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The Need for Collaboration in Planning Efforts during Natural Disasters: An Evaluation of the City of Richmond, Virginia

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The Need for Collaboration in Planning Efforts during Natural Disasters:

An Evaluation of the City of Richmond, Virginia

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by

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Abstract

This thesis evaluates whether or not information data sharing is effectively used between federal, state, and local government agencies and non-governmental agencies in a metropolitan area during and immediately after a major natural disaster. Also, whether vulnerable populations were identified and considered during emergency management. The chosen study area is the City of Richmond, VA, and the disaster response is based on flooding episodes that occurred in the city over the last decade following hurricanes and tropical depressions. Questionnaires were administered to representatives of federal, state, and local agencies and NGOs. The questionnaires consisted of a Likert-style series of 10 questions and a group of more broadly based and open ended questions that were administered in person or by phone and included four questions designed to identify progress made since the last disaster. The self-administered Likert-style of questions consisted of identifying agency planning and operational activity, interaction with other agencies, means for data collection, use of FEMA's Partnership Guides, and communication with the public. These questions were also designed to identify the agency activity in each of the four major areas of emergency management, namely mitigation, preparedness, response and recovery. In general there appears to be good lines of communication, co-operation, and interaction between agencies based on the concept that disaster management is a local issue and only involves the state and federal governments in cases of very severe disasters. Consistent with this was the fact that there was essentially no use of the FEMA Partnership Guide by state and local agencies. GIS capacity is generally good, as is data sharing via a number of methods, including regular meetings. A variety of methods are used to inform the general public, including reverse 911, radio, television and social networks although vulnerable populations may have difficult accessing some of these.

I. Introduction

Background

This thesis evaluates whether or not information data sharing is effectively used between government agencies such as the Virginia Department of Emergency Management and non-governmental organizations such as the American Red Cross in a metropolitan area during and immediately after a major natural disaster. The chosen study area is the City of Richmond, VA.

Natural disasters appear to be a growing concern for humanity as both climate change and population growth affects the planet. "Natural hazards are defined as those particular hazard events that arise from geophysical processes or biological agents and affect the lives, livelihood, or the property of the public (Gallant, 2008, p.41)." Rising sea levels and human development are reducing or eliminating the natural barriers that protect communities. Most often, developing countries or even poor communities in developed nations experience mass tragedies and long-term suffering due in part to natural disasters. Evidence shows that the poor are more vulnerable during all stages of a catastrophic event (Flanagan, et. Al, 2011). Earthquakes, tsunamis, cyclones, hurricanes, tornadoes, fires, and flooding can result in sequential catastrophic events, further confounding the plight of already affected areas. Human and economic impact caused by natural disasters can devastate communities so extensively that they may never recover.

The United States became more aware of the magnitude of devastation that a natural disaster can produce after Hurricane Katrina ravaged the Gulf Coast in 2005. Such a catastrophic event affecting several states had not been seen in recent years. According to Stanley Goldberg, a hurricane researcher with the National Oceanic and Atmospheric Administration (NOAA), "major storms powering annually from the tropics have more than doubled since 1995 under the influence of favorable winds and higher water temperatures in the

Atlantic… (while) the newly stormy hurricane seasons could threaten the East Coast for the next decade or for the next four decades (Bacque, P., September 23, 2004, p. B-1)."

At the time of Hurricane Katrina, the Federal Emergency Management Agency (FEMA) had been absorbed into the United States Department of Homeland Security after the events of September 11, 2001. The focus had shifted from disaster preparedness to terrorism, diminishing FEMA's role in helping build direct relationships with state and local responders (Cigler, 2007). The loss of life and economic destruction unveiled by the media, left many Americans asking how could a well-predicted storm leave so many people isolated without necessities days after the event, why did economically disadvantaged individuals appear to be suffering disproportionately, and who was responsible for assisting these communities.

Katrina was the first large-scale disaster to test the NRP (National Response Plan) and NIMS (National Incident Management System), created in 2003 (Col, 2007). Foundations of the NRP is the NIMS, providing 'a consistent nationwide approach for Federal, State, and local governments to work effectively and efficiently to prepare for, respond to, and recover from domestic incidents…To provide for interoperability and compatibility among Federal, State, and local capabilities (Walsh, et. Al, 2005, p.4).' Although such directives were in place in 2005, the system failed at all levels. Therefore, following Katrina, emergency management was evaluated differently and seen as an all-encompassing practice in need of reform.

