1.11 AN INDEPENDENT EVALUATION OF THE OK-FIRST DECISION-SUPPORT SYSTEM

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1. INTRODUCTION

Like most states, Oklahoma's lifestyle and economy are closely tied to its environment. For example, in recent years, droughts and wildfires have resulted in billions of dollars of losses for wheat farmers, curtailed tourism in state parks by nearly 50 percent, and created wide ranging economic repercussions. During periods of more "normal" conditions, Oklahomans regularly contend with strong, dry winds during late winter and early spring that can whip up fast-moving wildfires; powerful thunderstorms and tornadoes during the summer months; and ice storms during the winter that can cut off power and make roads extremely treacherous. The National Weather Service in Norman, Oklahoma, issues more severe storm warnings – over 1,000 a year – than any other weather service office in the country. However, state and local officials in Oklahoma are not much different than their counterparts in other states when responding to emergencies; local decision-support systems generally suffer from lack of current and localized environmental information necessary to make informed decisions about weather-related events (Oklahoma Climatological Survey 1996).

In order to provide emergency managers and police and fire officials with information that could improve public safety decision-making, the Oklahoma Climatological Survey (OCS is a state-chartered agency within the University of Oklahoma), developed and implemented a decision-support system known as OK-FIRST: **OK**lahoma's **F**irst-response **I**nformation **R**esource **S**ystem using **T**elecommunications for Public Safety Agencies. OK-FIRST provides public safety officials with customized, county-level environmental information within minutes of observation; training and instruction on how to obtain, interpret, and use the data; and ongoing user support. This paper discusses an evaluation of OK-FIRST during its two year demonstration phase as a project funded by the U. S. Department of Commerce through its Telecommunications Information and Infrastructure Assistance Program.

2. THE OK-FIRST PROJECT

The key missing elements needed to better equip emergency managers to deal with impending weather-related emergencies are relatively easy and cost-effective access to timely radar from the national network of NEXRAD data and training in data acquisition and use.[1] Although the NWS produces vast amounts of county-level radar data and computer forecasts, it lacks adequate mechanisms to ensure dissemination to and application at the local level. Even if access was easy, in most cases, local officials have not had sufficient training to properly interpret and apply the new environmental data products made possible by the modernization of the NWS.

The impetus behind the OK-FIRST project was a desire to strengthen and upgrade the public safety component of Oklahoma's emergency warning system and to meet the expressed needs of public safety officials. Thus, OK-FIRST provides environmental information tailored to individual agencies in both content and geography, as well as training on how to access and use the products. To this end, participants attended two training workshops – computer skills and data interpretation – that were held on the campus of the University of Oklahoma. The first workshop consisted of three days of computer training, starting with basic information about the computer and its operating system. This was followed by training on use of the Internet and how to access OK-FIRST web pages. This included learning to use "plug-in" software developed by OCS to interactively display Mesonet data and NIDS images using web browsers (Wolfinbarger et al. 1998a & 1998b). Conferencing software (First Class™) allows participants to share information and to foster communication among the participants and staff.

A week-long data interpretation workshop was held ten days later and included lectures and laboratory exercises on severe weather, fire weather, flash and river flooding, and winter weather. Workshop participants were expected to be able to recognize the potential for an event, determine lead time, and use weather data to make informed decisions about the event. Thus, attention was given to the characteristics of radar, interpretation of radar images, interpretation of Mesonet data, and types and sources of weather information.

Refresher courses also were provided to participants. Those who attended the first set of workshops (Class 1) returned to the campus for a one-day workshop that was held in conjunction with the data interpretation workshop for Class 2. Class 1 and Class 2 participants returned for similar sessions when Class 3 began. OK-FIRST staff were able to answer questions and provide other assistance to help participants use the environmental data resources more effectively.

