television, and 54 percent indicated hearing the numbers on radio. Seventy percent correctly believed that the probabilities were being issued by the National Weather Service, with the remainder simply not knowing or thinking the numbers came

from the media or private forecasters. Seventy-five percent felt the media presentations of the probabilities were clear, and another 20 percent felt they were pretty clear. Eighty-two percent said they personally understood the probabilities, and 15 percent said they understood them pretty well. Respondents had slightly less confidence in their friends' understandings, however.

Did Probabilities Affect Response Decisions?

Sixty-eight percent said the probabilities helped convince them that Alicia would hit their area; 15 percent said that initially the probabilities made them think the storm wouldn't hit, but later numbers changed their mind; and two percent said the probabilities made them think Alicia wouldn't hit. The remainder either said the odds figures had no effect on their belief one way or the other or they couldn't remember. Half the sample said they would pay greater attention to the numbers next time or place greater emphasis on them in deciding what to do. About half felt they would deal with the future probabilities in about the same way they had with Alicia's. Ninety-six percent said they believed probabilities are useful in response decisions, and only one percent felt they weren't; three percent weren't sure.

Overall, the public response to Alicia was very good, and there is no evidence that probabilities inhibited people from evacuating. The high-risk areas of Galveston Island were advised to evacuate when Alicia's chance of hitting was only 36 percent, and evacuation in those areas was almost total. Clearly, people believe they understood the probabilities and think that they were useful. This study, in conjunction with previously existing evidence, indicates that the public can comprehend probability information in the form it was disseminated in Alicia and make reasonable use of it in their response decisions.

Using New Technology

Hurricane Surge Models: A Primer

As a hurricane approaches the shore, several factors combine to cause a rise in sea level which can produce severe inundation and great destruction. This is the "hurricane storm surge." The storm surge is a dome of water, perhaps 50 miles wide and from four to 18 feet high, that sweeps across the coast near the point where the hurricane makes landfall. The storm surge is responsible for perhaps as many as 90 to 95 percent of hurricane-related deaths.

Through modern technology in computer applications, historical hurricane surge information has been used to develop numerical surge models to calculate storm inundation. These models take into account the intensity of the storm and the unique topography of the bay, estuary, or coastline shelf to predict the storm surge at the most hurricane-prone sections of our coastline. Using these models, meteorologists and emergency planners can now estimate the storm surge at a specific coastal location by simulating the

approach of all possible sizes, intensities, and shapes of hurricanes along all relevant tracks and at all possible speeds. The simulations are also extremely valuable to emergency preparedness efforts, because the data allow planners to develop evacuation maps and plans in much greater detail than has ever been possible.

Three major surge models are used in the United States:

- SLOSH (Sea, Lake, and Overland Surge from Hurricanes), the newest model developed by the National Weather Service (NWS);
- SPLASH (Special Program to List the Amplitudes of Surges from Hurricanes), which is an earlier NWS model; and
- The FEMA Flood Insurance Storm Surge Model, used for the FEMA flood insurance program.



American Red Cross photo

SLOSH

The SLOSH model is used in basins that have irregular coastlines and contain large bays or estuaries such as in the New Orleans area, Tampa Bay, and Galveston/Houston. Five storm intensities on the Saffir/Simpson Scale are provided by the SLOSH model. In addition to its intensity, any surge damage potential to a particular area depends on several other factors, including the track, size, and forward speed of the hurricane; and the nature of the area's coastline. Each hypothetical hurricane simulated by SLOSH would confront an area with hurricane force winds in one of five scenarios.

The output of the SLOSH model provides four major types of information on the effects of the simulated hurricanes. They are:

- (1) Surface envelope of highest surges above mean sea level;
- (2) Time histories of surges at selected gages or grid points;
- (3) Computed windspeeds at selected gages or grid points; and
- (4) Computed wind directions at selected gages or grid points.

SPLASH

To obtain open coast surge height data for a relatively smooth coastline, the numerical storm surge prediction model called SPLASH can be used. The SPLASH model predicts the height and duration of open coastline storm surge heights created by an approaching and landfalling hurricane. It assumes a generally smooth coastline and the absence of amplification of the surge by a bay or estuary. With the SPLASH model, inland routing techniques are used to delineate the inundation areas.

FEMA/FIA Model

A third storm surge model, the FEMA/FIA model used by FEMA's Federal Insurance Administration, calculates coastal flooding due to hurricanes. This is also a computer model, which uses the same types of equations as SLOSH and SPLASH to set coastal flood insurance rates under the National Flood Insurance Program. The FEMA model is used to calculate the 100-year storm elevation--a value of surge height that has a probability of occurring within 100 years at a given location.