From an evaluation of exiting literature, interviews with members of the emergency management community, and identification of vulnerable populations, suggestions can be made to better serve the residents of Richmond before, during, and after an event. Particularly, content analysis of the in-depth interviewee responses with key agency stakeholders will identify if improvements can be made within an emergency management scenario. Interview analyses will

compose the primary source of research from which to base any suggestions. However, analysis of existing documents, such as news articles or interviews, will also be implemented during the research process. Based on the experiences of the 2003, 2004, and 2006 Richmond floods, shortcomings in disaster preparedness, response, and recovery will be identified and attempts will be made to determine what has been learned by the responsible agencies to avoid similar mistakes in the future.

Research Objectives

At a local level, it is important to identify how Federal, State, and city officials along with NGOs and the private-sector prepare for and handle a disastrous event, while taking into account the needs of socially vulnerable individuals and/or communities. Similarly, how do such various agencies and organizations work together to better serve the community so that redundancy or deficiency of services does not occur? The efficiency and rate at which relief is administered is due in part to the collaboration of the responsible agencies and organizations, and is primarily based on communication of resource availability and aid response. Without a clear picture of what task each stakeholder is responsible for, time may simply be wasted in providing the help that is so desperately needed. This research focuses on the involvement of the various governmental agencies and NGOs during the four phases of emergency management, the extent to which data are shared among key stakeholders, what types of data are crucial for responders and planners, and whether suggestions may be made to increase successful collaborative efforts between government agencies and NGOs. Implicit in this evaluation is the identification of lines of authority, communication, and responsibility among the involved agencies.

This thesis evaluates whether or not information data sharing is effectively used between government agencies such as the Virginia Department of Emergency Management and non-

governmental organizations such as the American Red Cross in a metropolitan area during and immediately after a major natural disaster. The various activities that are evaluated have been divided into the four areas of disaster management, namely mitigation, preparedness, response and recovery, and the study model that has been chosen is the City of Richmond during and following a disastrous surface-flooding event. The following three objectives are the proposed aim of the research conducted.

1) Illustrate the problem that may currently exist in emergency management regarding flooding in Richmond, Virginia and the impact this may have on vulnerable populations.

2) Examine preparedness and response by Federal, State, local agencies, and NGOs in order to identify missing links that might prevent hardship in already vulnerable areas.

3) Provide recommendations for future emergency management practices so that minimal effects to communities may occur.

Value of research

As a professional planner, I believe that it is important to consider all members of a community and to design their community so that it is safe and viable. Urban planners are assigned the task of providing insight into the built environment, but it is during the recovery phase where they figure most prominently. Neglecting the other three phases of emergency management cannot benefit the process as a whole. Therefore, I feel that it is vital that planners assess the risks of a community while proposing its design because if such considerations are taken into account prior to a natural disaster, the potential for significantly less destruction exists.

There is frequently a lack of communication between agencies during the response and recovery phases after a disaster, which exacerbates the potential for further loss of life and extends human suffering. The key to expediting aid post-disaster is to have an accurate and clear picture of the community pre-disaster. Community involvement is necessary to document and understand the lives of its members, the impact of any natural disaster on the community, and the

feasibility and aspirations of the affected individuals for their future recovery. Governmental and non-governmental agencies assume the bulk of the response and recovery activities in any natural disaster, and while communication and collaboration between agencies is often effective during the response stage of a disaster, this is not always the case in the planning for the subsequent recovery.

Post-Katrina, across the country, Federal and local officials have identified where failures occurred or might be expected to occur in other communities, whether during preparedness or through the recovery process. Resulting in a multitude of plans that have been devised to better serve communities in the event of a disaster. Vast literature exists identifying how a lack of coordination, collaboration, and communication exacerbated the devastation and loss of life for those living along the Gulf coast region. Localities have taken into account federally mandated statutes when planning for their communities. As more natural disasters occur in the United States, localities are learning best practices either from past experiences in their community or from similar disasters that have occurred elsewhere.

Ultimately, the scope of the disaster dictates the response and aid warranted for the community. However, financial limitations dictate where and how assistance is to be administered. Whether federal funding from FEMA is available or financial and humanitarian aid is available from national and/or local NGOs and faith-based organizations, limitations exist as to the amount of assistance that is readily available. Traditionally, in affected communities long-term recovery has often been left to the insurance industry, unless Federal, State or local agencies have property buy-out plans as part of a larger remediation or redevelopment program. The situation is more uncertain in vulnerable, older, and lower socioeconomic communities

where the lack of property insurance limits assistance from for-profit private sector insurers, as was the case for the New Orleans fourth ward.