3. EVALUATION DESIGN AND IMPLEMENTATION

Patton (1997, 23) defines program evaluation as "...the systematic collection of information about the activities, characteristics, and outcomes of programs to make judgments about the program, improve program effectiveness, and/or inform decisions about future programming." Program evaluation typically has been applied to social programs in various human service arenas; e.g., education, health, criminal justice, welfare. Evaluations often are done to satisfy legislative mandates or accreditation requirements, enhance managerial effectiveness, aid in resource allocation decisions, document that goals and objectives have been achieved, determine relationships between cost and effectiveness, or to assist with program development and improvement. Although evaluation methods generally have not been applied to meteorology programs or

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projects, nothing precludes the evaluation of such efforts. The methods, tools, and techniques are broadly applicable to many kinds programs and endeavors. The staff of the OK-FIRST project recognized the benefits that could accrue from the systematic assessment of their efforts; the needs of the staff dovetailed with Patton's definition of what evaluation is all about.

OK-FIRST entered into an agreement with the Institute for Public Affairs at the University of Oklahoma for an evaluation of the OK-FIRST project. The Institute conducts needs assessments, policy analyses, and program evaluations for public and nonprofit entities. The Institute had no vested interest in the OK-FIRST project which allowed for an unbiased and objective perspective. Staff from the Institute and OK-FIRST worked in close collaboration to combine the methodological expertise of Institute staff with the substantive/disciplinary strengths of project personnel, and to ensure that the evaluation would provide the desired data and information.

The goals of the evaluation were to: (1) determine the extent to which the OK-FIRST program provided participants with access to weather data and the training they needed to enhance their ability to identify, forecast, and respond to threatening or dangerous weather conditions; (2) document the use of the skills and knowledge gained and impacts on emergency management decision-making; and (3) to identify the lessons learned to highlight areas of strength on which to continue to build, inform further improvements, and that would assist others interested in developing a similar program. Quantitative and qualitative data were collected using a pre-test, post-test, and follow-up approach.

The close coordination and cooperation between the project and evaluation staffs continued throughout the implementation of the evaluation. For example, after the first class had completed both training sessions, the evaluation staff identified two potential problem areas: one where participants had not shown very much improvement on the post-test instrument and one where participants reported a need for further training. In the first case, the OK-FIRST staff worked with evaluators to refine the data collection instrument to more accurately reflect the actual training that was taking place. In the second case, the OK-FIRST staff changed their approach to training on that specific element. The OK-FIRST staff always were receptive to suggestions from the evaluation staff and the participants and made modifications in the training and the software as a result.

3.1 Background Information.

Two self-administered questionnaires were used to collect information to describe the characteristics and experiences of the participants. The first was mailed prior to the computer workshop. It asked respondents to rate their familiarity with various computer concepts and their levels of comfort in executing specific tasks, report their levels of experience with a number of computer-related activities, and to indicate how often they used specific software applications important to the OK-FIRST project. A second survey was administered at the start of the data interpretation workshop and asked participants to report their job titles, years of experience in the field, how often they use weather data, their previous sources of weather information, and the limitations of that information and sources of weather data they would most like to have available to them.

3.2 Computer and Data Interpretation Workshops.

The effectiveness of the training workshops was measured using skills and knowledge tests administered before and after the workshops. At the computer training workshop, participants began by completing a test to measure their computer skills. Each participant worked independently at a computer and was given a series of tasks to perform. Each task was displayed on a screen at the front of the room. Observers stood behind the participants and recorded whether or not each individual performed the task correctly. Participants also were asked to identify specific components of a computer desktop on a printed image of a desktop. A similar test was administered at the conclusion of the workshop.

When participants returned for the data interpretation workshop, a questionnaire was administered that included, among other items, questions about the strengths of the training received during the computer workshop, areas for possible improvement, and usage of their computers and associated software during the interim period. Similar information was solicited during focus group discussions that were held with members of Classes 1 and 2 each time they returned to participate in a refresher workshop. These group discussions were very important sources of information and insights about the experiences of the individuals.

The tests for the weather data interpretation workshop also were developed in close collaboration with the OK-FIRST staff. The evaluation team worked with the program staff as they developed a list of training objectives. The OK-FIRST staff developed the specific items of information to be included and identified appropriate weather data and images for test items; the evaluation staff determined appropriate methods to measure the level of accomplishment for each objective and item. For example, objectives related to identifying wind shifts or recognizing the radar signatures of various types of precipitation were measured by asking the participants to look at images taken from radar or Mesonet data and then to identify the specific weather phenomena. Participants also were asked to define terms and to identify and apply weather concepts. The test was administered prior to the start of the data interpretation workshop and again at the end to assess changes in participants' knowledge. Follow-up information concerning workshop strengths, possible areas for improvement, and utilization was collected during the focus group discussions and through self-administered questionnaires completed by OK-FIRST participants who attended a refresher course in December 1998.

