Best Practices of Rural and Small Urban Transportation Systems for Decreasing the Impact of Natural Disasters

William D. Cooper, Ph.D.
Principal Investigator

L. Milton Glisson, Ph.D., C.P.M
Co-Principal Investigator

Urban Transit Institute

Transportation Institute
North Carolina Agricultural & Technical State University

B402 Craig Hall
1601 East Market Street
Greensboro, NC 27411
Telephone: (336) 334-7745   Fax: (336) 334-7093
Internet Home Page: http://www.ncat.edu/~traninst

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16. Abstract

   The purpose of this study is to identify and compare the planning procedures used by rural and small urban transportation systems to safeguard assets and to decrease the impact on services during periods of natural disasters. To accomplish this goal, the researchers will focus on the effects of Hurricane Isabel, which hit the North Carolina coast on September 18, 2003. Six counties, three in North Carolina and three in Virginia that suffered the most significant damage were selected for study. An intensive study was conducted, which isolates those planning procedures that worked best and determined the causes for that procedure success.

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TABLE OF CONTENTS

LIST OF TABLES

EXECUTIVE SUMMARY

The purpose of this study is to identify and compare the planning procedures used by rural and small urban transportation administrators to safeguard assets and to decrease the impact on services during periods of natural disasters. To accomplish this goal, the researchers focused on the effects of Hurricane Isabel, which hit the North Carolina coast on September 18, 2003.

The research centered around six counties; three in North Carolina and three in Virginia, all of which suffered an extremely high degree of damage. The study identifies the plans and procedures developed by rural and small urban county administrators that affect the transportation system during a natural disaster. Some counties had the personnel and monetary resources to handle their own situations. Other counties that were not so fortunate, in terms of resources, had to go it alone or teamed up with a neighboring county, pooled their common resources, and dealt with the ravages of a natural disaster.

Out of this common experience of dealing with a natural disaster, these counties collectively developed a number of "Best Practices" as outlined below. These are the steps they took, first to minimize the potential damage of a devastating natural disaster and, second, to recover from the damage that was inflicted over the county.

- All counties were found to have developed a comprehensive emergency plan for the transportation system to be used during a natural disaster. Moreover, several of the counties have identified problems that would affect the transportation system. These problems, mainly flooding and power outages, were being corrected.

- Most of the counties in the study updated their emergency plan annually. The remaining counties that did not update annually reviewed their emergency plan every five years.

- A chain of command must be established with a position within the organizational chart, entitled Director of Emergency Service or another position with similar duties. This individual generally reports directly to the county administrator and is responsible for getting the county ready for a natural disaster, make decisions during the disaster, and coordinate disaster relief after the event.

- The development of a readiness checklist is an absolute necessity to help the county administrator or Director of Emergency Service determines the best course of action during the natural disaster.

- Clear consistent goals of what should be accomplished during a natural disaster should be stated and known by county administrators. The goals should also be incorporated into the emergency plan.

- A "Table Top" test of the emergency plan should be accomplished annually with a full "Mock Test" every five years.

- Immediately after a natural disaster, while memories are still fresh, a debriefing should be conducted with all county administrators (i.e., County Manager, Director of Emergency Management, Sheriff, and Fire Chief) and any other individual who had command responsibility during the disaster.

- Counties need to have a language specialist available during and after the disaster. This will become more of a concern as the number of non-English speaking individuals increase within each county.

It will behoove any county to do everything it can to prepare for the eventuality of a disaster, natural or manmade, because of the turbulent times of today. With the very recent events of the beginning of the 2005 hurricane season and the devastating actions of terrorists in London, England, every county must be prepared to expect the worst. Be it ever so old and quaint, nothing expresses this necessity better than the old saying, "An ounce of prevention is worth a pound of cure." In short, prevent whatever you can and be prepared for what you cannot prevent.

1. **INTRODUCTION**

Description of Research Project

On September 18, 2003, Hurricane Isabel hit the North Carolina coast with winds in excess of 100mph. Damage from this storm was extensive, which was reflected in the fact that 59 counties in North Carolina were declared major disasters. Several states (Virginia, Pennsylvania, West Virginia, Maryland, Delaware, and others) also suffered extensive damage. Fortunately, Hurricane Isabel was a slow-moving storm that allowed the weather bureau to not only predict location of landfall but gave ample time to notify residents and government officials to prepare for the on-coming natural disaster. *(1)*

This study will focus on six counties, three in the state of Virginia and three in the state of North Carolina. The study will identify the type and extent of the plans taken by rural and small urban county administrators that affect their individual transportation systems during a natural disaster. Once identified, an evaluation of the effectiveness of these plans will be made in order to determine the "Best Practice" that should be used. Contained within the introduction section is a discussion of Recent Natural Disasters, Effects of Natural Disasters on Human Behavioral, and Effects of Hurricane Isabel.

Recent Natural Disasters

Records of the National Hurricane Center in Miami, Florida, indicate that 15 tropical or subtropical storms formed in the North Atlantic, Caribbean Sea, and the Gulf of Mexico during the 2004 hurricane season. Nine of these became hurricanes with six becoming major hurricanes, which are classified as a category three or higher on the Saffir-Simpson hurricane scale. The strongest hurricane was Ivan, which reached category five status. *(1)*

According to the National Hurricane Center's records, six of these hurricanes – Alex, Charley, Frances, Gaston, Ivan, and Jeanne – struck the United States in 2004; in addition to three tropical storms. Atlantic tropical cyclones were directly responsible for more than 3,000 deaths in 2004. The vast majority of these deaths were in Haiti due to rains from Jeanne. Based on the Center's records, unadjusted property damage in the United States is estimated at more than 42 billion dollars. This makes 2004 the costliest hurricane season on record. Charley is the second costliest, while Ivan ranks as the third costliest. The National Hurricane Center provides a summary of the 2004 hurricane season as follows in Table 1. *(1)*

TABLE 1
Hurricane Season, 2004

Classification	Name	Dates Max	Wind	Deaths	U.S. Damage ($mil)
H	Alex	31 July-6 August	102	1	5
TS	Bonnie	3-12 August	65	N/A	N/A
H	Charley	9-14 August	150	15	14,000
H	Danielle	13-21 August	105	N/A	N/A
TS	Earl	13-15 August	50	N/A	N/A
H	Frances	25 August-8 September	145	7	8,860
H	Gaston	27 August-1 September	75	8	130
TS	Hermine	29-31 August	40	N/A	N/A
H	Ivan	3-24 September	165	95	13,000
TD	Ten	7-9 September	35	N/A	N/A
H	Jeanne	13-29 September	120	3,000+	6,500
H	Karl	16-24 September	145	N/A	N/A
H	Lisa	19 September-3 October	75	N/A	N/A
TS	Matthew	8-10 October	45	N/A	N/A
TS	Nicole	10-11 October	50	N/A	N/A
TS	Otto	30 November	50	N/A	N/A

Legend: N/A-Not Available; H-Hurricane; TS-Tropical Storm; TD-Tropical Depression
Source: ftp://ftp.met.fsu.edu/pub/weatheer/tropical/Outlook-A/00latest

Ivan. Hurricane Ivan was a classical long-lived Cape Verde hurricane that made two landfalls along the United States' coast and, as mentioned, reached category 5 status/strength three different times. Ivan developed from a vigorous tropical wave that moved across the West Coast of Africa. It became a tropical storm on September 3, 2004, a hurricane early on September 5, and a major hurricane later that same day. Ivan steered a westward path for the next several days and passed over the Southern Windward Islands where it caused considerable damage and loss of life. Grenada was especially hard hit by Ivan. *(1)* This hurricane moved west by northwest crossing the southern Caribbean Sea; passing just north of Venezuela and the Netherlands Antilles. Category 5 strength was reached while it was over the central Caribbean Sea early on September 9. It had dropped back in strength to category 4 before passing just south of Jamaica on September 11, but then oscillated between categories 4 and 5 until passing through the Yucatan Channel on September 14. For three days, Ivan moved slowly north-westward to northward over the Gulf of Mexico while it weakened. It made landfall early on September 16 near Gulf Shores, Alabama as a category 3 hurricane. The once category 5 hurricane had been weakened but went into the Gulf of Mexico on September 21 where it, again, became a tropical storm on September 23 only to make landfall over extreme Southwestern Louisiana on the 24th of September and finally dissipated inland over East Texas later that day. *(1)* Ivan is directly blamed for 95 deaths, including 39 in Grenada, and 26 in the United States. Damage in the U.S. is estimated to be $13 billion. *(1)*