Numerous players of various backgrounds are involved during the emergency management process. "The field and profession of emergency management have been evolving into a more collaborative enterprise, while the transformation has gradually moved beyond the classic top-down bureaucratic model to become a more dynamic and flexible network model that facilitates multi-organizational, intergovernmental, and inter-sectoral cooperation. (Waugh and Streib, 2006, p.131)." While each nation, region, and disaster is unique, many of the problems encountered, and perhaps the solutions, share some commonality with the subject of this proposal. "To reduce the vulnerability of places (and people) to the risk of natural disasters, the objectives of spatial planning and the pattern of cooperation among local, regional, and national levels of government may need to be changed (Konvitz, 2004, p. 69)."

II. Literature Review

The purpose of this study is to assess whether lines of communication, leadership, and information sharing are effectively open and utilized among agencies that assist before, during, and after a disaster. Considerable literature exists to support the need for open lines of communication that will promote collaboration between governmental agencies and NGOs. More recently, media coverage of unprecedented natural disasters in recent years has brought the nation's attention to the resulting overwhelming devastation. Urban and rural areas with large concentrations of population are likely to suffer extensive damage lending support to the importance of preparedness, response, and recovery. Lessons have been identified, if not learned, regarding the breakdown of community preparedness and agency interaction.

The following literature review concentrates on four major components to establishing a successful response and recovery while taking appropriate preventive measures to avoid disaster devastation. Since Hurricane Katrina was and remains to be the event for which most evaluations of policy and practice have been conducted in the United States, the literature is primarily based upon the Gulf Coast region's emergency management successes and shortfalls.

The lessoned learned after Katrina provide a valuable basis for the future of emergency management and planning. Most often, such lessons focus on the importance of communication, collaboration, and information sharing while clearly identifying the key stakeholders and what role each should play during the process. Conceivably, the skills of urban planners should be considered and therefore integrated into the emergency management field, especially before a disaster occurs. By doing so, community development in a potentially hazardous environment may be deterred or even prevented. "Poorly planned, narrowly defined, and inadequately executed development practices themselves can increase the likelihood and the effects of a

disaster, directly influencing and shaping disaster risk (Oviatt and Brett, 2010, p. 54)." Finally, the technologies currently available which emergency managers and planners have access to and employ provide valuable tools that can only benefit the process. The following literature review takes into account these four concepts to support the idea that emergency management is an integrated process that should take full advantage of the tools available.

Lessons Learned Post-disaster: Best practices for Emergency Management

First, a definition describing the four phases of emergency management is provided. Emergency management is the field of study associated with disasters, whether manmade or natural. The field of emergency management is defined by the four phases of mitigation, preparedness, response, and recovery. According to Brian Gallant and Jeanne-Marie Col (Gallant, 2008, p. 20 and Col, 2007, p.115):

Mitigation includes efforts to prevent manmade or natural disasters by the assessment of threats to the community, reducing or eliminating such threat to people and property.

Preparedness is the state of readiness to respond to a disaster through planning, resource allocation, and training of individuals through response exercises.

Response includes public donations, incident management, coordination, search and rescue operations, damage assessments, and handling of fatalities, while meeting basic human needs.

Recovery involves decisions and actions regarding cleaning up, the reinstitution of public services, the rebuilding of public infrastructure, and all that is necessary to help restore civic life, including disaster assistance and crisis counseling.

As previously mentioned, Hurricane Katrina was the major disastrous event in the United States for which the emergency management field realized problems existed in planning and practice. From the federal, state, and local levels of government, failures occurred in relaying

pertinent information, establishing a clear plan for evacuation, providing a speedy and thorough response, and ultimately planning for the reconstruction of towns and cities along the Gulf Coast (Olshansky and Johnson, 2010). The President issued federal disaster declarations for a number of states including Alabama, Mississippi, and Louisiana (U.S. GAO, March 8, 2006). According to the White House, in 2006 the overall cost of Katrina was estimated at nearly $100 billion. After this disaster, professionals of emergency management and planning came forward to draft new plans based on the breakdown witnessed, so that future events would not produce such catastrophic results.