3.3 Outcomes.

Program evaluations frequently distinguish between long-term outcomes and intermediate outcomes. Long-term outcomes are broader outcomes that the program is attempting to affect, but which it alone cannot accomplish. Intermediate outcomes are the impacts that directly result from the activities of a program. Public safety officials have as a goal the long-term outcomes of preventing the loss of life and property. The purpose of OK-FIRST was to increase the capacity of local officials to accomplish that goal. However, these long-term outcomes are likely to be influenced by events and conditions outside the control of OK-FIRST, and

often beyond the control of public safety officials. Thus, OK-FIRST could enhance computer skills, increase knowledge about the availability, interpretation, and use of environmental information, and successfully promote its use in real world situations. However, the project had no direct control over conditions that could affect indicators associated with accomplishment of the broader goal--e.g., dollar value of property loss, number of people injured, or number of lives lost. Public safety officials could use the knowledge and skills gained through OK-FIRST to issue warnings about the likelihood of hazardous road conditions or flash flooding, but they cannot completely control whether citizens heed the warnings and advisories. It can be argued that without the warnings, the probability is greater for loss of life or property and that the warnings contribute to conditions that would more likely lead to the goal of saving lives and protecting property. Thus, the OK-FIRST evaluation focused on intermediate outcomes that reflect incremental progress toward longer term outcomes and measure results more directly related to project activities.

Feedback concerning the utility of the computer and data interpretation training and the impact of acquired skills and knowledge on emergency management decision-making was a major component of the focus group discussions. A substantial amount of time was spent talking about how the availability of real time environmental data and the participants' ability to access and interpret the data had influenced their approach to problem solving and the substance of their decisions. Information about utilization also was collected through the questionnaire administered at the December 1998 refresher course.

4. OK-FIRST PARTICIPANTS

Three cohorts of public safety officials (Class 1, June 1997, N=23; Class 2, October 1997, N=22; Class 3, March 1998, N=24) participated in the computer training and data interpretation workshops during the evaluation period. Of the 69 OK-FIRST participants who began the program, 70 percent represented local emergency management agencies. Representatives of police departments comprised 10 percent of the total and fire department personnel made up eight percent. Twelve percent of the participants were in other state or local positions (e.g., police or fire dispatchers who typically did not have responsibility for intervention decisions). Of those who provided information about their job experience (N=61), 12 percent had worked in public safety for a year or less, about one-third had been on the job two to five years, and 54 percent had at least five years of experience.

All of the OK-FIRST participants reported that they had used a computer at some time, and 86 percent reported that they used a computer on a daily basis. Eighty-four percent of the respondents reported operating in a Windows format daily (the OCS software used a Windows platform). Internet use was not as high; 32 percent did not use the Internet regularly and only 50 percent indicated that they used the Internet daily. When asked to rate their level of comfort with a series of computer tasks, 60 percent of the respondents reported being either very or somewhat comfortable with more than 75 percent of the tasks presented.

Variation did exist among the classes coming into the program. In general, Class 1 had worked in Windows but were less likely to have used Windows 95, and tended to rate themselves higher in terms of comfort in performing computer tasks. Class 2 had the least computer experience overall. Sixty-eight percent used a computer on a daily basis and only 26 percent used the Internet daily. Only 36 percent were comfortable with more than 75 percent of the computer tasks. Class 3 generally had the most computer experience. All had used Windows 95, 88 percent used a computer on a daily basis, and 69 percent accessed the Internet daily

5. ASSESSMENT OF OK-FIRST TRAINING AND TOOLS

5.1 Computer Training Workshop

Analysis of pre-test and post-test data for the computer training sessions indicate that, overall, participants learned a great deal through the workshop. For the 60 participants who took both the pre-test and post-test for computer skills, the average pre-test score was 57 percent correct. By the post-test, that had increased significantly to 79 percent. An interesting pattern is evident when considering the level of knowledge an individual had upon entering the program. Those individuals who were able to accomplish less than half the tasks on the pre-test (N=24) showed an average of 30 percentage points improvement, moving from an average of 35 percent correct to an average of 65 percent correct. Individuals who scored very high on the pre-test, more than 80 percent of the items correct (N=7), did not show substantial improvement, moving from an average score of 89 percent correct to and average of 93 percent correct. That is not surprising given the fact that these individuals had very little room for improvement because of their high pre-test scores. The individuals who scored between 50 percent and 70 percent on the pre-test (N=29) showed a 19 point improvement, increasing their average from 68 percent correct to 87 percent correct.