Effects of Natural Disasters on Human Behavior

Often times, getting people to leave a hurricane's path is no easy matter. Emergency officials not only have to consider how they word the message they are trying to get out, but how it is delivered. *(2)* According to William W. Waugh, Jr., a Public Administration Professor at Georgia State University who has studied the 'Psychology of Evacuation.' "It's a fine art in terms of being able to provide enough information for people to heed the warning – to understand it and heed it." *(2)*

Research tends to support certain generalizations about evacuations. For instance, women are more likely to evacuate than men; people who have an extended family in the affected area are more likely to leave; and tourists and/or renters are more likely to evacuate than property owners. However, 14 percent of respondents would not evacuate under any circumstances. The same Mason-Dixon poll also suggested that people often base their decision to stay put on erroneous assumptions, such as putting masking tape on windows keeps them from shattering. Jay Baker, a behavioral geographer who has studied evacuations at Florida State University, found that 20 percent of the people surveyed on North Carolina's Outer Banks felt their homes were safe even in a 155-mph storm, a notion that is absurd for all but the most bunker-like residences. *(2)*

Studies, like the one by Mr. Baker, the behavioral geographer, indicates that the more personal the appeal, the more likely people are to heed the evacuation order. But for those areas that do not have the personnel to knock on every door, there are services such as Reverse 911. *(2)* This program refers to the Indianapolis-based firm that has the capability of making hundreds of thousands of telephone calls per hour in areas targeted for evacuation. While the company offers a canned, automated voice, its President urges customers to have a recognizable local official – the mayor, sheriff or a popular politician – record the alert message in order to give it a more personal touch. *(2)* The hurricane names we will see used this storm season, between June 1 and November 30, 2005, are the following:

- Arlene
- Bret
- Cindy
- Dennis
- Emily
- Franklin
- Gert
- Harvey
- Irene
- Jose
- Katrina
- Lee
- Maria
- Nate
- Ophelia
- Philippe
- Rita
- Stan
- Tammy
- Vince
- Wilma

Effects of Hurricane Isabel

Hurricane Isabel, rated by the National Weather Service as a category 2 storm, caused significant damage to the Mid-Atlantic region. This storm created havoc throughout North

Carolina, Virginia, West Virginia, Maryland, Pennsylvania, and Ohio. Other states and cities affected were the District of Columbia, Delaware, New Jersey, and Rhode Island. *(3)*

Although Hurricane Isabel was not an unusually powerful storm, the destruction the storm caused was widespread. The National Weather Service preliminary post-storm report stated that Isabel will be remembered for the greatest wind and storm surge in the Mid-Atlantic region since Hurricane Hazel in 1954 and the Chesapeake-Potomac Hurricane in 1933. Isabel also caused extensive power outages and numerous trees were fallen. *(4)*

The Department of Energy's Office of Energy Assurance (OEA) reported the energy impacts from Hurricane Isabel were among the most severe in history. "Power outages affected over 6.5 million customers at the storm's peak. Utility crews were stretched to their limits, even with assistance from mutual aid crews . . . . Even Hurricane Andrew, by far the most costly of all hurricanes with insurance cost of $19.8 billion (adjusted to 2002 dollars) resulted in only 1.3 million power outages…." *(4)*

Hurricane Isabel caused the most extensive power outages ever in the state of Virginia. *(4)* To illustrate the level of damage one could look at Dominion Virginia Power (DVP), the largest utility within the state. Of DVP's 2.1 million customers, approximately 1.71 million (or 81.3 percent) lost power, some as long as 15 days. By contrast, DVP lost about 800,000 customers for up to five days from Hurricane Floyd in 1999 and in 1996, Hurricane Fran caused 540,000 customers to lose power for up to six days. Neither storm caused as much system-wide damage to the DVP's system as Hurricane Isabel. *(5)*

To summarize, while Hurricane Isabel was not one of the strongest hurricanes to hit the east coast of America, it did result in record level power outages and massive destruction of the area's infrastructure. It was determined that while the number of electrical consumers impacted from major storms has been increasing due to increasing customer density and tree growth, there has been no parallel increasing trend in the length of time to complete the restoration of service following major storms over the last 30 years. *(6)* The reason for this development could be, in part, because utilities have been able to adapt to the increases in the number of customers experiencing outages and destruction to their infrastructure through improved planning, advances in information technology, and the ability to manage an increasing number of contracted personnel external to the utility. It should be noted; Hurricane Isabel resulted in outages of unprecedented number and duration. *(5)* The utilities believed that the record-level energy impacts caused by Hurricane Isabel were the result of a combination of factors that were generally not controllable. These were the widespread nature of the individual storms and the heightened susceptibility to tropical-storm-force winds on those trees existing outside of the utilities' rights-of-way. Expert judgment, anecdotal evidence, and expenditures on tree cleanup support this conclusion. *(5)*

In Virginia, data from the forest inventory published by the U.S. Forest Service *(7)* and the hurricane damage estimate provided by the Virginia Department of Forestry *(8)*, determined that Hurricane Isabel damaged nearly 100 million trees. The City of Richmond estimated that it lost as many as 10,000 trees as a result of Hurricane Isabel.

2. LITERATURE REVIEW

The literature review is designed to accomplish four specific tasks. Its first task is to define the concept of Best Practices as it relates to transportation and emergency preparedness. For this study, the term Best Practices is defined as providing solutions that represent superior performance when adapted and implemented in one's own organization, including processes and procedures that others are using to transport people and materials during a natural disaster.

The second task of this literature review is to determine the appropriateness of using "Best Practices" in transportation research. The authors found the method of research called Best Practices not unique to this study, but used in a variety of papers, particularly in the field of transportation. For example:

Donald N. Rothblatt and Steven B. Colman, *Best Practices in Developing Regional Transportation Plans*, Mineta Transportation Institute, San Jose State University, September, 2001.

Researchers Rothblatt and Colman used Best Practices to conduct a study on developing plans for regional transportation. In their study, Rothblatt and Colman compare Metropolitan Planning Organization (MPO) Regional Transportation Plans and planning processes in California with selected regions. These researchers selected seventeen MPO to form a base for making recommendations as to how best prepare a regional plan.

Philip J. Tarnoff, *Transportation Research and Development: Investing in the Future*, Institute of Transportation Engineers (ITE), U.S. House of Representatives Science Subcommittee on Environment, Technology and Standards, April 10, 2003.

Researcher Philip J. Tarnoff noted the need to identify best practices of incorporating operations and safety into the planning process. The ITE recommended extensive research should be conducted in several areas, each focusing on the needs and opportunities for enhancing transportation operations. Moreover, the ITE noted additional research areas that best practice methods could be used:

- Transportation system integration and management;
- Jurisdictional cooperation and communication among multiple transportation organizations, law enforcement, emergency response, and media for real-time transportation emergency management;
- Regional operation and resource sharing for project and programming decisions;
- Implementation of performance measures related to customer service, agency accountability, real-time monitoring, results outcomes over output, and instrumentation (enabling infrastructure) and data; and
- Research and deployment of data collection and use, including technology for data collection, sampling, and simulation modeling to augment system performance data.

Homeland Plans Corporation, *Home Matrix*, 2001-2003.

A Home Matrix is an assessment matrix that allows one to quickly survey a large number of safety topics that are relevant and to reduce thousands of pages of information into a more manageable form. From this matrix, an action-oriented plan that is relevant and concise would be created.

The vertical portion of the matrix listed considerations for which the governmental unit was responsible (i.e., transportation, communication, disabled persons, senior citizens water supply and power sources). The horizontal portion of the matrix was labeled with hazards that could affect the governmental unit (i.e., flash floods, thunderstorms, tornados, radiation exposure, hazardous materials, gases, nuclear, fire, and terrorism).

Based on the selection in the matrix, a best practice report consisting of a collection of individual reference cards, each containing expert advice and useful information on one or more topics would be developed. Each card displayed the title of the best practice, the author, and a hazard and consideration key, showing to which cell of the matrix the best practice applied.

The Homeland Plan encourages the governmental unit to personalize the assessment matrix and the reference cards that are the products of the matrix to meet the needs of each organization. By highlighting key points from within the best practice method, pertinent details will be easily found and a date-sensitive action item quickly found.