Although the system may have failed to some degree throughout each of the four phases of emergency management during Katrina, government officials and NGOs have sought to rectify and better prepare for any disastrous event, regardless of magnitude. The importance of communication and collaboration was cited as a shortcoming when aid was immediately needed (Fischer, 2008). An effective basis for developing a disaster plan is to determine the effectiveness of pre- and post-disaster planning in the same or similar community previously exposed to a natural disaster. In this manner, procedures can be applicable to variously sized communities and vulnerable populations can be identified prior to an event where resources can already be in place to allow communities to make a quick recovery. “Effectively addressing social vulnerability decreases both human suffering and the economic loss related to providing social services and public assistance after a disaster (Flanagan, et al.2011 p.1).” Because of the diversity seen at all levels in every community across the country, from geography and population to governance, a one size fits all template for all disaster planning is probably not feasible.

By all accounts, the Gulf Coast region and particularly New Orleans was an area where

the occurrence of a major disaster was merely a matter of time. By 2000, the majority of the city's population (62 percent) resided below sea level, exacerbating vulnerability (Campanella, 2007). In 2005, the hurricane protection system for Louisiana, consisting of 350 miles of levees and floodwalls, remained incomplete due to design delays, environmental concerns, and funding cuts (Olshansky and Johnson, 2010). Once Katrina made landfall over Louisiana on August 29, 2005, the storm remained a category 3 Hurricane with constant rain and battering winds topping 120 mph (NOAA). The lack of provisions in place resulted in nearly 1,800 deaths and over 300,000 properties damaged (White House 2006).

Problems arose for New Orleans as Katrina neared, causing Mayor Ray Nagin to issue a mandatory evacuation for the nearly 100,000 remaining residents just one day before the storm was predicted to hit (Olshansky and Johnson, 2010). Evacuation was slow and those without personal transportation were left to fend for themselves (Keifer and Montjoy, 2006). Media coverage merely exacerbated the situation by highlighting the lack of assistance that was being administered. The suffering of stranded residents was brandished throughout all media outlets, while much of the anguish continued not only immediately after the hurricane hit, but has continued for years.

Many believe that a human injustice occurred since the majority of the population displaced was already socially and economically vulnerable (Webb, 2009). Communities typically become vulnerable when network capacity deteriorates and outside resources are unavailable (Waugh and Streib, 2006). As was the case during Hurricane Katrina, "poor minorities had decreased ability to cope during the disaster, and after, they had less access to government services that could speed recovery (Cigler, 2007, p.67)." However, effectively addressing social vulnerability has the potential to decrease both human suffering and economic

loss related to providing social services and public assistance only after a disaster occurs (Flanagan et al., 2011).

When Katrina occurred, the city lacked a comprehensive plan and the zoning ordinance was outdated according to the New Orleans Planning Assessment Team, which meant that when the city had to rebuild, it also had to invent a new planning process (Olshansky, et al. 2008). Due to the mandatory evacuation order issued by area officials, most planners in the public and private sector evacuated. Once officials returned, damage assessment and recovery planning was the priority. Yolanda Rodriquez, the director of the New Orleans Planning Commission during this time and presently, was tasked with the order to work alongside FEMA on details of the city's public assistance program and to revise the area's hazard mitigation plan so the city could qualify for federal mitigation funding (Becker, 2010).

At this time, FEMA and the state initiated the Long-Term Community Recovery Emergency Support Function (ESF-14) as part of the National Response Plan (Olshansky, et al. 2008). ESF-14 was created to provide technical assistance by helping communities plan for and identify resources necessary for recovery (U.S. GAO, July 2009). Unfortunately, most of the planning commission's staff had decreased significantly post-Katrina since the city's revenue diminished and ESF-14 had never been implemented for such a large-scale disaster. FEMA's proposed process to prioritize a list of recovery projects was ultimately unsuccessful, "because of the scale of damage, the lack of municipal employees, and the absence of an agreed-upon planning process with which to create project lists (Olshansky, et al. 2008, p. 275)."

Nonetheless, numerous other factors have also been attributed to the failure of response and recovery during the emergency management process. FEMA has received the bulk of responsibility for the loss of life and the lack of assistance since the federal government is

assumed to be the lead authority for major disasters of all sorts. However, "the primary legal and political responsibility for dealing with most disasters normally resides with state and local officials (Waugh and Streib, 2006, p.136)." In response to the failures of Katrina, the 109th Congress enacted the Post-Katrina Act of 2006, which reorganized the DHS, reconfiguring FEMA (effective March 31, 2007), 'with consolidated emergency management functions, elevated status within the department, and enhanced organizational autonomy (Bea, et al. 2006, p.6).' As part of the Post-Katrina Act, FEMA established two new positions and one entity including; 'a Disability Coordinator, a Small State and Rural Advocate, and a National Advisory Council […] [In addition] at the regional level, the Act provides for the creation of Regional Advisory Councils, Regional Office Strike Teams, and regional Emergency Communications Coordination Working Groups (Bea et al. 2006, p.7).'