These findings are important in that they indicate that those who came into the program with the least knowledge and lowest skills benefitted greatly from the training session. While the training did not bring them to the same skill level as those who entered the program with the greatest capabilities, it did help them improve their scores significantly. Further, those individuals who scored moderately well on the pre-test were able to improve their capabilities enough through the training workshop to bring them nearly to the level of those who had come into the session at the highest skill level. Given that the products and services provided through OK-FIRST require a great deal of computer and Internet usage, it was important that participants were leaving the training with a level of knowledge that would allow them to use their computers to access weather data.

More detailed information that is useful for planning training efforts can be obtained through an examination of participant responses to each of the specific questions included on the pre-test and post-test. Thus, an item analysis was conducted to identify the changes that took place from pre-test to post-test for each question. Twenty-three of the 34 items on the computer skills test were significant at the .01 level and 30 were significant at the .05 level. Only four items did not exhibit statistically significant change at these levels. However, for two items – identify start menu and use address – a substantial percentage of the participants (76 percent and 79 percent, respectively) were able to respond correctly on

the pre-test and had less room for improvement.

However, just because participants improved substantially and the change was statistically significant, it does not necessarily mean the improvement was sufficient from a practical standpoint. For example, only 31 percent of the participants could correctly identify a document on the pre-test. The 22 point improvement from pre-test to post-test was significant at the .001 level. Nevertheless, at the time of the post-test, slightly more than half of the participants could correctly complete this item. Thus, the percentage of participants who can correctly complete an item could increase dramatically from pre-test to post-test but if the level in initial skill is very low, this increase might not be sufficient to consistently use the feature successfully. Consequently, it is important to consider the skill levels at the time of the post-test and not just whether a "large" or statistically significant change took place.

5.2 *Weather Data Interpretation Workshop*

The weather data interpretation workshops sought to provide individuals with the background and skills necessary to take advantage of the array of weather data at their disposal. Participants were tested on a wide range of weather-related topics that formed the content of the workshops. Table 1 shows the results overall and within categories of items. Despite the high levels of on-the-job experience for a large number of participants, the overall scores on the pre-test were somewhat low. For participants who took both the pre-test and post-test, the average pre-test score was 44 percent correct. All of the classes showed significant improvement by the time of the post-test, with the average score increasing to 62 percent correct. The overall post-test scores were lower for the data interpretation training compared to the computer workshops. However, the level of participant knowledge entering the workshops was lower for the data interpretation training and the material was much more complex and difficult to master. The lower data interpretation scores likely are due, in part, to the fact that it is easier to teach someone to use a computer in a short workshop than it is to impart the intricacies of understanding and using of weather-related data for decision-making.

More improvement was made by each of the consecutive classes. The first class improved 11 percentage points. The second class improved by 16 points and the third class improved by a substantial 28 percentage points. The pattern of improvements is inversely related to the amount known coming into the data interpretation workshop. Class 1, on average, had the highest pre-test score and improved the least. Class 2 knew somewhat less than Class 1 and improved more, while the average score for Class 3 was the lowest and they gained the most.

More improvement also was made by individuals who started out doing poorly (scoring less than 30 percent on the pre-test) than was demonstrated by those who started out doing relatively well (scoring better than 50 percent on the pre-test). Individuals who answered less than 30 percent of the items correctly improved 35 percentage points. Participants who scored at least 50 percent correct prior to the workshop improved the least--10 percentage points.