Michael Replogle, *Best Practices in Transportation Modeling for Air Quality Planning*, The Environmental Defense Fund, Dec. 15, 1991.

The author developed five quality-planning principles that should be included when using Best Practices methodology. These are:

1. Best Practices should be performance-oriented, rather that process-oriented, to encourage innovation.
2. Standards for Best Practices should be set at a high level, reflecting the state-of-the-art, rather than at the lowest common denominator.
3. Standards should not be static, but should be updated frequently to respond to rapid advances.
4. Recognition should be given to the poor state of the practice in many regions and the time, cost, and physical energy necessary to improve the system.
5. While improved systems are being developed, simpler techniques that provide policy sensitivity to key factors should be put to use as soon as possible for interim conformity.

In a related study that focuses on computer security, three members of the Chief Information Officer (CIO) Executive Council presented eight best practices for the building, testing, and deployment of disaster recovery plans entitled:

Martha Heller, *Eight Best Practices for Disaster Recovery*, **CIO Magazine, Nov. 15, 2005.**

The practices recommended include several recommendations that are applicable to a wide range of situations. These recommendations are:

1. Dedicate and Empower Staff: Dedicate a department within IT to manage business continuity planning and disaster recovery.
2. Divide and Conquer: In order to ensure business involvement, the entity needs to develop and maintain a business continuity plan and a separate disaster recovery plan, each with its own governance and goals. For disaster recovery, the goal is technical recovery while business continuity is business process stability.
3. Make Sure the Plan Can Stand Alone: When a disaster strikes, the staff member who wrote the recovery plan may not be available to execute it.
4. Challenge the Business: Determining the right people to involve as well as the services to recover is part of the negotiation process.
5. Align Disaster Recovery with Application Development: Incorporate disaster recovery in the application development process. Test the environment to determine if the disaster recovery plan and current applications are functioning.
6. Tabletop Tests Won't Cut It: Regularly reviewing your plan on paper is important but it is not enough. In addition to tabletop tests, mock disasters that might affect a crisis management team frequently help. The crisis management team should be made up of staff and board personnel.
7. Try (and Test) Before You Buy: Test the system before you fully implement the disaster recovery plan.
8. Hold Postmortems and Adjust: As you test a system, document what went wrong and use that report to make improvements.

Andrew Nash, *Best Practices in Shared-Use High-Speed Rail Systems*, **Mineta Transportation Institute, San Jose State University, June 2003.**

The researcher, Andrew Nash, started with the premise that there might be European strategies and practices that were unknown in the United States on how to improve shared-use, high-speed rail systems. His study focused on how the European strategies were applied, their importance, and recommendations from planners who have experience building and operating shared-use high-speed rail systems.

Joana Conklin, Carol Schweiger, and Buck Marks, *Rural Transit ITS Best Practices*, **FHWA-OP-03_77, 2003.**

The Conklin, et al., study identified operational best practices and related technology for applying ITS to rural transit. The researchers, Conklin, Schweiger, and Marks assembled information gathered through case studies from several rural transit agencies to produce the Best Practices recommendations.

The third task of our literature review is to determine the magnitude of the natural disaster (Hurricane Isabel) we wish to study. The researchers wanted to determine if the natural

disaster chosen was significant enough to alter normal operational activities of rural and small urban communities. This phase of the study was easily completed by reviewing the Web sites for FEMA and the Department of Emergency Management for both North Carolina and Virginia.

It was found that Hurricane Isabel knocked out power to more that 3.5 million people, swamped tidal communities, uprooted trees, disrupted air traffic, and shut down the nation's capital. President Bush immediately declared a number of cities and counties in North Carolina, Virginia and other states federal disaster areas. As of October 2, FEMA reported that $36 million in disaster aid was approved for North Carolina and that 18,264 individuals had applied for assistance. These numbers have continued to grow in the intervening period.

The fourth and last task of our literature review is to determine if there exists any publications that would identify the types of activities that a rural or small urban transportation system needs to perform to prepare for an emergency. The principle and most current documents found were:

John N. Balog, Annabelle Boyd, and James E. Caton, *The Public Transportation System Security and Emergency Preparedness Planning Guide***, DOT-FTA-MA-26-5019-03-01, 2003.**

This study's focus ranged from the vulnerability of the nation's infrastructure to major events, including terrorism. The authors offer practical guidance for planning effectively, spending wisely, and making the public transportation infrastructure safer. This study builds on two previous Federal Transit Administration publications: "Transit System Security Program Planning Guide" and "Transit Security Handbook." The guide is based on research to identify practical steps that systems can take to better prepare for *all emergencies*. Another study of importance was written by:

Alan Goforth, *Transit's Role in Emergency Response***, Wiregrass Transportation Authority, 2002.**

In this paper, Alan Goforth identified general guidelines that should be taken for each critical stage of an emergency. These stages are:
- Before it happens
- During notification and deployment
- During evacuation
- After it subsides

Within each stage, the author lists specific steps that should be taken to improve emergency response.

The authors noted that foreign researchers found that best practice methods are also useful. One such author is Fumiaki Yoshimura.

Fumiaki Yoshimura, *Disaster Risk Management through Hazard Analysis: Best Practices in Japan***, Asia Disaster Reduction Center, 2001.**

Yoshimura noted that continued population growth and unplanned urbanization, combined with environmental changes such as deforestation and desertification, have increased the frequency of natural disasters and magnified the damage caused by them, specifically in the developing countries of the Asian Region. Using a map to analyze hazardous areas, the author was able to identify the best practices for dissemination of evacuation-related information, selecting spots for shelters, and evacuating routes. In another international study:

Toward Wise Coastal Practices for Sustainable Human Development, Environment and Development in costal regions and in small Islands (CSI), **UNESCO-Paris, 1999**.

This study introduced the concept of wise practices for sustainable costal development. UNESCO, in large part, used the same methodology favored by previous researchers to identify wise practices that could by used by many countries to enhance coastal development. The pooling of accumulated experiences and expertise for the purpose of adapting them to national, regional, and local government units, as being those protocols most responsive to site specificity, are concepts used by other best practices researchers.

There are a couple of additional resources and contacts that may be of value to the reader; these are as follows:

L.L. Higgins, C. W. Gilliland, & M. D. Hickman. *Emergency Management Guidebook Helps Transit Agencies Prepare for Crises***, http://tti.tamu.edu/product**.

This guidebook (which costs $5.00) explores the roles and activities of transit sytems during a crisis and helps the reader to develop emergency plans together with local governmental entities.

And lastly:

*Preparedness***. Community Transportation Magazine, Winter 2001-2001 http://www.ctaa.org/ct/winter 2002**.

This publication examines the role of transportation during an emergency.

3. RESEARCH METHODOLOGY

To accomplish this research proposal, six counties were selected, three each in North Carolina and Virginia, that suffered the most damage. This selection was based on reports issued by the Human Services Division of both North Carolina Emergency Services and the Virginia Emergency Services. The three counties identified in North Carolina were Pasquotank, Chowan, and Hertford. These three North Carolina counties are contiguous to each other at some point. Perquimans County is also contiguous to all three counties, but was not included in the study.

Selection of these counties appears reasonable since the eye of the storm, after leaving

the Atlantic, went through these counties. The three counties most affected by Hurricane Isabel in the State of Virginia were Greensville, Sussex, and Southampton. The Virginia counties selected were along the state line with North Carolina and close to the North Carolina counties chosen.

After selecting the counties, the researchers developed a questionnaire that would assist them in determining what kind of transportation system the county operates, what emergency operating systems/programs were in place at the time of the emergency, what protective measures were taken by the transportation system, and the effectiveness of each measure. To accomplish this goal the questionnaire was divided into five major sections:

1. General Information
2. Before Disaster Occurs
3. During Notification and Deployment
4. During Evacuation
5. Post Disaster Evaluation

Once the questionnaire was completed, it was mailed to the six county administrators/ managers for their input and comments. When initial contact was established to send the questionnaire, an appointment (day, date, and time) was established when the investigators could meet with each county manager and review each question to assure both parties that (1) the questions were understood by the respondents; and (2) the answers were understood by the investigators. The combining of the two methodologies of mail questionnaire and personal interview increases both the validity and the reliability of the responses and, as in this case, assures a 100 percent response rate. The combining of these two methodologies is possible in a situation where the universe being investigated is relatively small. It would be too expensive and require too much time in a situation where the universe under investigation consists of several hundred or several thousand respondents. The geographical location of these counties under investigation and their administrative respondents, in this particular study, also contributed to the combining of two very distinct research methodologies.

