Early Warning Systems

Byron K. Kennedy

Atlanta Fire Rescue Department, Atlanta, Georgia

August 2009

CERTIFICATION STATEMENT

I herby certify that this paper constitutes my own product, that where the language of others is set forth, quotation marks so indicate and that appropriate credit is given where I have used the language, ideas, expressions, or writings of another.

Signed: _____
Byron K. Kennedy

Abstract

The problem was that the city of Atlanta has a limited ability to communicate with its residents and visitors during catastrophic events, leaving its constituents vulnerable to serious injury and death without warning. The purpose of this applied research project was to determine if and how a city-wide warning system might benefit the constituents of the city of Atlanta, Georgia as it relates to catastrophic events and disasters. Research questions investigated the affect of warning systems on the number of serious injuries and deaths, various systems that are in place to communicate to the residents and visitors of Atlanta, constituents' perceptions and recommendations concerning the systems that are in place, and the cost associated with purchasing and maintaining the various warning systems. A descriptive research method was used in conjunction with procedures that include a review of literature, personal communications, surveys, and analysis of data. The results yielded that the existence of early warning systems dramatically reduces the number of serious injuries and death within communities. Additionally, the research determined that the only viable early warning system that is in place for the residents and visitors of the City of Atlanta is the traditional emergency broadcasting system that is seen and heard on TV and local radio stations. The research indicated that the stakeholder's perception of confidence is very low as it pertains to their community effectively notifying them in the event of an actual emergency. Participants made several recommendations for their specific communities. Finally, the research showed that several early warning systems can be effectively purchased and implemented for a reasonable cost.

Table of Contents

Appendix

Table

Introduction

The problem was that the city of Atlanta Georgia has a limited ability to communicate with its residents and visitors during catastrophic events, leaving its constituents vulnerable to serious injury and death without warning. This applied research project (ARP) was created to determine if and how a city-wide warning system might benefit the constituents of the city of Atlanta, Georgia as it relates to catastrophic events and disasters. A future goal of the researcher is to influence additional research and city-wide awareness of the possible benefits of early warning systems. Four research questions were composed to collect a variety of information that would serve as a foundation for the research on early warning systems: How have established warning systems affected the number of serious injuries and deaths when disaster strikes? What systems are in place to communicate to the residents and visitors of Atlanta, Georgia during a city-wide emergency? How do Atlanta residents feel about the present mechanisms that are in place for warning them about pending or on-going emergencies and what if any improvement do they desire? How much does it cost municipalities to purchase, maintain and use various warning systems? This ARP will use the descriptive research method to enhance the awareness and knowledge of the reader about in the early warning systems within a major metropolitan city. Additionally, this research project will consist of the following:

1. A comprehensive review of literature that carefully examines the existence and need for early warning systems

2. Various forms of data and information compiled from interviews, personal communications, surveys, and statistical analysis software

3. The positive and negative impact of early warning systems or devices

Background and Significance

For more than a century, citizens across the city of Atlanta, Georgia have depended on some form of early warning system. These systems have ranged from fire-watch towers and bells of the past to modern-day reverse 911. The primary goal of hazard forecasting or early warning systems is to protect lives and property. The city of Atlanta has a daytime population around 1 million people. The nighttime population accounts for more than half of a million residents. Atlanta has never been known as a place in which killer catastrophes have frequented. However, the city has been hit hard on several instances. In 1917 a fire burned through 100 blocks of the city of Atlanta (Atlanta, GA fire, May 1917, 2009). According to Georgia Tornadoes (1999), there were 17 confirmed tornadoes in Atlanta between the years of 1950 and 1995. One of those tornados killed more than 150 persons. In 1995 Hurricane Opal blasted through the heart of Atlanta causing damage throughout the city. Most recently, an unexpected tornado ripped through the heart of downtown Atlanta with tens of thousands NCAA Finals visitors in the city. It is presumed that literally thousands of lives were saved because the game went into overtime. There were no loudspeakers, sirens, or public announcements to be made. However, for those who had electricity or were in their vehicles, they were able to hear the emergency broadcasts that were put on the airways by local news station and other authorities. If the game had finished 15 minutes earlier, the game-goers would have been filing out of the arena into the party streets of Atlanta. It is certain that the death and injury toll would have been considerably higher affecting the unsuspecting and uninformed gamers.

The United State Fire Administration (USFA) has set forth five objectives that are intended to support the Department of Homeland Security's strategic objectives. The objective that is most relative to this research project deals with promoting, within communities, a

comprehensive, multi-hazard risk reduction plan that is led by the fire service. During this author's studies at the National Fire Academy, the Executive Fire Officer Program offered a course named Executive Analysis of Fire Service Operations in Emergency Management (EAFSOM). This course delivered a tremendous amount of enhancement to the valued knowledge, skills, and attitudes that are required of fire service leaders to apply towards large scale emergency incidents within their communities. This dynamic course stimulated the author to analyze, research, and rationalize the need for a solution to the alarming issue of the level of community preparedness and as well as the operational components of fire service effectiveness. Similar to many cities across the nation, Atlanta residents and visitors depend on local, state, and federal authorities to keep them informed of impending dangers and emergencies. If we fail our constituents, we have failed at our duty.

Literature Review

This review of literature was compiled and presented for the benefit of the author's research and was instrumental in influencing the direction of the project's four research questions. Considering that the project's primary concentration focused on the issues of early warning systems, it was believed that the thoughts and opinions of others should be taken into consideration. Whitcomb (1995) insists that timely and effective warning systems will elicit life and property saving procedures within communities. Furthermore, Whitcomb acknowledges that these systems can be very sophisticated and expensive. The author insists that technological devices such as remote sensing, global positioning systems (GPS), geographic information systems (GIS), computer modeling and expert systems, and electronic information management all contribute to the composing accurate, wide spread and convincing warnings. Whitcomb believes that traditional warning systems that use gongs, flags, loudspeakers, public radio, telephone, fax, and telex will always have a vital role in early warnings across the globe. Whitcomb also believes that added value can be achieved if new high technology is cohesively married with the commonplace methods of transmitting impending emergencies or catastrophic events. Whitcomb mentions that early warning systems will not work without resources that offer monies, manpower, materials, and technology. The author warns that the synergy between how the warning is advised and how the community and organizations respond must be strengthened. He goes on further to explain that the social response to early warning systems is not a function of the system's effectiveness. He explains that social response is an issue of system credibility. Finally, Whitcomb suggests that embarrassing questions concerning early warning systems will continue to plague the disaster management community. He suggests that

communities build a prevention culture similar to or progressively better than the extraordinary efforts of the 21st century.