Although Hurricane Katrina sheds light as to what can and likely will go wrong during a natural disaster, there may be no way of knowing if the federal government in conjunction with states and localities can handle an event of such magnitude, until it happens again.

Collaboration and Communication among Stakeholders

A major component for successful disaster management is coordination among stakeholders. "Coordination means more than providing information about what is happening…[It] means that all stakeholders are informed about and allowed to participate in the process (Phillips, 2009, p.64)." Recognition of stakeholders includes those affected by the disaster and the NGOs and governmental emergency agencies involved in the disaster process. From the national level (FEMA), to the state level (VA Department of Emergency Management), down to the regional aid organizations providing assistance (Red Cross), communication should be the priority. As Jonathan Walters and Donald Kettl (2005) observed when Hurricane Katrina

hit New Orleans, the intergovernmental relationship that was supposed to connect local, state, and federal officials before, during, and after such a catastrophe had disintegrated (Kiefer and Montjoy, 2006). Once again, FEMA was and remains to be at the top of the hierarchal emergency management network even when state and local officials perform most of the tasks required during each phase of emergency management.

However, as noted in a report by the United States Government Accountability Office, "FEMA has assisted state and local governments in developing post-disaster recovery plans in various ways, which in turn can help facilitate collaboration among stakeholders (U.S. GAO, July 2009, p.15)." FEMA has established a Long-Term Community Recovery Self Help Response Partner Guide for the private sector, the state, and the federal level of government. However, the extent to which they are followed is undeterminable. Addressing how the federal agency maintains and effectively shares data in order to better serve those affected is key in confirming the use of GIS and other forms of information technology for informing the public, allocating disaster services, planning for community reconstruction. Similarly, information sharing web sites cannot produce the same results as direct communication when learning from experiences. Most notably, a disconnection may emerge at the federal level from the communities it is trying to assist. Local capacities are not assessed and the public must navigate through bureaucratic policies in order to actually receive assistance (Ganapti, 2009; Chamblee-Wright, 2007).

As suggested by Cigler, 'cooperative partnerships' within the network, involve more than information sharing, "but not a substantial commitment of resources or a reduction in autonomy (Kiefer and Montjoy, 2006, p.125)." Apparently, problems with command and control systems exist because of the lack of situational awareness, resulting in poor communication among

officials and decision makers (Waugh and Streib, 2006). Hence, effective communication of information and knowledge is key to ensuring all those involved from various levels of authority, to emergency services, and the public will have a common understanding and can jointly implement each phase of managing an urban flood disaster (Price and Vojinovic, 2008).

Trust among the agencies involved is also pertinent so that open lines of communication may be established and collaboration instituted (Kiefer and Montjoy, 2006). Therefore, state and local agencies will not only take advantage of community volunteer organizations, but in turn, such groups will act in accordance with understood mandates to expedite the recovery phase. Similarly, emergency management personnel need plans that will help them anticipate contingencies, assess developments, and direct effective response and recovery operations (Gunes and Kovel, 2000). Since many organizations will play some role during the disaster process, establishing and maintaining necessary linkages is difficult, but necessary. Collaborative capacity building amongst the nation's disaster networks is critical and may occur through frequent interaction, including participation in planning and training exercises (Waugh and Streib, 2006).

One example of successful partnerships that was effectual for Louisiana's recovery process was the Louisiana Recovery Authority (LRA), established by the state's governor. "The LRA adopted principles and policies for local redevelopment and established a long-range planning taskforce, which oversaw the Louisiana Speaks regional planning process (Olshansky, et al. 2008, p. 275)." Planning professionals from around the country embarked on the mission of rebuilding communities better than they were prior to Katrina. Existing NGOs and newly established volunteer organizations also played a pivotal role in aiding residents and creating social networks to re-establish some sense of normalcy. Volunteers were invaluable during all

phases of disaster management, proving to be crucial contributors possessing resources or expertise not otherwise available (Rao, et. Al, 2007). Ultimately, the effectiveness of the proposed plans was dependent on the capacity and commitment of the implementing organizations that included both governmental and nongovernmental networks (Kiefer and Montjoy, 2006).