4. QUESTIONNAIRE DEVELOPMENT

The questionnaire is divided into five major subsections: General Information, Before Disaster Occurs, During Notification and Deployment, During Evacuation, and Post Disaster Evaluation. Justification for using these subsections came from an article entitled "Transit's Role in Emergency Response" written by Alan Goforth. In addition to the subsections developed by Goforth, many of his suggestions for implementing the goals of the subsections were incorporated into the questionnaire.

A brief description of the purpose of each of the subsections, together with an analysis of each question in that subsection, is presented below:

General Information

In order to obtain an overview of the resources of each county, both economic and physical, the authors developed nine questions. These questions concerned location, size,

population, principle product, largest city, county seat, and location of a trauma center. It was hoped that this information would help the authors better understand the resources and limitations that confront the county administrator. The last question in this subsection requested the respondent to provide a copy of the county government organizational chart. The authors focused on the administrative relationship that exist between the Director of Emergency Management, County Manager, County Sheriff, and any other individual(s) in a administrative position who are affected by a natural disaster.

Before Disaster Occurs

This subsection contains eleven questions. The principle focus of this subsection was the emergency planning that took place before the natural disaster occurred. Goforth wrote in his article, "It's always better to have too much information at the beginning, then winnow it down to a workable plan." Also, it should be noted that any emergency plan developed needs to be periodically updated to maintain its relevancy.

The first three questions in this subsection directly addressed the central focus of this subsection: the existence of an emergency plan for the transportation system, problems that the transportation system would encounter, and how often the emergency plan was updated.

Questions four through six identified individuals responsible for emergency planning and the availability of a readiness checklist. Question six tried to denote the goals of the emergency plan. Many of the counties listed more than one goal an in several cases ranked the goals of the emergency plan by degree of importance.

Question seven and eight focused on how much of the county resources were allocated to emergency planning. Futher, question eight asked the respondent to allocate the emergency plan by category (i.e., food, trucks, emergency equipment and other items).

Questions nine through eleven asked the responded to note how often was the emergency plan tested and whether the county had a process for identifying necessary improvements. The last question in this subsection, question eleven, concerns the frequency of inspections conducted on equipment that would be used during an emergency.

During Notification and Deployment

A well-designed emergency plan will minimize not only the miss allocation of assets but minimize the time necessary to make important decisions and thus save lives. It should be noted, however, that no emergency plan, no matter how skillfully written, will totally eliminate the chaotic and changing environment that surrounds a natural disaster. To overcome this problem, an emergency plan must be structured in a manner so that it can quickly adapted to situational changes. Questions in this subsection, there were eight, were designed to measure how quickly the county would be able to react to unexpected changes.

Questions one and two addressed how the county was notified of and impending natural disaster and, in turn, how the citizens of the county were notified by the county.

Questions three through five ask the responded to identify the procedures used to notify groups that might have special problems with evacuation. Examples of these groups were: hearing impaired, special care groups, non-English speaking groups, public schools, hospitals, and nursing homes.

Questions six through eight focused on how the county allocated their assets, changes in chain of command, and if the county established staging areas to gather and monitor assets. The purpose of this was two fold. First, the researchers wanted to determine how quickly the county reacted to changes created by a natural disaster, and second, if the goals stated by the county in subsection B – Before Disaster Occurs – were being implemented.

During Evacuation

Activities during this subsection concentrate on how the county accomplishes the emergency plan. Specific attention was given to assets, personnel, and chain of command during the natural disaster.

There were four questions in this subsection. Question one pinpoints the type of facility the county uses to shelter displaced people. Examples noted were schools, hospitals, churches, community centers, and national guard armories.

Question two targets how the county moves displaced persons to safe areas. Examples include sheriff vehicles, national guard vehicles, fire department vehicles, church buses, school busses, and county transit equipment.

Questions three and four focuses on those individuals in charge during the natural disaster. This is accomplished by noting individuals given authority to call for an evacuation and also noting who has responsibility for activating shelter. Differences may indicate a weakness in the emergency plan, because any ambiguity in the chain of command may cause a delay in implementation.

Post Disaster Evaluation

The purpose of this section is to measure how much support does the county government provide to its citizens after the natural disaster has abated. At the conclusion of a natural disaster, emergency support personnel are exhausted, but the needs of citizens are increasing as the extent of the damage becomes known. Therefore, the researchers developed six questions to measure the type of services provided and the length of time these services would be available.

Question one asked the responded to indicate the type of addition support provided beyond immediate emergency support. Respondents were encouraged to elaborate on the various type to services provided to their citizens. Moreover, the responded noted how long these services were provided.

Questions two and three were directed on how the county assess the needs of its citizens and noted who records complaints about the effectiveness of the emergency plan.

Questions four through six were concerned with how federal and state assistance were allocated to the county. The authors wanted the responder to identify the method(s) used by these outside governmental units to provide assistance. For example, were resources provided by the estimated dollar value of the damage, by actual number of people injured, or by the number of filings by citizens asking for assistance?

**BEST PRACTICES OF RURAL AND SMALL URBAN TRANSPORTATION SYSTEMS
FOR DECREASING THE IMPACT OF NATURAL DISASTERS**
<u>Questionnaire</u>

A. <u>General Information:</u>

1. Name and Location of County: Name: _____
   a. ☐ North Carolina   c. ☐ Coastal   e. ☐ Contiguous to another state
   b. ☐ Virginia   d. ☐ Inland   f. ☐ Contiguous to N.C. counties

2. Size of County:
   a. Area in square miles: _____   b. Population: _____

3. Principle product of the county: _____

4. Largest city in county: _____ ; Population _____

5. Name of County Seat: _____

6. Does your county have a trauma center or 24-hour hospital?   a. ☐ Yes   b. ☐ No

7. Name of Respondent: _____

8. Respondent's Position: _____

9. Obtain a copy of the organizational chart of the county government. a. ☐ Yes   b. ☐ No

B. <u>Before Disaster Occurs</u>

1. Does your county have an emergency plan for the transportation system during a natural disaster?
   a. ☐ Yes   b. ☐ No (If "No", Skip Section B; Complete Sections C, D, and E only)

2. Have you identified problems that your transportation system would encounter during a natural disaster?
   a. ☐ Yes   b. ☐ No   c. If "YES", please identify at least 1 or 2 major problems:

   _____
   _____
   _____

3. How often do you update emergency plans?
   a. ☐ Annually   c. ☐ Once every 3 years   e. ☐ After a Disaster   g. ☐ Other
   b. ☐ Bi-annually   d. ☐ Once every 5 years   f. ☐ Emergency Planning Office

4. Please identify the office/position responsible for emergency planning.
   a. ☐ Director of Emergency Management   c. ☐ County Manager
   b. ☐ County Sheriff   d. ☐ Other: _____

5. Do you have a readiness checklist? (A list that identifies duties of key personnel at various times before a disaster occurs?) a. ☐ Yes   b. ☐ No   c. ☐ Is one available?

6. What goals do you want to accomplish during a natural disaster? (Check all that apply)
   a. ☐ Preservation of life   d. ☐ Establishing control
   b. ☐ Preservation of property   e. ☐ Restoration of critical services mitigation
   c. ☐ Mitigation of the hazard or threat   f. ☐ Other: _____

7. Please estimate how much of the county budget is allocated to emergency disaster planning?
   a. Dollars: $_____   b. Percent of Budget: _____%

8. How much of the county budget is allocated to the purchase of equipment and supplies that could be used during a natural disaster: **Dollar Value ($)** **Per Cent (%)**   **Sufficient?**

   a. Food, Clothing, Water: $_____   _____%   ☐ Yes ☐ No

   b. Trucks $_____   _____%   ☐ Yes ☐ No

   c. Emergency Equipment $_____   _____%   ☐ Yes ☐ No

   d. Other:_____ $_____   _____%   ☐ Yes ☐ No

9. How often do you test the emergency plan?

   a. Table Top Test: 1. ☐ 6 mo.   2. ☐ 1 yr.   3. ☐ 2 yrs.   4. ☐ Other_____

   b. Mock Test   1. ☐ 6 mo.   2. ☐ 1 yr.   3. ☐ 2 yrs.   4. ☐ Other_____

10. Do you have a process to identify necessary improvements?

    a. ☐ Yes   b. ☐ No   If "Yes", please explain. _____

    _____

11. How often are the assets that are to be used in natural disasters inspected to make sure they are in good working order? a. ☐ Monthly b. ☐ 6 Months c. ☐ Annually d. ☐ Annually e. ☐ Other_____