With respect to the various categories of questions, the flood-related items was the area about which participants knew the most coming into the workshops (76 percent correct on the pre-test) and the average score increased to 88 percent correct (the highest score) at the time of the post-test. The interpretation of wind data was one of the areas about which participants knew the least when they began the workshop. It also is the area with the least improvement. Although the increase from 22 percent correct at pre-test to 27 percent correct on the post-test is statistically significant (.017), the level of participant knowledge upon completion of the training remained minimal. Overall, the greatest improvement was with the interpretation of NIDS radar data to detect storms and other weather phenomena, and with the use of VIL readings to identify hail within storms. Although the amount of change was similar for NIDS and VIL (35 and 32 percentage points, respectively), the lower pre-test score for the VIL items resulted in a substantial difference at the time of the post-test. The average score post-test score for the NIDS items was 72 percent correct, compared to 51 percent correct for the VIL items.

Attention to the scores on individual items or clusters of items can be useful for planning future training efforts. For example, if pre-test scores indicate that most participants already have a substantial level of knowledge on certain items or in certain areas, the emphasis in these areas might be reduced. It could allow for a reallocation of time and effort to focus on areas where participants are less knowledgeable or skillful. If scores are low for some items upon entry and remain low at the conclusion of the training, an examination of the materials and methods used might be warranted.

It is interesting that the second and third classes showed significant improvement in interpreting Mesonet data while the first class saw little improvement. This change likely can be attributed, in large part, to the responsiveness of OK-FIRST staff to feedback from the evaluation of the first class. It was clear from the test scores and direct feedback from the participants that the training had not accomplished its goal for this portion of the training. The staff made changes to the workshop and the second and third classes apparently benefitted from those changes.

It is important to note that those individuals who did not have a great deal of experience in emergency management, either because they were located in a more general position or because they had not been on the job very long, were able to realize significant improvement through the weather data interpretation workshop. In fact, those with the least experience coming in were brought to virtually the same level as those who had been in the business of tracking the weather for some time. On average, individuals who had been on the job for one year or less increased their score from 32 percent correct on the pre-test to 60 percent correct on the post-test. Those who had been on the job for more than five years had the best scores overall on the pre-test (48 percent correct); their scores increased 13 percentage points to 61 percent correct. This indicates that the training helped those

Table 1: Data Interpretation Overall Percent Correct

	All Classes (N=68)				Class 1 (N=23)				Class 2 (N=22)				Class 3 (N=23)			
	Pre-test	Post-test	Δ	Sig.*	Pre-test	Post-test	Δ	Sig.*	Pre-test	Post-test	Δ	Sig.*	Pre-test	Post-test	Δ	Sig.*
Overall Results	44	62	18	.000	49	60	11	.000	45	61	16	.000	37	65	28	.000
General Information (19)**	59	73	14	.000	70	76	6	.030	56	73	17	.001	51	70	19	.000
NEXRAD (24/29) ***	40	65	25	.000	36	47	11	.000	47	63	16	.001	33	67	34	.000
NIDS (6)	37	72	35	.000	49	80	31	.000	37	62	25	.001	25	72	47	.000
Mesonet (8)	32	51	19	.000	46	50	4	.195	24	47	23	.000	24	55	31	.000
VIL (3)	19	51	32	.000	32	57	25	.002	17	41	24	.008	7	54	47	.000
Wind (5)	22	27	5	.008	25	31	6	.034	20	22	2	.314	20	28	8	.041
Floods (6)	76	88	12	.002	77	83	6	.107	81	90	9	.123	70	91	21	.012
Types and Sources (8)	45	54	9	.002	56	60	4	.175	39	49	10	.047	39	52	13	.011

* One-tailed test of significance**.**
** The number of questions in each section.
*** The NEXRAD sections for Class 1 contained 24 questions, Classes 2 and 3 had 29 questions.

individuals with the least experience enhance their capacity to interpret weather data to identify threatening weather conditions.

5.3 *OK-FIRST Web Page*

To provide access to information to aid emergency managers with their decision-making, OK-FIRST developed a Web page through which weather-related information could be obtained. Through the Web page, participants could access NIDS data, Mesonet data, fire danger products, hydrological products, training materials, links to NWS forecasts, and other general OK-FIRST project information.