Narasimhan (1995) warns that the humans have a proneness to rear-guard action. Narasimhan quotes a poet from centuries ago who asked a question concerning the purpose and benefit of digging a well for firefighting water after the house has caught fire. He goes on further and mentions that society's tendency to react after the fact is very evident in its approach to meeting the various challenges of natural disasters. The author admits that nations and societies spurred into to action as a disaster occurs. He continues and mentions that as the need for immediate relief and rehabilitation subsides, so does the perception of calamity in their consciousness. Bishop and Syme (1992) found evidence that the perception of control may be directly related to both social and official behaviors. Additionally, the authors insist that when community members perceive that there is a lack of control, they are more likely to build apathy about the issue. Narasimhan (1995) mentions a cyclone that took place in Andhra Pradesh, India in 1977 that killed 10,000 people and 230,000 cattle. Another cyclone of greater force went through the same area in 1990 and affected twice as many individuals as the first cyclone. Astonishingly, the cyclone of 1990 only killed 910 humans and only 27,000 cattle were killed. Narasimhan credits the drastic difference to the state's purposeful shift from providing relief to providing prevention. The author's article also mentions that delays in communication and the lack of credibility were the contributing factors of the 1977 cyclone. Finally, Narasimhan suggests that the lessons learned from the cyclone of 1977 and 1990 imply that better warning systems, community education, community involvement, and efforts to improve infrastructure significantly reduced the impact of disasters to the involved communities. On a similar note, Klass (1953) conducted research that suggested that the presence and proper usage of early

warning systems, during World Word II, were vital to the morale of communities. Klass (1953) goes on further to mention that false alarms caused communities to ignore the warning systems.

Cisney (1995) insists that each spring and fall will bring severe storms, heavy rain, hail, and tornadoes to Texas. The author reports that averages of five persons a year are killed in the state of Texas by tornadoes alone. Cisney implies that the Fire Chief of McKinney lit the memorable fire that resulted in the existence of one of the finest and sophisticated siren warning systems that was available at the time. Cisney (1995) reports that the system would be installed by Motorola and will use Whelen WPS-2800 series sirens. Eight sirens were strategically located across the city to deliver warnings over nearly 100% of the area. Each siren was capable of broadcasting sound at 70 decibels at a distance of 5,200 feet. Additionally, each siren site was powered with electricity and backup battery power in the event of main power failure. Cisney mentions that the McKinney officials were also considering the installation of solar panels in the areas that were located in the more remote areas. Finally, city officials estimated the project to cost less than $350,000 from installation to testing its operation. Taxpayers basically agreed to pay $2.00 per household per year for a total of six years.

Millsap (1994) writes about some of the issues that a newly formed Cobb County EMS Council had to address concerning severe weather warnings. Millsap explains that the local fire department has 25 stations that serve approximately 480,000 people. Millsap goes on to mention that Cobb County purchased sirens for a minimum investment from government surplus. Several of the sirens needed to be rebuilt. Many did not require any maintenance. Poles for the sirens were established by the local electric company. Finally, the author advises that the estimated utility cost would be $9.50 per siren location. Additionally, Cobb County is planning to purchase 15 additional sirens at a price of less than $9,000 each.

Hossain (2006) writes about early warning systems for floods. He insists that there are three components that should be considered. Additionally, Hossain mentions the inadequacies of surface based early warning systems in tropical areas. He believes that a operational system should have means of measuring rainfall, soil moisture measuring system, and a surface discharge measuring system. Hossain advises that the high frequency of tropical environment that have poor economies make the traditional surface based systems nearly impossible to acquire. Alsdorf and Lettenmaier (2003) suggest a space-based program to counter the high prices that may exist. Foufoula-Georgiou and Krajewski (1995) insist that remote rainfall measuring has had a great deal of research completed. Furthermore, the authors imply that space-borne rainfall measuring has the most promise for short and long-term success.

Moore (2008) mentions that the Emergency Alert System (EAS) is built on a structure conceived in the 1950's. At the time of its conception, over-the-air broadcasting was the best-available technology for alerting communities of impending emergencies. The author states that the EAS system was opened to state and local governments in 1963. Prior to the 1990s, the system was familiarly known as the Emergency Broadcasting System. Moore suggests that the name changed as a result of upgraded technology that involved automation. Additionally, Moore attributes some of the problems of widespread ineffectiveness to differences of responsibilities that the federal government has versus the responsibilities of the tribal, state, and local authorities. Moore insists that the issue behind the incongruence is because the smaller governing authorities have depended on the Integrated Public Alert and Warning System (IPAWS) to serve as the backbone of the system. Moore goes on further to suggest that budget short-falls have crippled the timely involvement of the federal IPAWS objectives.

Almand (2007) addresses changing occupant attitudes and improving notification effectiveness. The author suggests that effectiveness of systems that only alert the community to an emergency is highly dependent on the amount of training that the involved community has had. Additionally, she describes these alert only systems as tonal signals with no voice or computer generated instructions. The author suggests that these types of systems should be augmented by voice notification systems. She believes that this redundancy will greatly enhance the effectiveness of a notification system. Furthermore, Almand suggests that it is mandatory that communities invoke a voice notification system that provides concise information in an authoritative and consistent manner. Almand also believes that communities should consider alternative notifications such as visual or tactical systems. Finally, Almand implies that it is imperative that authorities make every effort to understand the perceptions and behavior of the community.

Larson (2000) supports voice capable notification sirens. However, Larson admits that storms sirens with voice capabilities have limitations as one considers the ability of the voice transmissions to be heard inside of buildings. Additionally, Larson insists that telephones are almost always in operation or turned on. Unlike televisions and radios, which are frequently in the off position, telephones are always on. Larson highlights the fact that television and radios provide a very wide and general area of notification. He believes that after several notifications that do not affect the individual, people are known to basically ignore most future warnings. Finally, Larson believes that a reverse 911 system can be used as a tool to distribute fast and accurate information to the community that may be in harm's way.

Procedures

The procedures used to attain this applied research project included the exploitation of several systematic steps. If future researchers use these proceedings as a stencil, it is believed that this research will be easily duplicated. The author created four baseline research questions and customized them to fulfill the desired goal of this applied research project. A comprehensive review of literature was completed using the National Fire Academy's Learning Resource Center and the author's local library. Multiple variations of key words such as emergency warning systems, emergency alert systems, warning systems, sirens, disaster preparedness, emergency operations centers, cost effectiveness, risk evaluation, emergency communications alarms, natural disaster warning systems, remote sensing, satellites, and disaster planning were used as first course words for selecting articles and papers that would be used for the review. Additionally, the author determined that it was necessary to conduct a situational analysis that highlighted and examined contributing factors as well as to determine the city's need for early warning systems. Contributing factors such as the cost of supplemental warning systems, the community's complacency of warning systems, and general unawareness of the need for early warning systems were all considered. The situational analysis highlighted forces in the community that would be helpful in accomplishing the purpose of this research. Furthermore, the situational analysis aided the author in defining and prioritizing issues as well as the strategies that may prove to be useful during implementation. The author established contact with community stakeholders. Section Chief Walter Parker, the Chief Fire Inspector for Atlanta Fire Rescue Department AFRD. He was asked, during a phone conversation, about the existence of any codes that require that high rise buildings notify the occupants of emergencies other than smoke or fire in Atlanta. AFRD's Captain Rod Smith was contacted to inquire about information