C. **During Notification and Deployment**

1. How is the county notified of an impending natural disaster**?**   (Check all that apply)

   a. ☐ National Warning System (NAWAS)   d. ☐ Telephone

   b. ☐ National Weather Service (NWS)   e. ☐ Satellite Communication

   c. ☐ Emergency Alert System (EAS)   f. ☐ Other: _____

2. How are citizens notified of an impending natural disaster ? (Check all that apply)

   a. ☐ National Warning System (NAWAS)   f. ☐ TV

   b. ☐ National Weather Service (NWS)   g. ☐ Car w/Speakers

   c. ☐ Emergency Alert System (EAS)   h. ☐ Sirens

   d. ☐ Telephone   i. ☐ House-to-House Alert

   e. ☐ Radio   j. ☐ Other: _____

3. Do you have any special or unique procedures for notifying the hearing impaired, special care groups, and non-English speaking groups?   a. ☐ Yes   b. ☐ No

   If "Yes", Please Describe: _____

   _____

   _____

4. Do you have any public schools, hospitals, nursing homes and other similar facilities throughout the county that would need to be notified of a natural disaster? a. ☐ Yes   b. ☐ No

5. How would you notify the organizations in question # 4? _____

   _____

   _____

6. How do you allocate your assets?

   a. ☐ To high-risk areas   c. ☐ Other: _____

   b. ☐ To high-population areas

7. During a natural disaster, is the chain of command altered for line personnel in the county government?

   a. ☐ Yes   b. ☐ No c. ☐ How?

8. Which of the following staging areas have you established for use during a natural disaster?
   a. ☐ Initial Staging Areas   c. ☐ Resource Staging Areas
   b. ☐ Secondary Staging Areas   d. ☐ No Staging Areas are Established

D. During Evacuation

1. Which of the following facilities are used as initial, secondary or resource staging areas during natural disasters? (Check all that apply.)
   a. ☐ Local School Building   c. ☐ Community Center   e. ☐ Church
   b. ☐ Hospital   d. ☐ National Guard Armory   f. ☐ Other: _____

2. How does your county move people to safe areas? (Check all that apply.)
   a. ☐ Sheriff Vehicles   c. ☐ Fire Department   e. ☐ School Busses
   b. ☐ National Guard Vehicles   d. ☐ Church   f. ☐ County Transit System
   g. ☐ Other: _____

3. Which individual/position has the authority to call for an evacuation?
   a. ☐ Sheriff   c. ☐ Fire Chief   e. ☐ Other: _____
   b. ☐ County Manager   d. ☐ Emergency Management Director

E. Post Disaster Evaluation

1. After a natural disaster, what types of additional support do you provide beyond immediate emergency support?
   a. ☐ Short-Term   b. ☐ Long-Term   c. ☐ None
   Discuss: Short-Term: _____

   _____

          Long-Term: _____

   _____

2. How do you assess the needs of the people?
   a. ☐ Demand   b. ☐ Control Center Response to requests for assistance
   c. ☐ Other _____

3. Who records complaints about the effectiveness of the emergency plan?
   a. ☐ Control Center   b. ☐ Office of Emergency Management
   c. ☐ Office of County Manager   d. ☐ Other_____

4. How do you determine if state or federal assistance is needed?
   a. ☐ Dollar Value of Damage   b. ☐ Number of people injured
   c. ☐ Other _____

5. How are state and federal assistance allocated to your county?
   a. ☐ Estimated Dollar Value of Damage   b. ☐ Number of people injured
   c. ☐ Number of Filings for Assistance   d. ☐ Other (identify)_____

6. How should federal/state assistance be allocated? Please discuss: _____

   _____

   _____

   _____

5. **DESCRIPTION OF COUNTIES AND RESULTS FROM QUESTIONNAIRES**

As indicated earlier, the study consisted of six counties; three in North Carolina and three in Virginia and their respective administrators/mangers. The North Carolina counties included Pasquotank, Chowan, and Hertford. The Virginia counties included Greensville, Sussex, and Southampton. General information about each of the counties follows.

North Carolina Counties

Pasquotank County

Pasquotank County is located on the upper northeast coastal edge of North Carolina. Its area is approximately 229 square miles with a population of 36,432. The county seat is Elizabeth City, a historic village with six national historic districts, located about one hour from the Outer Banks. Elizabeth City is also home to the largest U.S. Coast Guard Air Base. Pasquotank County, Camden County, and Elizabeth City have formed an organization called the Emergency Management Agency, which has a four-principal approach to emergency situations: (*9*)
- Preparedness
- Response
- Recovery
- Mitigation

Preparedness Emergency management is provided by the Pasquotank-Camden-Elizabeth City Emergency Management Agency in conjunction with other local agencies to develop plans for natural disasters (floods, hurricanes, or tornadoes) and manmade disasters (hazardous material spills, plane crashes, or terrorism). The Agency offers training and education programs to their emergency personnel. Exercises with government officials and local emergency responders are conducted to ensure that proposed plans operate properly. Other North Carolina counties and the North Carolina Division of Emergency Management are also included in these exercises to ensure that proper procedures are in place for coordination. *(10)*

Response The Pasquotank-Camden-Elizabeth City Emergency Agency works with a number of different agencies including local law enforcement, fire departments, emergency medical services, the Federal Emergency Management Agency (FEMA), the North Carolina Division of Emergency Management, the American Red Cross, and the Salvation Army to quickly assist the city, community, and counties in the event of a disaster. During an emergency, their Mobile Command Post is dispatched, which is equipped with radios, telephones, and other necessary equipment in order that the emergency responders can more effectively manage the incident. In case of a county-wide emergency, the local emergency operations center is activated in order that all agencies will be able to coordinate their efforts for a more effective response. *(10)*

Recovery Recovery activities revolve around the tasks of assisting the affected area(s) and its citizens to return life to normal or near-normal conditions, to the extent possible, following a disaster, as quickly as possible. If the community should experience a disaster, such as a hurricane, that has created wide-spread devastation, one would also see state and federal agencies, such as those identified in the "Response" paragraph above, assisting the local

agencies. In such times, all local, state, and federal agencies are dedicated to working together to provide restoration services to all members of the county, town, city, and state, if necessary. *(10)*

Mitigation Mitigation is the combined effort of local, state and federal governments to reduce the severity of an event and/or to eliminate the problems associated with disasters. This includes using such measures as building codes, land-use management, flood insurance, public education, statutes, and ordinates. In order to develop proper teamwork, all resources are linked through planning, direction, coordination, and clearly-defined functions. *(10)*

The emergency management agency and other health and human services agencies are very concerned with the special needs population of their region. It is extremely important to identify these individuals because of the many unique problems that may be encountered by this group of citizens. Therefore, they should be identified in advance of an emergency in order that the Agency be able to better plan and provide for their unique needs. *(11)*

Special Needs For Individuals During a disaster, certain individuals in a population may encounter unique problems. Therefore, it is important to identify them in advance of an emergency. As a result, a Special Needs Registry has been created for both Pasquotank and Camden Counties. If an individual has a mental or physical impairment, his/her level of care would go beyond the normal first-aid level found in a public shelter. All such individuals should be identified in the Register. Examples include those who suffer from impaired mobility, impaired eyesight, dialysis, or any other limiting condition, such as oxygen dependency, feeding tube, etc. Also included are the elderly, those living alone or who have other limiting impairments and would like to be checked on during a disaster should register. This is confidential information and will be shared with assisting agencies on a need-to-know basis only.