Several questions were included on the December 1998 follow up instrument to solicit feedback about OK-FIRST tools. The responses were very positive. When asked, "Overall, how satisfied are you with the OK-FIRST Web site?" 98 percent said they were very satisfied and two percent were somewhat satisfied. Everybody in attendance said that the information they needed was available through the site and 91 percent were very satisfied with its content. The remaining participants were somewhat satisfied. Every component of the Web page was viewed as very or somewhat useful by at least 80 percent of the participants. The NIDS data was assessed the most positively (100 percent said very useful). The NIDS data also was the most frequently accessed component of the Web page; 88 percent used it as least several days per week and 61 percent at least once a day. If a Web site is not "user friendly"it is less likely to get used–regardless of the quality and value of its content. Seventy-seven percent of the participants reported that the site was very easy to navigate and 21 percent said it was somewhat easy to get around in the Web page.

5.4 *First Class Bulletin Board System*

OK-FIRST created a bulletin board to facilitate communication among participants and staff. This allows the participants to ask for assistance from their colleagues, share experiences, and post information of general interest to others on the system. The First Class bulletin board is not highly used. Thirty-seven percent of the participants said they had not yet used the system. Those who do use it do so infrequently. Sixty-nine percent access the bulletin board once or twice a month to post messages and 47 percent look for responses with the same frequency. About half of the participants (47 percent) browse the messages posted to the board by others at least several times a week. When asked how useful the information they found posted on the First Class system was to their work, of those who had used it, 77 percent said they found the information very (44 percent) or somewhat (30 percent) useful. One potential reason for the lack of use of First Class is that the BBS requires the use of a separate software application, which isn't linked to the web. Project staff are working to integrate the BBS functionality into the Web site and this may increase use.

6. USING OK-FIRST KNOWLEDGE AND SKILLS FOR EMERGENCY MANAGEMENT DECISION-MAKING

While it is important to know the degree to which participants mastered the content of the OK-FIRST workshops, utilization of the acquired knowledge and skills to enhance decision-making and to protect life and property is the key measure of the impact of the program. Questions were included on the December 1998 follow up instrument to determine how useful the training workshops had been in helping prepare participants to deal with a wide range of weather-related situations. Although almost all of the participants who attended the December refresher workshop (N=44) had an occasion to deal with severe weather (only five percent had not); about one-third of the participants had not dealt with a flood, fire, hazardous substance event, or winter weather at the time they completed the survey. Those who had dealt with one of more of these five conditions indicated that the initial training and information helped them substantially. Everybody who offered an opinion said the training and information helped them a great deal (95 percent) or helped somewhat (5 percent) with severe weather situations. They also indicated that their experiences with OK-FIRST helped them a great deal or somewhat with flood situations (93 percent), winter weather (90 percent), fire situations (89 percent) and hazardous substance events (79 percent).

The following data and statements come from focus group discussions, the December 1998 follow up questionnaire, letters of support from OK-FIRST participants to state legislators, and newspaper accounts of usage. For more detailed stories of how OK-FIRST has been used, see Morris et al. (1999).

6.1 *Improved Decision-Making Overall*

On the December 1998 follow up questionnaire, participants were asked, "To what extent has participation in OK-FIRST made you more effective at making timely and appropriate decisions related to the following situation: flood situations, fire, severe weather, winter weather, hazardous substance events?" For those who had experienced the listed situations and offered an assessment, the responses were overwhelmingly positive. With respect to severe weather situations, every respondent said their OK-FIRST experience had improved their decision-making effectiveness a great deal or somewhat. Similar responses were given with respect to decisions related to winter weather (96 percent), flood situations (90 percent), fire situations (88 percent) and hazardous substance events (82 percent). The following statements are representative of the feedback provided by participants about the impact of OK-FIRST on their decision-making behavior:

- I'm proactive now rather than just reactive.
- This is the most fantastic tool emergency managers have ever had.
- I feel that this program has become critical to our organization in virtually every severe weather event and will continue to significantly impact our operations. In short, every decision in every situation has been based on OK-FIRST and has provided, in my opinion, very positive results.