on the reverse 911 system of Atlanta. He is responsible for all of the day-to-day communications of AFRD. This include dispatchers, radios, repeater towers, as well as the computer aided dispatch (CAD) system and all other electronic equipment that is used in communications. Captain Smith was asked about whether Atlanta has used the reverse 911 calling during an emergency. Additionally, he was asked whether there are any plans to supplement any of the established early warning systems that are already in place. Finally, Captain Smith was asked about his knowledge of why sirens and loud speakers have not been used within the boundaries of Atlanta. The author spoke with two homeless gentlemen and asked them about the methods in which they are informed on what to do in the event of a natural or man-made disaster. The author ascertained the need for a method and a means of polling the participants. An electronically developed and distributed survey was discovered to be the best means for the distribution of the surveys. Numerous limitations were encountered as the author had no method of following up on persons to prompt them to answer the survey. Initially, the researcher was going to send thank you / reminders to all of the polled participants. However, the researcher believed that the polled persons would then realize that the author had no idea who answered and who had not. Therefore, this situation would produce an increase in the number of uncollected online surveys. Another limitation involved the fact that several residents do not have access to the internet. The author decided not to offer paper surveys as part of the process. Groups of subjects were formed amid the latent participants and instructions were fashioned. The author then created questions for the participants with an overall attempt at specifically manipulating each question to be non-threatening to the participants, regardless of which group they represented.

The survey that was created is comprised of ten questions that did not use any fancy fire department lingo. The survey was short and constructed to be relatively easy. Although the

survey did not require any technical expertise, it did require non-Atlanta residents / workers participants to have a very general knowledge of their community's demographics (Appendix A). The survey was divided into four distinct sections. They are Demographics, Early Warning Systems, Effectiveness of Warning Systems, and the Conclusion. This effort spore another limitation. Several of the participants had no idea of the demographics of their area.

There were a total of 83 participants who answered the online survey. Participants included city of Atlanta employees from fire, police, watershed management, Atlanta community activists, as well as others from cities across the nation.

All members of the initial participant pool were asked to forward the survey link to their cohorts and email buddies. All surveyed participants were emailed and advised to click on the provided link that would take them to the survey. Survey links were emailed out to AFRD members, Atlanta officers, code enforcement officials, neighborhood association members, local business leaders, organizations, and elected officials. The survey was available for 14 days. The unrefined data was collected and charted by the survey host. The results were then prepared for presentation for the convenience of future readers and researchers. The findings were then interpreted by the researcher for a compilation of recommendations to be considered and made.

Results

The author found it necessary to conduct interviews and establish communications with subject matter experts. These communications proved valuable in every way and influenced clarity and stimulated additional thought on several issues. During a phone conversation with Chief Parker (Parker, personal communication, March 6, 2009) advised that, with exception of smoke or fire, there are no codes that require Atlanta's high-rises, low-rises, or any other

occupied building to notify its occupants of impending danger. He added that several of the high-rise buildings have the capability to make custom announcements to all of their occupancies. Chief Parker went on further to mention that even if the city of Atlanta had siren / loud speakers strategically placed throughout the area; it would be impractical to impossible to hear the loud speakers in most of the high-rises. He pointed out that several of the buildings have heights that extend well beyond 30 floors and of few that are very near 80 floors. Captain Rod Smith (Smith, personal communication, March 9, 2009), of AFRD communications section, addressed research question number two. When asked about the early warning systems that are in place for the residents and visitor of Atlanta, Captain Smith (Smith, personal communication, March 9, 2009), explained that the City of Atlanta has no functional system in place with the exception of Emergency Broadcasting on TV / Radio and city fire truck blowing their horns on the ramps of the fire houses. Additionally, he advises that Atlanta has the capability to execute the reverse 911 calling. Unfortunately, this system is not in place and ready for immediate use by 911 operators. He goes on further to mention that a very limited number of the persons in the communications section are aware that the 911 system has the capabilities. Even fewer individuals know the passwords to operate the system.

In reference to research question number three, the researcher spoke with the homeless community. During a brief interview with a homeless gentleman, on the outside of a local Atlanta fast food restaurant, the author inquired about how the homeless are alerted to the nature of impending danger. The initial question focused on the how the individual believed the authorities of Atlanta notify its residents and visitors impending disasters whether natural or manmade. Norman Edwards (N. Edwards, personal communication, May 2, 2009) advised that he had been on the streets for most of his life. He mentioned that he had learned how to tell when

bad weather was coming. The author re-asked the question and Mr. Edwards revealed that he was unaware of any other method to notify people other than television, radio, telephones phones. Finally, he suggested that the police should use the speaker on their cars to talk to people and tell them what is going on. Later that evening, the author interviewed another homeless person named Antonio (Antonio, May 2, 2009). The same question was asked with a somewhat different answer. Antonio believes that the authorities don't notify people of impending dangers because they don't care. He advised that he has seen and heard "the firefighters turn on the long sirens just as things are really getting bad." He also added that he didn't know what the sirens meant as he stated that the firefighters could use the speakers too.

Survey question number one asked the sample about whether they live or work in the city of Atlanta. This question had a logic stipulation as well. More specifically, if the respondent answered yes, the survey would automatically forward them to page three and question number four of the survey. A total of 81 participants answered this question. According to the results, 37% of all respondents worked or lived within the city of Atlanta. 63% reported that they did not live or work in Atlanta. 2 participants skipped this question all together (Appendix B).

Survey question number two inquired about the total residential population of those who answered no in the first question. The options were 1 – 10,000, 10,000 – 100,000, 100,000 – 500,000 and 500,000 or more. According to this question 45.1% of all respondents believe that they live in a residential population of 10,000 – 100,000. 33.3% indicated that their town or city has a residential population of 100,000 – 500,000. The third most popular residential population was 1 – 10,000 at 13.7% of the polled participants. The least popular selection for survey question number two was 7.8% of the participants believe that they live or work in an area in which the residential population is more than 500,000.

Survey question number three was the last question that involved demographics. It asked participants about how they describe their community's layout. The choices were inner-city, suburban, and rural. 80% or 40 of the participants describe their community as suburban. The results indicate that 12% of the polled participants describe their community as rural. Only 8% of the participants live in an inner-city environment.