Hurricanes Due to of their geographical location, both Pasquotank and Camden Counties are vulnerable to hurricanes, the season for which runs from June 1 to November 30. Hurricanes develop from tropical depressions, sustained winds up to 38 mph, to tropical storms, winds ranging from 39 to 73 mph, which become hurricanes with winds of 74 mph and higher. The winds are a product of extremely low-pressure zones powered by moisture from the sea and heat from condensation that spiral downward counter-clockwise. If the barometer drops below 1.000 millibars, weather broadcasts should be monitored. The amount of damage from a hurricane is directly linked to the wind velocity of the storm. The National Hurricane Center uses the Saffir/Simpson scale that classifies storms into five categories:
- Category 1   Winds 74-95 mph
- Category 2   Winds 96-110 mph
- Category 3   Winds 111-130 mph
- Category 4   Winds 131-155 mph
- Category 5   Winds greater than 155 mph

It is important to remember that a hurricane does not need a direct hit to cause a great amount of damage. In addition, the course and intensity of a hurricane can change as it approaches land. Hurricane force winds can reach as fast as 200 mph or more as far out as 20 to 30 miles from the eye of the storm. The gale winds of a hurricane can extend 200 miles or more on the front side and trail hundreds of miles on the backside of the storm. The greatest threat

from hurricane winds is flying debris and the potential formation of tornadoes. Frequently, the most dangerous part of a hurricane is the northeastern quadrant. *(12)*

Chowan County

Political Structure Chowan County is the smallest county in land area in North Carolina with a population of approximately 14,500. There are three townships from which a total of seven Commissioners are elected; two Commissioners from each township and one at-large Commissioner. A County Manager is appointed by the Board of Commissioners and serves at the Board's pleasure. *(13)*

Geography and Demographics Median family income for Chowan County is $30,930. Per capita income is $15,027 for a population of 14,554 who live within a total area of 233 square miles, which has a land area of 172.75 square miles. Real estate is taxed within the townships at $0.3950/$100 valuation while real estate taxes in the county are $.73/$100 valuation. *(14)* The climate of Chowan County averages 60.9 degrees. The average for January is 42.3 degrees and for June 75.3 degrees. Annual rainfall averages 47.9 inches. Annual average snowfall is 4.6 inches and elevation is 19 feet above sea level. *(14)*

Education and Economic Vitality The Edenton-Chowan School System consists of two elementary schools, one middle school, and one high school. Housing subdivisions are located throughout Edenton and Chowan County for home building, which range in price from $80,000 to $450,000. Building permits have increased in the last five years. A number of apartment complexes have been built to meet the demand for rental housing.

Hertford Country

History and Geography Hertford County is located in the upper northeast courner of the state of North Carolina. The county was formed in 1759 and was named for Francis Seymour-Conway, the first Marques of Herford. The county is 356 square miles with a population of 22,601 taken from the 2000 census. The county is divided into six townships: Ahoskie, Harrellsville, Maneys Neck, Murfreesboro, St. Johns, and Winton. The county seat is Winton (956 population), but there are several other towns with larger population such as Ahoskis (4523 population) and Murfreesboro (2045) population.

Demographics The racial makeup of the county is:

37.5%	White
59.5%	Black or African American
3.0%	Others (consisting of Native American, Asian, and Hispanic)
100%	

There are 8,953 households out of which 30 percent have children under the age of 18 living with them, 45.80 percent are married couples living together, 19.50 percent have a female householder with no husband, and 30.30 percent are non-families. The median age is 39 years and for every 100 females there are 85 males. The age categories of the residents is as follows:

25.3%	Under 18 years
7.8%	Between 18 to 24
26.3%	Between 25 to 44
24.8%	Between 45 to 64
15.8%	Over 65 years
100%	

The median income for a household in the county is $26,422 and median income for a family is $32,002. Males have a median income of $26,730 versus $20,144 for females. The per capita income for the entire County is $15,641. 18.3 percent of the population and 15 percent of families are below the poverty line Out of the total population, 21.3 percent of those under the age 18 and 21 percent of those 65 and older are living below the poverty line. The county does not have a 24-hour hospital.

Business and Industry There are several large employers located in Hertford County, including a privately-run federal prison, a private college (Chowan College), a Nucor steel mill, several Perdue facilities, an aluminum extrusion facility in Winton, and a lumber processing facility in Ahoskie. These industries, combined with the normal local retail and restaurant business, give Herford County one of the lowest unemployment rates in northeastern North Carolina. Normally this area has lagged behind the rest of the state in terms of economic development. There are 547 private businesses employing 7,466 people. Minority-owned firms are 39.7 percent with women owning 30.3 percent.

Virginia Counties

Greensville

Geography and Population Greensville County is easily found because it is located at the intersection of U.S. Route 58 and the Intersection of I-95 in the Commonwealth of Virginia. The county is situated in the Piedmont and the Tidewater Regions. It is bound on the north side by Sussex and Dinwiddie Counties in Virginia ; on the south side by Northampton and Halifax Counties in North Carolina; on the east side by Southampton County, Virginia; and the west side by Brunswick County, Virginia. Greensville County is also located approximately 65 miles south of Richmond, the State Capitol, and approximately 80 miles west of Norfolk and the Ports of Hampton Roads on the Atlantic coast. New York City is a little over 400 miles north; Washington, DC is within a mile or two of 170 miles north, between Greensville County and New York; while Atlanta, GA is situated 528 miles due south-by-southwest.(*15*)

Greensville County's location on the eastern seaboard of the United States places it within a day's drive of over 50 metropolitan areas and nearly two-thirds of the country's population and provides prime access to the eastern part of the United States via Interstate I-95 and U.S. Route 58.(*15*)

Approximately 11,873 people have found a home in Greensville County. However, the area effectively draws in labor and customers from a much larger region that allows the county to serve a potential population of nearly 147,000. Many businesses and industries find the county's landscape, location, and market areas attractive.(*15*)

The town of Emporia was chartered by an Act of the General Assembly on July 31, 1967, as a separate political entity from Greensville County. The Town of Jarratt, incorporated by order of the Circuit Court of Sussex County on June 20, 1938, is located in northern Greensville County and partly in southern Sussex County.(*15*) Population, gender, and age distribution statistics are provided in Table 2 below.

TABLE 2
Greensville County: Population Statistics

	1990	2000
Population	8,853	11,873
Gender Distribution:		
Male	4,214	5,660
Female	4,639	6,213
Age Distribution:		
Under 5	619	688
5 – 14	1,318	1,760
15 – 24	1,275	1,660
25 – 34	1,226	1,377
35 – 44	1,247	1,930
45 – 54	1,011	1,764
55 – 64	937	1,257
65 – 74	740	778
75 and Over	480	659

Source: http://www.greensvillecountyva.gov/greensville%20County/locality%20information/population.html

History Greensville County was formed in 1781 and may have been named for Sir Richard Greensville, leader of the Roanoke Island settlement in 1585. However, another possibility of a namesake is General Nathaniel Green, who marched through the County after the Battle of Guilford Courthouse. The historical record is not clear as to who founded Greensville County even though the area was first explored in 1670, but not settled until 1710.(*16*)

General Cornwallis and his army marched through the county in May 1781, and General Tarleton raided throughout the region with small skirmishes. During the War Between the States, Confederate General Wade Hampton spent much time defending the railroad and railroad bridge that crossed through the county.(*16*)

Some of the famous and historically prominent people generally associated with the county are John Y. Mason, Legislator, twice Secretary of the Navy, Attorney General and Minister to France; William McKendree, first American-born bishop of the Methodist Church; Henry Tazwell, United States Senator; and John R. Chambliss, a general in the Army of the Confederacy.(*16*)

County Government The Greensville County Board of Supervisors is the legislative body of the County. It passes laws, levies taxes, and sets policies by which the county operates. The Code of Virginia provides that each county be governed by a board of supervisors and composed of three to eleven members. Greensville County's Board of Supervisors is elected by qualified voters from four single-member districts or multi-member districts. The apportionment of these districts is within the discretion of the board, but must be approved by the U.S. Department of Justice. The individual members of the Board of Supervisors are elected for four-year terms which takes place as a part of the state's general election in November of odd-numbered years.(*17*)

The county's Board of Supervisors has both administrative and legislative responsibilities, some of which are discharged in the role of the local governing body and some of which have derived from its function as an administrative subdivision of the state. The powers and duties of the board include but are not limited to the following:
- Preparing the county budget,
- Levying county taxes,
- Appropriating funds,
- Pre auditing claims against the county and issuing warrants for their settlement,
- Constructing and maintaining county buildings
- Approving and enforcing the county's comprehensive land use plan,
- Making and enforcing ordinances for police, sanitation, health, and other regulations permitted by state laws, and
- Providing for the card and treatment of indigent and handicapped citizens.(*17*)

Sussex

History and Geography Sussex County is located in south-central Virginia. The county is 496 square miles and is bisected by Interstate 95. Sussex County is 45 miles south of Richmond and is situated along side the Virgina and North Carolina line. Elevation rages from 50 to 250 feet above sea level.