The Role of Urban Planners during the Disaster Process

Urban planners are often seen as educators, facilitators, and/or advocates during community development. Of the four phases of disaster management, planners play a vital role during mitigation, using their knowledge of zoning enforcement and building code requirements, and recovery, by working with the community to assess fundamental livelihood requirements during the rebuilding process. As it appears, planners are not necessarily involved during disaster preparedness and response. Although planning professionals may not possess the expertise to assist in these two phases, their knowledge applied during mitigation and recovery can help to ameliorate the effects of a natural disaster. However, if disaster planners embrace the concept that recovery is a process of decision-making that is part of a continuum…recovery planning should therefore commence at the same time any disaster response commences (Becker et al. 2011).

Long-term disaster recovery has become of escalating importance due to the increasing devastation of the urban environment. Although states play a pivotal role as capacity builders through information generation and propagation of data to local governments and citizens, such a regulatory role can facilitate wise local action (Cigler, 2007). Leadership needs may vary while emergency management presents a different set of challenges than response. Mitigation, preparedness, response, and recovery are essentially intertwined (Waugh and Streib, 2006). In

addition, “local emergency managers are increasingly collaborating with building code, urban planning, and other officials who can help reduce risks (Waugh and Streib, 2006, p.134).” Olshansky stresses that planning is critical to mitigate the effects of disaster, stating that those mitigation tools include, “development review procedures, citing guidelines, area hazard studies, building codes, engineering structures, public purchase, and strategies to relocate, strengthen, or otherwise modify existing structures (Olshansky, “Planning for Post-Disaster Recovery, p. 134).” Therefore, urban planning should be integrated throughout the process.

Recovery is often linked to economic and social development (Waugh and Streib, 2006). However, if a planning group were in place as part of preparedness for a disaster, new ideas could be generated and integrated into the reconstruction process quickly with community consensus (Phillips, 2009). There are no quick fixes for those who are displaced, but the role of planners working to rebuild the community is key. Planners may be involved immediately following a disaster, when temporary housing is required, and later if sustainable community development is to be attained. Recovery is a long process of restoring individual and community functioning (Chandra and Acosta, 2009). By creating an environment where principles of sustainability are adopted, many factors that need to be addressed during recovery will have already been considered. “A sustainable community is more inclusive and potentially more resilient to disasters” Becker et al, 2011, p. 529).

Initial planning involvement during community development aids in diminishing the risk of vulnerability to hazards. GIS is simply one tool professionals use to evaluate whether the land designated for development is viable. Planners often work closely with community members when researching community needs through a series of public meetings, surveys, and focus groups. Heads of local community organizations work with the planning body to ensure the

public is fully educated as to what will take place. According to the study conducted by The Rand Corporation, "NGOs can strengthen social networks by enhancing connections between residents and community organizations […] [and] are permanent fixtures in the community, they can also work on an ongoing basis (Chandra and Acosta, 2009, p.4)." Again, evidence substantiates that planners should work collectively with these organizations both before and after a disaster occurs.

The Importance of Data Sharing Tools

The means by which data are shared among agencies is just as important as stressing the need for increased communication that will result in network collaboration.

Various information technologies (IT) have the potential for an even greater impact on enhancing disaster management across all phases, "provided it is used consistent[ly] with the knowledge of hazards, disasters, and disaster management practices that has been gained from the diverse range of disciplines that contribute to that knowledge base (Rao, et. Al 2007, p. 22)."

Geographic Information Systems (GIS) are one such technology that planners and emergency management officials use. Since GIS is becoming more readily used in the field of planning, it appears to be an excellent source for data sharing throughout the disaster phases. Some research has been undertaken regarding the capabilities and impediments to using platforms such as GIS for prevention management before a disaster. However, GIS is not typically used after the catastrophic event to address the needs of a particular community. For a successful disaster management, one would expect effective information management to be in place. Because the rescue window may be small, emergency officials need to have ready access to all necessary types of information if they are to respond effectively to all phases of a disaster in the most efficient and effective manner (Farris, et al., 2006). Similarly, Gunes and Kovel

suggest that emergency management personnel, "need plans that help them anticipate contingencies, assess developments, and direct effective response and recovery operations (Gunes and Kovel, 2000, p.137)." One way to obtain information and assess the current situation is by implementing the use of GIS and other technologies in a collaborative and cooperative manner.