Survey question number four is the first question on the Early Warning Systems page. Question four seeks to determine whether the participant's community has an Early Warning System in place. Furthermore, the question is explained in more detail as it implies that Early Warning Systems warn the public of impending disasters. There were only three choices: Yes, No, and I don't know. This question also has a logic based function as well. Basically, if the participant answered No to the first question of Early Warning Systems page, they would then be directed to the first question of the next page (i.e. question number seven). 75% of the participants who answered this question indicated that their community is protected by an early warning system. 17.8% said no and 11.1% indicated that they did not know if their community had an early warning system.

Survey question number five is next. This question focused on the type or types of Warning Systems that are in place in their community. The eight choices were Reverse 911, sirens, sirens with voice loud speakers, radio / TV emergency broadcasting, warning lights, fire department sirens / horns, and other. 65.1% polled participants suggest that their community has emergency broadcasting over TV and Radio frequencies. 44.2% of the participants indicated that their community has sirens. Similarly, 44.2% insist that their community has reverse 911 in operation. 20.9% of the participants indicated that their community has sirens with voice loud speakers. 6 individuals indicated that their community uses fire department sirens or horn blasts.

2.3% indicated that their communities have warning bells. Another 2.3% indicated that their community has other means of early warning. Finally, none of the polled participants indicated that their community uses warning lights.

Question number six concludes the questions from the Early Warning System section of the survey. The question asks participants whether their community has been alerted to danger using an Early Warning System. The choices of the question were yes, no, and not sure. Of the survey participants who were polled, 53.3% signified that their community has received an early warning in the past. 26.7% were not certain. Finally 20% of polled participants indicated that their community has never been alerted by any early warning systems.

Question number seven is the last question under Early Warning Systems. The question requests that the participant select the types of Early Warning Systems that they have experienced during an actual emergency. Similar to question number five, there were eight choices. Reverse 911, sirens, sirens with voice loud speakers, radio / TV emergency broadcasting, warning lights, fire department sirens / horns, and other. 52.3% of the surveyed participants who answered this question signified that they had been alerted to an actual emergency by the emergency broadcast methods of TV or radio. 40.9% indicated that they had been alerted by sirens. 18.2% of the group reported that sirens with voice loud speakers have alerted them to an actual emergency in the past.18.2% also suggest that they have never experienced any type of warning during an actual emergency. 4.5% of the polled participants reported that they were warned by some other type of system during an actual emergency. Warning bells data suggests that only 2.3% of the participants who answered question number seven have been alerted to impending danger by using warning bells. Finally, 0% of the participants have been alerted by the use of warning lights during an actual emergency.

Question number eight is the first question within the section of Effectiveness of Warning Systems. The question is a yes or no question. It asks whether the participant has ever experienced an impending emergency in which the participant was not alerted by any type of early warning system. Excluding radio and TV emergency broadcasting, 46.4% of all the participants who answered this question indicated that they have experienced an emergency in which they were not warned by any other type of early warning system. 53.6% of the subjects suggest that they have never experienced an emergency in which they were not notified by means other than TV or Radio. Fourteen individuals skipped this question all together. A total of sixty-nine subjects answered the question.

Question number nine is the second question on this page. It asks the level of satisfaction that the participant has with the present warning systems that are in place within their community. The respondent was asked to rate their satisfaction with the various early warning systems such as reverse 911, sirens, sirens with voice loud speakers, radio / TV emergency broadcasting, warning lights, fire department sirens / horns, and other. Each listed early warning system was rated from Not Applicable (N/A), very satisfied, satisfied, somewhat satisfied, and not satisfied. Sixty-six subjects answered this question and seventeen skipped the entire question. Referencing the level of satisfaction of reverse 911, 38.3% of the 60 participants who rated this method of early warning said that it does not apply to them. 13.3% percent indicated that they are very satisfied with this system. 21.7% indicated that they are satisfied. Only 10% suggest that they are somewhat satisfied with the reverse 911 system and 16.7% signified that they are not satisfied with the system. 58 participants rated their satisfaction level of sirens. 31% did not believe that sirens pertained to them. Another 20.7% indicated that they were very satisfied with sirens. On a similar note, 20.7% also indicated that they were satisfied. 15.5% indicated that they

were somewhat satisfied and only 12.1% signified that they were not satisfied with sirens. Just as with sirens, 58 subjects indicated their level of satisfaction of sirens with voice loud speakers. 44.8% indicate that loud speakers did not apply to them. 21.1% were very satisfied with the loud speakers. 21.1% indicated that they were satisfied. Only 13.8% indicated that they were somewhat satisfied and 17.2% signified that they were not satisfied with the performance of voice loud speakers. In reference to radio and TV emergency broadcasting, an overwhelming 55% of the 60 participants, who rated their level of satisfaction for the emergency broadcasting on radio and TV, said that they were very satisfied with the system. 21.7% implied that they were satisfied. A reduced 10 % suggested that they were somewhat satisfied. Finally, only 5 % of the 60 participants indicated that they were not satisfied with the emergency broadcasting on radio and TV. 56 of the 66 participants rated their level of satisfaction of warning bells. A moderately high 64.3 % of those who rated their satisfaction of warning bells indicated that the warning bells did not apply to them. 7.1 % of those indicated that they were very satisfied with the warning bell system. 3.6% suggest that they are satisfied. Another 3.6% indicated that they were somewhat satisfied. 21.4% indicated that they are not satisfied with the performance of the warning bells early warning system that is in place in their community. Just as with warning bells, 56 subjects rated their level of satisfaction with warning lights. 67.9% of the subjects signified that warning lights do not apply to them. 3.6% of those who rated their satisfaction determined that they were very satisfied with warning lights. Another 3.6% indicated that they were satisfied. 3.6% more indicated that they were somewhat satisfied. Finally, 21.4% of the participants suggest that they are not satisfied with the warning lights in their community. Fire department siren / horn blasts received 57 responses. 45.6% of the participants indicated that the question category did not apply to them. 12.3% indicated that they were very satisfied with

this method of early warning. 8.8% suggested that they were satisfied. Only 7% of those who related to this category of warning system indicated that they were somewhat satisfied. However, the majority of them, 26.3% suggested that they were not satisfied with this method of early warning. The last category deals with other types of early warning systems. 78.8% of the 33 participants said that the question did not apply. None of the 33 participants indicated that they were very satisfied with their system. 3% of the subjects indicate that they were satisfied and another 3% said that they were somewhat satisfied. Finally, 15.2% of the 33 subjects suggest that they are not satisfied with their system.

The final question under this section is an open dialogue box for participant to suggest improvements for municipal governments to make in regards to notification of impending emergencies. A total of 23 of the subjects entered custom information to the survey. 60 individuals elected not to enter information for this question. All of the responses are unedited and displayed in Table 1.