Sussex County was formed in 1754 from Surry County. The county was named after Sussex County in England. The first settlements appeared just before 1700 when settlers moved west and south across the Blackwater River from Surry County and other counties east of the region. Agriculture and timber are the primary industries, and the first commerical peanut crop in the USA was grown in the county in 1842. Some of the major towns in the county include Qakefield, Waverly, Sussex, Stony Creek, Jarett, and Yale.

Demographics The population of the county is 12,504 using the 2000 census. A more current estimate (2003) indicates population has decline to 11,956 for a 4.4 percent decrease. Racial makeup of the county is as follows:

        36.4% White
        62.1% Black or African American
         1.5% Other (consisting of American Indian, Asian and Hispanic)
        100.%

    There are 4,126 households in the county with the median household income of $31,007. Per capita income is $14,670 with the number of persons living below the poverty line 16.1 percent. As a point of reference, the State of Virginia per capita income levels and percentage of persons living below the poverty line were $23,975 and 9.6 percent respectively. The age of the residents of the county by category is:

        24.2%   Under 18 years
        37.6%   Between 18 to 64
        13.4%   Over 65
        100.%

    There are 42.5 percent females living within the county while the percentage of people who do not speak English is 2.2. The percentage of high school graduates is 57.6 percent while the percentage of bachelor's degrees is 10 percent. The home-ownership rate is 69.6percent, which compares favorably with the state rate of 68.1 percent. Minority-owned firms (using 1997 data) is 23.1percent, which again was better than the state average of 14.9 percent.

    Natural Resources and Business. Eighty percent of the county's land is commercial forest (99% privately owned). Mineral resources include sand, and gravel, and clay used in bricks and cement. Ilemininte and leucoxens, used in the manufacturing of paint, are produced in the county. Major employers in the county are in the pork industry (processing), government, and education. However, the largest employer in the county is the prison system.

Southhapton

History and Geography Southampton County was formed in 1749 from a portion of Isle of Wight west of the Blackwater River. The county was named for either for the third Earl of Southampton or for the Borough of Southampton in England. In 1831, Southampton County was the sight of the Nate Turner rebellion. Turner led a group of slaves who killed 60 whites before the militia captured, tried, and hanged 20 of the rebels.

    The county is located in the Mid-Coastal Plains region of Virginia and consists of 600 square miles. The county is situated along Interstate 95 and the Hampton Roads port area (45 miles away). Norfolk Airport is located 55 miles from the county line. Farming and timber are the principle products of the area with Southampton ranking number one in peanut and cotton production.

Demographics According to the 2000 census, there are 17,482 persons living in Southampton. The racial makeup of the county is:

56%   White
43%   Black or African American
  1%   Others
100%

There are 6,279 households within the county with a home-ownership rate of 74.3 percent. High school graduates constitute 63.2 percent of the population with 11.7 percent of the people holding bachelors degrees. The age of the residents maybe summarize as follows:

20%   Under 20 years
36%   Between 20 to 44
25%   Between 45 to 64 years
14%   Over 65 years
100%

The median per household income in the county is $33.995 with 14.6% of the population living below the poverty level. The county does not have a 24-hour hospital.

Business and Industry There are 269 private businesses within the county employing 4,077 individuals. The percent of firms owned by women are 23.2 percent. Major employers in Southampton by industry are paper chemicals, automotive seatbelt, correctional facilities, and education.

6. ANALYSIS OF QUESTIONNAIRE

As previously noted, the questionnaire developed by the researchers is divided into five categories: General Information, Before Disaster Occurs, During Notification and Deployment, During Evacuation, and Post Disaster Evaluation. This section presents the results obtained from the six counties questioned by each of the studied category.

General Information

The focus of this study is to identify the best practices of rural and small urban transportation systems during a natural disaster. In accordance with that objective, the six counties studied were relatively small in both population and, as so happens, in number of square miles. The population in these counties ranged from approximately 12,500 people to about 36,500 individuals. The largest city in the counties selected, Elizabeth City located in Pasquotank County, has a population of 17,686. Correspondingly, the square miles of the counties studied were from 144 to 600. The principle products of these counties were agriculture. For example: timber, hogs, and row crops which consist of peanuts, cotton and soy beans. Also, it should be noted, that prisons were an important industry to the selected counties. Three of the six counties studied had a trauma center or 24-hour hospital. Those counties that did not have medical

facilities relied on other counties that were close. A copy of all six county's organizational chart is included in the section Research Findings.

Before Disaster Occurs

This section attempts to determine what specific or detailed steps, procedures, or precautions the county activates before a natural disaster strikes. To accomplish this task, the researchers developed 11 questions that covered a variety of topics that take place before a natural disaster would strike.

1. First, the researchers question if the county had developed an emergency plan. All six counties stated they had.

2. The second question tried to determine if the counties had identified problems that the transportation system would encounter during a natural disaster. Four of the six counties indicated that they had identified problems with three of the counties indicating the nature of the problem. For example, Greensville County noted that down trees and flooding of railroads and highways were a problem. Sussex County identified areas subject to floods and electrical outages were troublesome. The last county to describe a problem was Pasquotank County. Their officials determined that lack of vehicles and movement of people were areas of concern.

3. The third question asked how often the county updated their emergency plan. Four of the six counties stated annually while three counties, two of which noted that they did not do annual updates, reviewed and updated their emergency plan every five years.

4. The fourth question asked the county officials to identify the office/position responsible for emergency planning. Three counties marked that they had a Director of Emergency Management. The other three counties stated that they appointed a county manager, or a public safety coordinator. One of these three, Greensville, used a team approach consisting of a chairman of the board, a coordinator, and an assistant coordinator.

5. The fifth question addressed whether the county had developed a written readiness checklist. Five of the counties denoted that they had, a copy of which is in the section entitled Research Findings. The sixth county, Sussex, stated that they had developed a set of procedures to be followed, but did not have a written record.

6. The sixth question was structured somewhat differently than the other questions. Respondents were asked not only to mark the appropriate goals they wanted to accomplish during a natural disaster but to also *rank* these goals. A listing, with the highest rank first, are:
   · Preservation of Life
   · Establishing Control
   · Restoration of Critical Services
   · Preservation of Property
   · Mitigation of Hazard

7. Question seven focused on emergency disaster planning and how much of the county budget was earmarked for that activity. It would appear that for most counties 1 to 2 percent of the budget was allocated for such a purpose. Pasquotank County was somewhat larger, since that county included the budget for the entire Emergency Medical Services (EMS) Department.

8. The eighth question asked each county to specify how much of the county budget is allocated to the purchase of equipment and supplies that could be used during a natural disaster. The two primary pieces of equipment noted by county administrators were trucks and generators. Pasquotank County budgeted over $91,000 for generators while Chowan County allocated $50,000 to purchase trucks. One other county, Hertford, stated that they needed large generators for shelters and water systems. These items were not budgeted since the cost was excessive. Three other counties, Chowan, Pasquotank, and Hertford, indicated that they were purchasing other emergency equipment. None noted that the amount budgeted was adequate.

9. The ninth question regarded how often the county tested the emergency plan both by "table top" and by a mock test. Five of the respondents review by table top annually. The sixth county, Hertford, conducted a table top review every two years. As for mock tests, the results were more varied. Two counties marked that they did the test every year, one county (Hertford) suggested that they conducted a mock test every two years and also at other times by rotation with other counties. The remaining three counties had different responses. Greensville County specified that they conducted a mock test every five years. Southampton County has not had a mock test recently whle the last county, Sussex, performs an informal test every five years.

10. The tenth question tried to identify if the county has a process for specifying necessary improvements. All six counties indicated that they did; most were held immediately after a natural disaster. Pasquotank County stated that they also conducted a review after each test, mock, and table top review, and prepares a summary of the recommendations.

11. The eleventh, and last question in this category, noted if assets used in natural disasters were inspected to make sure they are in good working order. A variety of responses were received from the counties. Four counties stated that the inspection was conducted on an on-going bassi since the equipment was in constant use. Two counties, Southampton and Hertford, noted that they had an inspection annually or monthly respectively.

During Notification and Deployment

This category is concerned with the process of notification and deployment activities immediately preceding an impending natural disaster. The researchers developed eight questions that addressed this concern.

1. The first question addressed how the county was notified of an impending natural disaster. Most counties, there were four, received their notification through the National Weather Service (NWS). One county, Sussex, was notified by the Emergency Alert

System (EAS) while two counties, Chowan and Hertford, in addition to using the NWS, were notified by telephone. One county, Greensville, used VDEM-VA Department of Emergency Management.