6.2 *Providing Access to Timely Data*

The single concern emergency managers cited most coming into the program was a lack of real time weather information. OK-FIRST has provided them with just that and the participants value their access to this information. On the follow up questionnaire, participants were asked, "How useful would you say the access to real time data is in helping you deal with the following situations: flood situation, fire, severe weather, winter weather, hazardous substance events?" Of those who had experienced a particular situation or event and responded to the question, the use of real time data in conditions of severe weather topped the list (100 percent said access was very or somewhat useful in these situations). Fire conditions (98 percent) and winter weather (97 percent) also were almost uniformly viewed as situations in which access to current information was useful. At least 92 percent of the participants said access to real time data was useful for helping them deal with each of the situations listed. As the public safety officials reported on numerous occasions throughout the project:

- Access to real time data is critical at all times. Don't know how I got along without OK-FIRST.
- The more you work with it and become able to find the information you need, the more it factors into all your decisions. OK-FIRST information, being timely and accurate, has kept disasters from happening. Absolutely critical decisions become routine because good timely information kept you on top of the situation.
- With the OK-FIRST data, each community can have access to data specifically aimed at their community or region. This allows the emergency manager to check his own specific area while the NWS and TV stations are concentrating their coverage on other areas of the state.

6.3 *Severe Weather*

OK-FIRST allows emergency management personnel to identify threats earlier and pinpoint storms more accurately. This allows them to utilize scarce resources more effectively and efficiently and to better. protect lives as shown in the following remarks:

- I've had success identifying drylines and being able to predict how badly our community is going to be hit or if it's going to miss us altogether.
- I can look at OK-FIRST and figure out where I need to send spotters rather than just scattering them out across the county and hoping that they are in the right places.
- The number of times storm spotters are activated has been drastically reduced, and when they are activated, it is for a shorter duration. Also, fewer spotters are needed.
- On October 4th weekend a tornado struck the city. Monitoring of NIDS data allowed a much faster response; we were able to relocate personnel to the most threatened area. Because of the ability to pinpoint threatened areas more precisely, we were able to also alert campers and others around an area lake to seek shelter.

6.4 *Floods*

Access to real-time data, has better equipped emergency managers to deal with both flash and river flood situations by helping them know when to close roads and whether or not to issue evacuations.

- Now I can predict when a road is going to wash over.

Before I waited for it to flood, then put out the barricades.

- We had an ambulance that needed to transport an individual to a different hospital during a flood. I was able to tell them the latest information about where roads were covered and where they could get through.
- On Christmas Day the river was within 6 inches of flood stage. Instead of having to run down to the river every couple of hours or pulling people away from their families, I was able to use OK-FIRST and see that the crest had already passed and it was going back down.

6.5 *Fires*

OK-FIRST allows emergency managers to work with fire departments to better protect fire-fighters, structures, and lives.

- There was a brush fire and a colleague was looking at OK-FIRST and saw that we had a wind shift coming. We called the fire department and they were able to make sure no one got caught off guard.
- Our fire department uses practice fires and we can avoid problems by checking the OK-FIRST data to make sure there aren't going to be any changes in the wind.
- Due to the drought I used the fire danger model to a great extent. I was able to get temperature and rainfall data to put in the local newspaper to emphasize the problem.

6.6 *Hazardous Materials Incidents*

OK-FIRST data also is used to assist agencies dealing with hazardous materials incidents.

- We used the OK-FIRST data at a propane gas leak for wind speed, direction, humidity, etc. It was a great help.
- We had a chlorine gas leak at the water treatment plant. We used current data to assist responding agencies and for evacuation of residents of the area.

6.7 *Public Works and Community Service*

Access to OK-FIRST has put emergency managers in a position of providing assistance for public works projects and other community events. Though the following examples are not directly related to emergency management, they indicate how OK-FIRST data helps communities across Oklahoma deal with the weather:

- This winter we had a storm moving in. We were able to watch it over the course of a few hours and could tell that the snow wasn't going to hit us. The city could send the snow crews home and saved a lot of overtime pay.
- I've used it on several occasions to assist county commissioners on their road work.
- We had very intense storms move in during little league baseball games in June. With OK-FIRST data, I had time to give officials approximately 20-30 minutes head start on getting the kids and their families to safety.
- We've used OK-FIRST to help school children get weather information for class work.

7. CONCLUSION

Current and credible information is a key ingredient for informed decision-making in any venue. It is particularly important when those decisions affect human lives. Many of the day-to-day weather-related decisions made by emergency managers and other public safety officials can result in actions intended to avoid the loss of life, reduce injuries, and minimize property damage. Prior to OK-FIRST, local officials in Oklahoma did not have adequate access to sufficient high quality, real time information necessary to make informed judgements about the likelihood of a dangerous weather event or the proper action to take. In most cases, local officials did not have sufficient training to know how to access information, understand it, and use it to enhance their decision-making capabilities.