The last section is the concluding session. This is also the eleventh and final question of the survey. The participant was asked to rate their level of confidence in their town / city's ability to produce immediate awareness to its residents and businesses regarding impending danger. The choices were very confident, confident, somewhat confident, not confident, and I am not familiar with any early warning system in my community. 68 individuals answered the last survey question. 15 people skipped the question in its entirety. Only 38.2% of those who answered the question indicated that they were somewhat confident that their city/town will be able to produce immediate awareness to its constituents regarding impending danger. 25% suggest that they are confident in their city's ability. 13.2% of the 68 mention that they are unfamiliar with any early warning system in their community. Only 11.8% of those who answered the question are very

confident. Similarly, 11.8% indicate that they are not confident in the town/city's ability to forewarn them of impending danger.

Discussion/Implications

Whitcomb (1995) writes about the pursuit of early warning systems. The author's article was instrumental in providing the primary direction of the research paper as he brings up several valid points about existing and new technology that is on the horizon. For example, Whitcomb writes that timely and effective warning systems will bring about life and property saving procedures within communities. I agree with this statement as I realize that it is more to the issue of an early warning system being effective. When a warning system is deemed effective, this implies far more than simply the fact of the system being operational. In fact, additional implications would suggest that some kind of cultural understanding exists as well. For a warning system to be effective, the community must believe and understand the various expectations of the system. Whitcomb goes on further as he mentions that devices such as remote sensing, global positioning systems (GPS), geographic information systems (GIS), computer modeling and expert systems, and electronic information management all contribute to the composing accurate, wide spread and convincing warnings as well as the fact that these systems can be very advanced and expensive. I had not thought about some of the methods of using new technology such as satellites and other instruments that are not land based. This article stimulated the need for more research in the area that would cover technology and early warning systems. On a similar note, Hossain (2006) focuses on early warning systems for areas that are prone to floods. Hossain insists that there are three inadequacies of surface based systems. The three deficiencies involve measuring rainfall, soil moisture measuring, and surface discharge measuring. I disagree with this portion of his statement because surface systems can accurately

measure all of the items that he mentioned. However, I must admit that the economically challenged regions that are the most vulnerable and susceptible to floods may not be able to put these measuring devices in isolated non-passable tropical regions of the globe.

Whitcomb (1995) brings up an interesting point about the price of technology. He suggests that new technology can be expensive. Naturally, I tend to agree with this statement. However, Alsdorf and Lettenmaier (2003) contend that a space-based system should be used to counter the high cost of sophisticated ground systems. Finally, Foufoula-Georgiou and Krajewski (1995) seem to agree with Whitcomb as well as Alsdorf and Lettenmaier. The authors all agree that remote rainfall measurement has a lot of research as well the concept of space based warning systems have a very high probability for success on the short-term and long-term continuum. I agree with Whitcomb as he argues that traditional warning systems that require the use of gongs, loud speakers, telephones, flags, radios, and fax will always play an important role in early warning systems throughout the world.

Whitcomb's article also mentions that added value is gained as traditional warning systems are married with new technology. I agree with this statement because of the fact that new technology is typically not intended to replace old technology. Only after the new technology is engrained within the community and advances have been made to it should a community consider replacing the old warning systems. In reality, replacement may not be the best decision as redundancy often ensures functionality in the event of system failure. Finally, Whitcomb warns of the synergy between how the warning is advised and how the community responds. I support this statement as I recall a method in which Atlanta Fire Rescue Department reacts to severe weather warnings. Atlanta Fire sends an announcement over the radios or via the Battalion Chiefs' offices to pull the fire apparatus out on the ramp of the fire station and turn on

and hold the siren for one or two minutes. Outside of the traditional radio and TV alerts, this the only method in which residents can be alerted. The problem with this method, as mentioned by Whitcomb, is that people have no idea that it is a warning or an alert of a hazardous situation. Nor are the citizens aware of what they need to do when they hear the sirens.

Narasimhan (1995) writes about the propensity of humans to have rear-guard action. I agree with this theory. Many refer to this reaction as the "knee-jerk" reaction. As it relates to Atlanta, the city launches into action with committees and sub-committees immediately after a disaster. The unfortunate thing is that once the disaster is over, people of both the community and the government seem to forget all about early warning systems. Narasimhan further validates his theory as he expresses the fact the as the need for immediate relief subsides, so does the perception of tragedy in their mind. Additionally, Bishop and Syme (1992) conducted research about the perception of community concerning control over warning systems. The article inspired new thoughts as it highlighted the opinion that if the constituents believe that the authorities do not have control, the constituents are likely to develop disinterest about the issue. I agree with Klass (1953) as the author suggests that false alarms will cause communities to basically ignore early warning system. In my opinion, this emphasizes the reasons for accurate warning systems and highlights the need for the warning to be specific in location and message to be delivered. Additionally, I can see why effective warning systems induced high community morale during World War II (Klass, 1953). This information influenced the creation of one the survey questions that sought to determine the level of confidence in their local authorities to provide adequate early warning to their community.

I found that it was very interesting that Cisney (1995) reported that a city in Texas that purchased loud-speakers sirens as part of an early warning system. The disappointing

information was that the sirens were capable of producing only 70 decibels. Having a general understanding of Fire Truck sirens, I know that many of the sirens will deliver decibels exceeding 110 to 130 decibels. However, I was encouraged to find that Cisney (1995) reports that the 70 decibels sirens had a reach of 5,200 feet. This also produced an interest in an area of future research concerning the possibility of new standards for minimum decibel levels.

Millsap (1994) writes about an area that sits adjacent to the West side of Atlanta. The researcher chose this article because of its relevance to an area that is in very close proximity of the city of Atlanta. In fact most of the storms, with the exception of hurricanes, come through Cobb County's area first. This article stimulated the theory that since both areas share the same weather, then both areas should be protected by similar, if not better, early warning systems. Information provided by the author lends to the theory that the loud speaker early warning system is affordable with only a minimum initial investment. Cobb County's plan to purchase surplus loud speakers and partnering with their local power company was an incredible idea. It makes sense that the location of the loud speakers is naturally at the fire stations, since all fire stations are built with respect to geographical location within cities and towns.

Moore (2008) believes that the inconsistent duties that the federal government has, compared to the responsibilities of local authorities, contributes to some of the problems with the ineffectiveness of some early warning systems. Initially, the researcher agreed with Moore's inference. However, as additional research was conducted, the researcher realized that it is the duty of the local officials to provide the assurance of an early warning system to its constituents. In fact, if worded properly, there may be a chance that federal agencies will contribute or pay for early warning systems. This thought takes me back to the origins of early warning systems. Most popularly, these systems were used to warn communities of impending danger from airstrikes

during World War II. With the big push for Homeland Security initiatives, it seems as though these early warning devices can be used in the event that there is a biological or chemical attack on a community. Additionally, local and state authorities can use these systems to warn and give specific directions or information to their constituents that may be affected. Therefore, the researcher feels as though the various state and local authorities are not seeking federal assistance to create an effective early warning system for their communities.