GIS has the potential to be a very powerful tool in emergency management. Such technology captures and stores digitized scanned data, imagery, or aerial photography, allowing it to be manipulated, subjected to queries, modeled and analyzed, and most importantly visualized. Thus GIS technology readily allows the user to integrate, manage, store, process, and output geographic information (Gunes and Kovel, 2000). This technology allows different scenarios to be proposed and evaluated. In order to facilitate the system's usefulness, data must be up-to-date and information should be readily available to all organizations. Having such data available is not in itself sufficient. Personnel need to be trained in accessing, interpreting and using the system.

Today, several related technologies such as GPS, remote sensing, wireless communications, and the Internet are converging to strengthen and extend the capabilities of GIS (Drummond and French, 2008). Companies and agencies are also creating new software to work simultaneously with current GIS applications. For instance, the Federal Emergency Management Agency (FEMA) worked with the GIS application company ESRI to produce E3R (Emergency Response and Risk Reduction). The software was developed, "to provide an easy to use and responsive graphic interface of dynamically produced maps of key community characteristics and auxiliary databases containing information relevant to risk assessment and emergency response […] the application can be used to describe geospatially the physical, infrastructure,

economic, and social characteristics of the city important for risk assessment and response and most importantly to do so in scenario queries (Ferris, et al. 2006, pp.429-430)." Such relationships between government agencies and software companies should continue to advance the resources available during a disaster. Planners need to become familiar with these new geospatial technologies and determine how they can be used to support planning activities in general (Drummond and French, 2008).

Although collaboration between agencies and tech companies will improve existing software, problems such as the ability to transfer data may arise essentially rendering the software useless during an active disaster. Data availability, accuracy, and suitability may be abundant, but utilization of the system poor. Most GIS-based disaster research emphasizes spatial data issues such as accuracy, scale and detail, analysis and modeling rather than implementation issues which are clearly the major impediment (Zerger and Smith, 2003). "Integrating disaster planning efforts across private and public IT systems that embrace diversity and redundancy could lead to significant improvements in the overall reliability of information and communications capabilities in the event of a disaster (Rao et. Al, 2007, p.92)."

Not only is GIS a useful tool for disaster management, but other forms of IT are used to relay information regarding warnings, resource allocation, and volunteer inventory. Public media and the Internet are very useful if infrastructure is not affected. Both before and after Hurricane Katrina local newspapers, radio and television stations, and various web sites carried information to the public, which was the unrepresented partner in the collaboration process (Kiefer and Montjoy, 2006).

FEMA, too, created the Long-Term Recovery Assessment Tool to help communities analyze the impacts of a disaster while taking into consideration the local government's capacity

to assist in promoting its own long-term recovery. The assessment tool was designed to help federal decision makers identity the type and level of supplemental long-term community recovery assistance that may be needed for full recovery from a disaster… also including processes and procedures, community evaluation protocols, standard planning templates, staffing strategies, and timetables for various levels of effort (U.S. GAO 2009). FEMA's Lessons Learned Information Sharing (LLIS) website is another source for communicating to the emergency management field information regarding resolutions. Unfortunately, only registered professionals in the field are permitted access. Such exclusion precludes any insight that may come from the grassroots level of community organizations directly involved throughout the process.

Summary

Disasters are typically associated with the emergency management profession. Nevertheless, numerous players of various backgrounds are involved during the emergency management process. "The field and profession of emergency management have been evolving into a more collaborative enterprise, while the transformation has gradually moved beyond the classic top-down bureaucratic model to become a more dynamic and flexible network model that facilitates multi-organizational, intergovernmental, and inter-sectoral cooperation. (Waugh and Streib, 2006, p.131)." While each nation, region, and disaster are unique, many of the problems encountered, and perhaps the solutions, share some commonality with the proposed recommendations and possible limitations of this proposal. "To reduce the vulnerability of places (and people) to the risk of natural disasters, the objectives of spatial planning and the pattern of cooperation among local, regional and national levels of government may need to be changed (Konvitz, 2004, p. 69)."

Plans that clarify the roles and responsibilities for those involved in accomplishing specific tasks, provide detailed information to facilitate implementation (U.S. GAO 2009). IT alone cannot address societal decisions such as settlement and land use patterns, construction standards and practices, and issues of social justice and equity.However, IT does provide useful resources for tackling many of these challenges (Rao et. Al, 2007). As Kennedy notes, decision-making processes are not always representative of the community, especially with respect to women, youth, and ethnic minorities. He suggests that, "by planning and implementing transitional settlement and shelter within the wider context of long-term development, planning, and housing activities, then vulnerabilities could be markedly reduced overall, preventing future disasters (Kennedy, et al. 2008, p.32)."