The data collected during the evaluation of the OK-FIRST project indicate that the OK-FIRST team has been successful in meeting the key needs of program participants and has empowered local officials to make decisions based on up-to-the-minute information. The project was successfully able to combine three critical elements: training, access to information, and ongoing support. The data clearly demonstrate that the OK-FIRST staff were able to enhance significantly the knowledge and skills of the project participants in a very short period of time. This is even more impressive given the very technical nature of the material and the fact the participants did not come from technical backgrounds; they did not have any formal training in meteorology.

Access to useful and reliable information also is important for effective local decision-making. The lack of real time data that is relevant to local conditions was the concern most frequently voiced by participants when they began their OK-FIRST experience. OK-FIRST met the need of local public safety officials for fast, accurate, and continuously updated information necessary to make informed decisions.

Ongoing support was the third important element of the OK-FIRST project. Support was provided in the form of computer hardware and software; without these resources, many would not have been able to participate. However, the ongoing support provided by OK-FIRST staff was central to the success of the project. The staff were sensitive to the needs of participants and were ready and able to assist individuals in their efforts to access and use real time data long after they had completed their initial training workshops. When asked on the follow-up questionnaire how satisfied they were with the timeliness of the responses they received when they asked for assistance, 97 percent said they were very satisfied (89 percent) or somewhat satisfied (8 percent). Similarly, 97 percent said they were very satisfied (83 percent) or somewhat satisfied (14 percent) with the content or usefulness of the responses they received.

A critically important lesson learned from the OK-FIRST project is that the integration and coordination of all the elements – training, access to data, and ongoing support – are vital to the success of the program. Superb training to increase knowledge about weather phenomena and develop the skills necessary to access, interpret, and use real time data is not very useful when access is not available. Similarly, access to high quality data is of little benefit if one does not understand the information or how to use it once it is obtained. Even with good training and easy access, without ongoing support it is not likely that individuals would make the most effective use of their knowledge, skills, and the available data. When attempting to enhance the capabilities of nontechnical people on very technical topics, the development of their abilities must continue after the initial

training. Even the most proficient trainers would find it difficult to impart sufficient expertise in a short period so that participants could operate independently from that point on. Each individual element is necessary, but not itself sufficient for success. All must be integrated so that the whole is greater than the simple sum of the individual parts.

As evident from the data and feedback reported in the previous section, OK-FIRST was able to accomplish an important goal. The project was able to change the behavior of local public safety officials and their approach to decision-making. The increased skills and capacity of the OK-FIRST participants have had a positive influence on the types of decisions they make, how they make those decisions, and when they are willing to make a decision. As one participant put it, "I'm proactive now rather than just reactive." Their total OK-FIRST experience has not only enhanced their knowledge and skills, it has increased their confidence so that they are willing to apply this new capability to local situations. They no longer are completely dependent on second hand information or the interpretation of the information by others. This has improved their abilities to make effective decisions that will protect life and property. Further, as stated by some of the participants, the application of their capabilities is not limited to emergency situations. They are able to provide assistance to support a wide range of government and public service functions. The benefits that can accrue from the application of the skills developed through the OK-FIRST project can be far ranging and varied.

Although OK-FIRST combines many novel elements, it should be possible to replicate similar programs in other states. The computer hardware used is off-the-shelf and any intellectual property developed by the Oklahoma Climatological Survey is available via licensing and consulting agreements. Although the development of the Oklahoma Mesonet was very important in order to gain experience and establish a credibility for user support and data dissemination in Oklahoma, a Mesonet is not necessary for other states. The National Weather Service modernization generates the same types of county-level weather information for each state. Some states already have specialized observing networks. The replication of the OK-FIRST experience would be an important step in improving the ability of local officials to make more informed emergency management decisions. The OK-FIRST organization and team should serve as a model for others interested in establishing similar efforts.

ENDNOTES

1.For a series of papers that provide descriptions of the OK-FIRST project and its development, see the project's Web site at **http://radar.metr.ou.edu/OK1** and works cited in the Reference section of this paper.

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