The researcher believes that early warning system effectiveness is gauged upon the credibility of the system. This is directly related to the system's ability to deliver concise and accurate warning and information to the community in which it bears the encumbrance to protect. On the contrary, Almand (2007) suggests that an early warning system's effectiveness is dependent upon the amount of training that a community has. Furthermore, Almand believes that the amount of involvement that a community has had is also a major determining factor of system effectiveness. The researcher argues that community involvement influences the amount of warning system confidence that is experienced by the community. This theory stimulated a survey question that inquired about the level of confidence that participants have in their communities various early warning systems. Almand and the researcher are in total agreement as the author infers that communities should invest in early warning systems that have the capability to communicate by voice with concise instructions and information. Finally, the author and researcher agree on the importance of the local and state government agencies must make every attempt to understand the cultural behaviors of the communities in which they serve. Similarly, Larson (2000) agrees with Almand and the researcher on value of early warning systems. However, Larson brings up an interesting point concerning the capability of these early warning systems to be heard inside of a building. This premise fueled the question concerning

the numerous high rise occupancies within the city of Atlanta. The question was posed to Chief Parker of Atlanta Fire Rescue Inspections Section. Finally, Larson (2000) mentions the fact that people will often become callused to some of the early warning that cover a large generalized area. The researcher agrees with this thought as he considers the large number of emergency warnings that he has personally heard that were literally 100 miles away. It seems as though the community does not pay attention to the warnings as much as their credibility is often questioned by the community's stakeholders.

Research question number one asked; how have established warning systems affected the number of serious injuries and deaths when disaster strikes? The information that was collected from reviewed literature supports the fact that early warning systems contribute to a dramatic reduction in the loss of life and injuries when disaster strikes. During an interview with Captain Smith (R. Smith, personal communication, May 29, 2009), he admits that that there is no doubt that early warning systems lend to saving lives and property. However, he added that the occurrences in Atlanta are so few and far between, that the authorities and the community do not consider themselves vulnerable to catastrophic disasters. Of research done and data collected, there was not any indication that inferred that early warning systems are a waste of time and effort. Additionally, Narasimhan (1995) offers a great example that shows the marked different in lives that were saved between events of 1977 and 1990. This evidence indicates that there is a substantial benefit to the implementation of an early warning system.

Research question number two inquired about the early warning systems that are in place to communicate to the residents and visitors of Atlanta, Georgia during a city-wide emergency. As a person who was born and raised in the city of Atlanta, I can personally say that I was never exposed to any information concerning early warning system. I have always seen and heard the

TV and radio warnings, but that was the extent of our early warning system from 1970s through the present day. Captain Smith (R. Smith, personal communication, May 29, 2009) advised that the only system that is somewhat in place is seen when Fire Communications has been made aware of impending bad weather, Atlanta Fire Stations are instructed to pull their units out on the ramp and turn on the sirens. I was not surprised to hear him advise that it is very likely that the community has no idea what the firefighters are doing. I agreed with him as he surmised that the citizens are probably wondering why the firefighters are blowing their horns when it looks like a storm is approaching fast. The researcher was shocked to learn that Atlanta Fire / Police Communications Center have never used the reverse 911 early warning system. Captain Smith admitted that most of the employees who work in the 911 Center are probably not familiar with the reverse 911 capabilities. The findings of this research question proved beneficial as it almost single-handily confirmed the existence of the issue mentioned in the problem statement.

Research question number three inquires about how Atlanta residents feel about the present mechanisms in place to warn them about impending or on-going emergencies. Considering the personal communications and results of the survey, I am somewhat surprised at the data. The results do not coincide with what I expected before the research was concluded. My expectation was that there would be a very low amount of confidence in Atlanta's residents. My findings were not a surprise from the homeless persons. Research indicates that the municipal agencies are failing at educating their constituents who have access to resources. Therefore, it was very safe to speculate that those who do not have access to resources such as a mailing address, TV, and radios would have a greater challenge of being reached by their municipal authorities. Survey question number one and four contributed to answering this research question. Of the total participants, 37% of those polled accounted for 30 individuals who

indicated that they live or work in Atlanta. Only 17.8% of the 45 persons who answered survey question number four indicated that their community did not have an early warning system. This percentage accounts for 8 people. Therefore, of the 30 participants who are related to Atlanta, only 8 know the truth that Atlanta really does not have any mechanism in place to warn its constituents of impending emergencies. On a comparative note, only 38% of those who answered survey question number eleven indicate that they are somewhat confident in their community's ability to notify them of an emergency. Although this includes all participants from various cities, the number is still ridiculously low.

The fourth research question asks about the costs of that municipalities must incur to implement and maintain an effective early warning system. Information from Millsap (1994) offered valuable information to anyone who is interested in purchasing an early warning system that uses sirens with voice loud speaker capabilities. I was very surprised that the system was moderately affordable on paper. During the interview with Captain Smith, I was not surprise to hear that the cost benefit of an early warning system is not up to the level in which the city of Atlanta will invest in a more effective system. The reality is that when disaster hits, the city authorities scurry together and throw the questions around about warning systems. 10 months later, the momentum fizzles and stops. Atlanta does not have many natural disasters to contend with, but when they happen, the city is crippled for an extended period of time.

Survey questions one, two, and three addressed demographic. I was pleased to see that more than 1/3 of the polled participants had residential or occupational affiliations with Atlanta. I initially expected more since the bulk of my initial prospective participants were Atlanta employees. Survey question number two was a surprise. However, it makes sense that the bulk of the results indicate populations between 10,000 – 100,000 and 100,000 – 500,000. The Atlanta

residents and employees of Atlanta should have indicated 500,000 or more. I was disappointed to see that only 4 participants indicated the residential population of Atlanta being nearly 570,000. I expected that most of the participants would select that they live in a suburban community. Survey questions four, five, six, and seven addressed warning systems. I expected that most people would indicate that they have an early warning system. Unfortunately, my expectations stem from my presumption that most are uninformed and they tend to caution on the side of just saying that they have a warning system. Question five was unexpectedly low. Although the numbers are very to be likely accurate, as suggested by the results of the survey, I was disappointed in the large number of participants who skipped survey question six. Additionally, another disappointing statistic reveled that nearly 30% of all who answered this question were not certain if their community had ever been alerted to danger by an early warning system. I was very surprised at the low percentage of 52.3% of those who answered survey question number seven. This question indicated that just over half of the subjects have ever seen or heard and emergency broadcast on TV or Radio. This concerns me because if these results are accurate, this is evidence that TV and radio are not reaching people during emergencies. Survey question eight offered a considerably different result than I expected. More than half of the participants suggest that they have not experienced an emergency an were not warned by an early warning system. This could be because of the high number of participants who were not affiliated with Atlanta. Survey question number nine supports an unstated hypothesis that emergency broadcasting is the staple of early warning systems. Half of all participants indicated that they are very satisfied with the performance of the emergency broadcasting system. For Atlanta, it is basically all that we have. I was very pleased with both the number of respondents and the overall quality of their custom responses on survey question number ten. Key relevant

suggestions that were mentioned included better warning system education for the public, install warning systems where they are not present, and enhance systems that are in place to increase effectiveness. Additional responses are in Table 1. The final survey question yielded disappointing but expected low percentages of participants' overall confidence in their town/city's ability to produce an effective early warning during an actual emergency. This highlights the need for local authorities to increase their constituents' confidence by creating and enhancing early warning systems.