2. The second question focused on how citizen were notified. The answers to this question were varied since some counties use more than one method. For example, Hertford County, used the National Warning System (NAWAS), the EAS, radio, and television. One county, Greensville County, indicated they used only radio. Another county, Sussex County, used a separate approach called Citizen Emergency Response Team (CERT).

3. The third question concerned citizens with special or unique conditions. Examples given were hearing impaired special care groups and non-English speaking individuals. Only one county, Southampton, stated that they did not make any special provisions for citizens in this group. The other counties, however, tried a variety of methods to communicate to these citizens. Greensville County hired a language specialist in social services; Sussex County hired individuals who speak a foreign language and the power and light company knew of individuals who have special needs; Chowan County Emergency Preparedness Group called these individuals; Pasquotank County went to nursing homes and prepared bi-lingual flyers for non-English speaking individuals; and Hertford County also prepared flyers for non-English speaking individuals and encouraged churches to provide shelter to special needs citizens.

4. Question four focused on the notification procedures for governmental or public concerns such as schools, hospitals, or nursing homes. All six counties stated that they did notify such instillations

5. Question five addressed the methods used to notify. A wide range of procedures were used. For example, Greensville County met with the concerned parties to discuss the natural disaster. Other counties called, Southampton and Chowan, while some used a fax, Pasquotank. Hertford used all three procedures: calling, faxing, and meeting.

6. Question six tried to determine the method used by the county for allocating their assets. While some noted that they were assigned to high-risk areas, Chowan and Southampton Counties, stated that they used other approaches. Greensville and Sussex Counties scattered their assets throughout the county. Hertford County allocation is based on need and population. The last county, Pasquotank, used only population for allocation.

7. Question seven asked whether the county altered their chain of command during the natural disaster. Four counties said no while two counties, Sussex and Pasquotank, indicated that they did.

8. The last question in this category addressed the establishment of staging areas to be used during a natural disaster. Four counties established an initial staging area. One county, Hertford, created a resource staging area while two counties, Greensville and Southampton, did not establish any staging area.

During Evacuation

Activities during an evacuation would involve implementing all of the planning procedures while remaining flexible enough to respond to new situations. Three questions were asked, each focusing on specific parts of the planning process.

1. The first question identified the facilities used by the county as initial, secondary, or resource staging areas. A wide variety of facilities were used by the counties. Two counties, Southampton and Sussex, used local school buildings. One county, Pasquotank, used community centers, the national armory, and churches. Hertford County relied on the fire departments to provide shelter and to be the primary staging area. Sussex County used the emergency center, central garage, and rescue squad building.

2. The second question asked concerned how the county moved people to safe areas. The sheriff and National Guard were the two most popular modes of transportation. Others used were: personal vehicles, EMS vehicles, fire department vehicles, church busses, and school busses.

3. The third and last question in this category wanted to know which individual had the authority to call for an evacuation. For two counties, Greensville and Southampton, the people making the call varied. In these counties the sheriff, county manager, or the fire chief were authorized. The remaining counties, Sussex, Chowan, Pasquotank, and Hertford used a more centralized approach. One county, Sussex, allowed the Emergency management director to determine if evacuation was necessary, while the other three counties relied on a group or team.

Post-Disaster Evaluation

The fifth and final category requests the county managers to identify those policies and procedures that worked best and those that failed. Six questions were asked, most were open ended requiring each county to reflect on those policies and procedures that worked those that did not.

1. The first question asked the types of additional support the county provided beyond immediate emergency support. The question was divided between long-term supports and encourages the county to discuss the nature of the support. All six counties indicated they gave both short term and long support. The nature of that support, as might be expected, was different. Under short-term support, the counties generally concentrated on food, water, ice, shelter, debris removal, and temporary housing. On an as-needed basis, the counties also provided medical care to those citizens in need. Long-term support again focused on clean up and food, but also the need to coordinate and assist citizens with state and federal programs. Housing was also a consideration. Money and assistance is provided to those citizens whose houses were in need of repair.

2. The second question addressed the assessment process used to determine the needs of the citizens. One-half of those counties responding relied on demand of citizens while the remaining relied on the Control Center's response to requests for assistance.

3. The third question concerned the office that recorded complaints about the effectiveness of the emergency plan. Most counties relied on the Office of Emergency Management to register complaints. One county, Sussex, noted that the Control Center and Office of Emergency Management were the same. The other counties, Greensville and Southampton, used other forms to record complaints. Greensville County held a public forum to vent grievances. Southampton County, on the other hand, used the Emergency Communications Center to list complaints.

4. The fourth question tried to determine how state and federal assistance is given. Four of the counties selected dollar values of damage with one county, Sussex, indicating the number of people injured as important. Several counties noted that the severity of the event, determination of assessment teams, and calls from affected citizens are used.

5. Question five questioned how state and federal assistance was allocated to the studied counties. Five of the counties stated that both the estimated dollar value of damages and the number of filings for assistance as the deciding factor. One county, Sussex, also indicated that the number of people injured was a consideration.

6. The sixth and last question concerning how should federal and state assistance be allocated received four responses. Sussex County stated that assistance from other governmental units was welcomed, but those units should be familiar with Federal Emergency Management Administration (FEMA) procedures. Chowan County noted that federal and state assistance should be allocated on the basis of historical information such as population, facilities, or highway miles. Pasquotank County stated that local officials were not informed by FEMA as to who applied for needed assistance. Moreover, there was some confusion in the county since two County Emergency Systems responds to 911 calls. Hertford County indicated that assistance should be based on income of the citizen. Also, administers in Hertford County stated that there was a lack of coordination among local, state, and federal officials concerning weight tickets for trucks hauling debris.

7. CONCLUSION

This study identifies the plans and procedures taken by rural and small urban county administrators that affect the transportation system during a natural disaster. Once identified, an evaluation as to the effectiveness of these plans was made in order to determine the "Best Practice" that should be used. Below is a list of those plans and procedures used by the county administrators that were determined to be the "Best Practice":

- All counties were found to have developed a comprehensive emergency plan for the transportation system to be used during a natural disaster. Moreover, several of the counties

have identified problems that would affect the transportation system. These problems, mainly flooding and power outages, were being corrected.

- Most of the counties studied updated their emergency plan annually. The remaining counties who did not update annually reviewed their emergency every five years.

- Most of the counties have a created position within their organizational chart entitled Director of Emergency Service or another position with similar duties. This individual would report directly to the county administrator and would be responsible for getting the county ready for a natural disaster, make decisions during the disaster, and coordinate disaster relief after the event.

- Most of the counties have developed a readiness checklist to help county administrators or the Director of Emergency Service determine the best course of action during the natural disaster.

- Clear, concise goals of what should be accomplished during a natural disaster should be stated and known by county administers. The goals should also be incorporated into the emergency plan.

- A "table top" test of the emergency plan should be accomplished annually with a full mock test every five years.

- Immediately after the natural disaster, while memories are still fresh, a debriefing should be conducted with all county administrators (i.e., county manager, Director of Emergency Management, Sheriff, Fire Chief) and any other individuals who had command responsibility during the disaster.

- Counties need to have available a language specialist during and after the storm. This will become more of a concern as the number of non-English speaking individuals increase within the county.

- All of the counties studied used all of the public and private facilities available to them during and after the storm (i.e., schools, hospitals, nursing homes, and fire departments).

- Most of the counties' assets were spread throughout the county based on need and population.

- Most counties established an initial staging area to gather all assets for further deployment.

- The initial staging area can be located at a number of locations; the most popular are: churches, school buildings, fire departments, and National Guard armories.

- All of the counties studied did not only rely on one form of transportation to move people to safe areas; the most popular methods used are: personal vehicles, National Guard vehicles, sheriff, school busses, and fire department equipment.

- Most counties rely on one individual or a small group of administrators to call for an evacuation.

- All counties provided some form of short-term and long-term support to its citizens. The nature of that support varies but usually are: food, clothing, water, shelter, quick repairs to damaged structures, and medical service.

- Most counties determined the needs of its citizens by either responding to the demands of its citizens or by a quick review of the county by the sheriff, fire department, or the housing officials.

- The office of Emergency Management collects complaints about the effectiveness of the emergency plan.

- State and federal assistance is allocated to the counties by dollar value of damage and field assessment.

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