In summary of this discussion/implication section, the results highlight the critical nature of the initial problem that is presented in paper. The research suggests that the problem of inadequate or absent early warning systems is shared by many communities across our nation. In addition, the results imply that governmental authorities, policy makers, visitors, organizations, and the homeless are all stakeholders who would benefit from aggressively investing in the task of promoting effective early warning systems in our communities.

Recommendations

As a student of the National Fire Academy's Executive Fire Officer Program, it is my compulsion to share the findings of this researched issue with other members of AFRD, other members of the fire service, the Atlanta community, as well as other communities at large. This sharing of information would serve the purpose of reaching out for support, buy-in and suggestions that would benefit everyone that is involved. Presently, Atlanta Fire Rescue is the only Atlanta agency that I am aware of who makes an attempt to warn Atlanta's constituents of impending danger. Although AFRD's efforts seem moderately in vain without clarity or any explanation to the public, it is a start in the right direction. Considering all of the information and

data collected, the city of Atlanta should really make an attempt to be proactive rather than reactive. As with most cities, if a catastrophic hit Atlanta, all agencies will come together to get the place back in order. My concerns are for the unprepared persons and businesses in the city. There is a considerable amount of research to be completed with many more aspects to be investigated. Future researchers may focus on a number of variables. Variables such as the pros and cons of early warning systems, various methods of delivering the warnings, and researching the possibilities of Homeland Security covering some of the costs as systems may be used to warn of Weapons of Mass Destruction emergencies in high risk communities. The city agencies as well as the community as a whole would benefit dramatically from the accomplishment of long-term goals that focus on reducing the loss of life due to natural and manmade catastrophic events in our nation's communities by educating and effectively being able to communicate the existence of impending danger.

Reference List

Alsdorf, D. E. & Lettenmaier, D. P. (2003). Tracking fresh water from space, *Science*. 301, 1491-1494.

Atlanta, GA fire, May 1917. (2009). Retrieved April 7, 2009, from http://www3.gendisasters.com/georgia/11359/atlanta-ga-fire-may-1917.

Bishop, B. J., & Syme, G. J. (1992) *Community perceptions of dam safety issues: A preliminary study*. CISIRO Division of Water Resource. 7-8.

Cisney, S. W. (1995) Siren: System to fight mother nature. *APCO*. 61 (11).

Foufoula-Georgiou, E. & Krajewski, W. (1995). Recent advances in rainfall modeling, estimation, and forecasting. *Rev. Geophysics.* 1125.

Georgia tornadoes. (1999). Retrieved April 7, 2009, from http://www.tornadoproject.com/alltorns/gatorn.htm

Hossain, F. (2006). Towards formulation f a space-borne system for early warning of floods: Can cost-effectiveness outweigh prediction uncertainty?. *Natural Hazards, 37* 273-276.

Klass, B. (1953). *The effectiveness of sonic outdoor warning devices*. Stanford, California: Stanford Research Institute.

Larson, R. (2000). Community alert systems. *9-1-1 Magazine*. 13 (6).

Millsap, S. (1994). Planning for disasters in your community. *Fire Engineering*. 147 (12).

Moore, L. K. (2008). The emergency alert system (EAS) and all-hazard warnings. *Washington D.C.: Library of Congress. Congressional Research Service.*

Narasimhan, B. (1995). Andhra Pradesh's (India) hard road forward: Massive loss of human lives and cattle in one cyclone, inspired the effort that saved hundreds of thousands more just 13 years later. *Stop Disasters.* 7-8.

Whitcomb, G. (1995). In pursuit of early warning. *Stop Disasters*. 5-6.

Appendix A

Early Warning Systems Survey

1. Demographics

1. Do you live or work in the City of Atlanta, Georgia?
If NO...answer the remaining questions for your permanent residence.

- ◯ Yes
- ◯ No

2.

1. What is the residential population of your town/city?

- ◯ 1 - 10,000
- ◯ 10,000 - 100,000
- ◯ 100,000 - 500,000
- ◯ 500,000 or more

2. How do you describe your community?

- ◯ Inner-City
- ◯ Suburban
- ◯ Rural

3. Early Warning Systems

1. Does your community have an Early Warning System that warns the public of impending disasters?

- ☐ Yes
- ☐ No
- ☐ I don't know

Early Warning Systems Survey

2. What type(s) of Warning System(s) does your community have in place? (check all that apply)

- [ ] Reverse 911 (911 Center calls the phones of affected areas)
- [ ] Sirens
- [ ] Sirens with Voice Loudspeakers
- [ ] Radio / TV Emergency Broadcasting
- [ ] Warning Bells
- [ ] Warning Lights
- [ ] Fire Dept. Siren / Horn Blasts
- [ ] Other

3. Has your community ever been alerted to danger using an Early Warning System?

- ◯ Yes
- ◯ No
- ◯ Not Sure

4. Please select the Warning Systems that you have experienced during an actual emergency. (check all that apply)

- [ ] Reverse 911 (911 Center calls the phones of affected areas)
- [ ] Sirens
- [ ] Sirens with Voice Loudspeakers
- [ ] Radio / TV Emergency Broadcasting
- [ ] Warning Bells
- [ ] Warning Lights
- [ ] Fire Dept. Siren / Horn Blasts
- [ ] Other
- [ ] I've never experienced any type of warning system activation

4. Effectiveness of Warning Systems

Early Warning Systems Survey

1. Excluding Television and Radio News Shows...have you experienced impending danger (ie. tornado, flooding, severe weather, etc.) in which you were NOT alerted by effectively by some type of early warning system?

- ◯ Yes
- ◯ No

2. How satisfied are you with the present warning systems that are in place within your community?

	N/A	Very Satisfied	Satisfied	Somewhat Satisfied	Not Satisfied
Reverse 911 (911 Center calls the phones of affected areas)	◯	◯	◯	◯	◯
Sirens	◯	◯	◯	◯	◯
Sirens with Voice Loudspeakers	◯	◯	◯	◯	◯
Radio / TV Emergency Broadcasting	◯	◯	◯	◯	◯
Warning Bells	◯	◯	◯	◯	◯
Warning Lights	◯	◯	◯	◯	◯
Fire Dept. Siren / Horn Blasts	◯	◯	◯	◯	◯
Other	◯	◯	◯	◯	◯

3. Do you have any suggestions for your municipal government to improve the methods in which you are notified of impending emergencies? (example - Educate the public about existing systems, purchase loudspeakers, etc.)

5. Conclusion

Early Warning Systems Survey

1. As it relates to your town/city, select your confidence level in its ability to produce immediate awareness to its residents and businesses regarding impending danger.

- ◯ Very Confident
- ◯ Confident
- ◯ Somewhat Confident
- ◯ Not Confident
- ◯ I am not familiar with any early warning systems in my community.

Appendix B

Early Warning Systems Survey

1. Do you live or work in the City of Atlanta, Georgia? If NO...answer the remaining questions for your permanent residence.

	Response Percent	Response Count
Yes	37.0%	30
No	**63.0%**	**51**
	answered question	**81**
	skipped question	**2**

2. What is the residential population of your town/city?

	Response Percent	Response Count
1 - 10,000	13.7%	7
10,000 - 100,000	**45.1%**	**23**
100,000 - 500,000	33.3%	17
500,000 or more	7.8%	4
	answered question	**51**
	skipped question	**32**

3. How do you describe your community?

	Response Percent	Response Count
Inner-City	8.0%	4
Suburban	**80.0%**	**40**
Rural	12.0%	6
	answered question	**50**
	skipped question	**33**

4. Does your community have an Early Warning System that warns the public of impending disasters?

	Response Percent	Response Count
Yes	**75.6%**	**34**
No	17.8%	8
I don't know	11.1%	5
answered question		**45**
skipped question		**38**

5. What type(s) of Warning System(s) does your community have in place? (check all that apply)

	Response Percent	Response Count
Reverse 911 (911 Center calls the phones of affected areas)	44.2%	19
Sirens	44.2%	19
Sirens with Voice Loudspeakers	20.9%	9
Radio / TV Emergency Broadcasting	**65.1%**	**28**
Warning Bells	2.3%	1
Warning Lights	0.0%	0
Fire Dept. Siren / Horn Blasts	14.0%	6
Other	2.3%	1
answered question		**43**
skipped question		**40**

6. Has your community ever been alerted to danger using an Early Warning System?

	Response Percent	Response Count
Yes	**53.3%**	**24**
No	20.0%	9
Not Sure	26.7%	12
answered question		**45**
skipped question		**38**

7. Please select the Warning Systems that you have experienced during an actual emergency. (check all that apply)

	Response Percent	Response Count
Reverse 911 (911 Center calls the phones of affected areas)	11.4%	5
Sirens	40.9%	18
Sirens with Voice Loudspeakers	18.2%	8
Radio / TV Emergency Broadcasting	**52.3%**	**23**
Warning Bells	2.3%	1
Warning Lights	0.0%	0
Fire Dept. Siren / Horn Blasts	15.9%	7
Other	4.5%	2
I've never experienced any type of warning system activation	18.2%	8
answered question		**44**
skipped question		**39**

8. Excluding Television and Radio News Shows...have you experienced impending danger (ie. tornado, flooding, severe weather, etc.) in which you were NOT alerted by effectively by some type of early warning system?

	Response Percent	Response Count
Yes	46.4%	32
No	**53.6%**	**37**
	answered question	**69**
	skipped question	**14**

9. How satisfied are you with the present warning systems that are in place within your community?

	N/A	Very Satisfied	Satisfied	Somewhat Satisfied	Not Satisfied	Response Count
Reverse 911 (911 Center calls the phones of affected areas)	**38.3% (23)**	13.3% (8)	21.7% (13)	10.0% (6)	16.7% (10)	60
Sirens	**31.0% (18)**	20.7% (12)	20.7% (12)	15.5% (9)	12.1% (7)	58
Sirens with Voice Loudspeakers	**44.8% (26)**	12.1% (7)	12.1% (7)	13.8% (8)	17.2% (10)	58
Radio / TV Emergency Broadcasting	8.3% (5)	**55.0% (33)**	21.7% (13)	10.0% (6)	5.0% (3)	60
Warning Bells	**64.3% (36)**	7.1% (4)	3.6% (2)	3.6% (2)	21.4% (12)	56
Warning Lights	**67.9% (38)**	3.6% (2)	3.6% (2)	3.6% (2)	21.4% (12)	56
Fire Dept. Siren / Horn Blasts	**45.6% (26)**	12.3% (7)	8.8% (5)	7.0% (4)	26.3% (15)	57
Other	**78.8% (26)**	0.0% (0)	3.0% (1)	3.0% (1)	15.2% (5)	33
			answered question			**66**
			skipped question			**17**

10. Do you have any suggestions for your municipal government to improve the methods in which you are notified of impending emergencies? (example - Educate the public about existing systems, purchase loudspeakers, etc.)	
	Response Count
	23
answered question	**23**
skipped question	**60**

11. As it relates to your town/city, select your confidence level in its ability to produce immediate awareness to its residents and businesses regarding impending danger.			
		Response Percent	**Response Count**
Very Confident		11.8%	8
Confident		25.0%	17
Somewhat Confident		**38.2%**	**26**
Not Confident		11.8%	8
I am not familiar with any early warning systems in my community.		13.2%	9
	answered question		**68**
	skipped question		**15**

Table 1

1.	Email alert.
2.	No
3.	In the ATL the Fire Dept. Siren/Horn Blasts do not work and are unsafe practices for personnel. They need to seek shelter as well.
4.	The municipal government should develop a warning system that will notified it citizens of the types of danger that are about to strike its communities. This system should be tested and allow the citizens to offer feedback on whether or not the system is working.
5.	Need to promote the use of weather radios and portable two-way radios. Also, the need for additional sirens should assessed.
6.	Need to purchase more loudspeakers and sirens for Forsyth county
7.	Add a Reverse 911 system
8.	You cannot hear well or understand the voice alert from the loudspeakers.
9.	Air-Raid Sirens
10.	educate people and early warning radios for homes and surrounding buildings
11.	A loudspeaker on a "main strip" of traffic in each area would certainly be helpful. Also having one practice drill every 6 mths to gather in a key for further instructions OR turn to a PSA channel at a certain time for further instructions would give an idea as to how many people are being reached at any one time.
12.	Install a warning system using another form of broadcast aside from radio/tv.
13.	Re-open the necessary fire stations so they can continue to notify us of emergencies and then respond to us when the emergency hits.
14.	Horns strategically placed on school buildings
15.	THE EXAMPLES WOULD BE GOOD
16.	Ice Alert system
17.	We could certainly install a speaker system throughout the community and also we could beef up our education efforts to make people more aware of what we do have.
18.	None
19.	Yes, more education programs
20.	I would like for the county I live in to purchase a or some systems.
21.	Pay those firemen more :-)
22.	Add loudspeakers