The large number of nongovernmental organizations involved in disaster operations has encouraged the creation of umbrella organizations such as National Volunteer Organizations Active in Disaster and Inter-Action (VOAD) (Waugh and Streib, 2006). Collaborative efforts must take place between the organizations involved and the local government to adequately serve the people for which they are hired/appointed/elected to help. Ultimately, "reducing the impact of disasters requires a complex mix of technical and social endeavors, and no single prescription or discipline can provide all the answers (Rao et. Al 2007, p.34)."

III. Research Methodology

Introduction

This research consists of a case study of the City of Richmond, evaluating the level of collaboration between agencies involved in emergency management. The study attempts to provide insight into the field of emergency management so that other metropolitan areas similar to the City of Richmond can utilize any applicable recommendations. More specifically, the study has the following objectives:

1) Illustrate the problem that may currently exist in emergency management regarding flooding in Richmond, Virginia and the impact this may have on vulnerable populations.

2) Examine preparedness and response by Federal, State, local agencies, and NGOs in order to identify missing links that might prevent hardship in already vulnerable areas.
   a) Identify the role(s) of key governmental and non-governmental agencies in each of the four phases of disaster management.
   b) Assess how each agency has evolved its disaster management role over time.
   c) Identify the lead agency during each phase of disaster management and the interaction/integration between governmental, non-governmental and private sector stakeholders.
   d) Assess the information system capacity and use during each phase of disaster management.
   e) Determine how each agency collects, uses, and communicates information with affected communities during each phase of a disaster.
   f) Assess what means are currently in place to address the needs of vulnerable populations.
   g) Using the perspective of the various agencies determine the current level of interagency communication, collaboration and planning for a response during all phases of disaster management.
   h) Formulate conclusions about the overall current effectiveness of disaster management in the event of major flooding in the City of Richmond.

3) Provide recommendations for future emergency management practices so that minimal effects to communities may occur.

Although the devastation created by catastrophic events is tangible, the means by which to proficiently prepare people for such catastrophes while taking into account the vulnerable population, as well as being able to restore their lives post-disaster, remains a weak link in

emergency management. The main hypothesis addressed by this thesis is that key governmental and private agencies, following prior experience with floods in the Richmond area, have not come together to develop a series of plans to address all aspects of disaster mitigation, preparedness, response, and recovery. Driving this hypothesis is the conclusion emerging from the literature reviewed above that agencies involved in emergency preparedness and response at various levels should feature clear lines of authority, communication, and responsibility with each other in order for their concerted efforts to be effective. Through a predominantly qualitative approach based on interviews conducted with key stakeholders in the City of Richmond, state agency representatives, as well as prominent NGO personnel, an evaluation of existing efforts in the four phases of a disaster can be completed.

Based on the literature review, the need for communication, collaboration, data sharing, and identification of vulnerable populations is vital throughout all four phases of emergency management. The case of Hurricane Katrina emphasized this need and established the evaluative concept for Richmond, VA.

The research methodology will first discuss the study area, than describe the research strategy implemented to address all objectives, data collection techniques, data analysis framework, and finally illustrate the potential limitations that may exist by using such methodology.

Study Area

The study area used to conduct this research is the City of Richmond. Richmond was designated as the study area in part because it is a major metropolitan area and is at risk for 50 year and 100 year floods. As a planning student, I am particularly interested in disaster recovery planning and feel as though the planning profession is not adequately integrated into emergency

management. Richmond is roughly 60 square miles located in central Virginia. As Virginia's state capital, it is not only a viable city, but is located directly along the banks of the James River. The City is an example where emergency management is imperative to not only protect, but also sustain the safety of its residents and visitors. Since the City is geographically located along the James, flooding has and will likely once again affect the City/area and the surrounding region. "Floods are the most common natural disaster… (while) 90 percent of all presidential declarations of emergency or major disaster involve flooding (www.dcr.virginia.gov/dam_safety_and_floodplains/index.shtml)." Richmond has experienced severe flooding, due in part, to hurricanes and tropical depressions over the past decade, but the floodwall has saved the city from disastrous James River flooding, but not from surface water being trapped behind the floodwall.

Data Collection

Data collection for this study relies on a mixed methods approach consisting of qualitative and quantitative techniques. Semi-structured interviews were conducted to obtain views from key individuals in emergency management for the City of Richmond. The interviewees were selected through a purposive sampling process: respondents consist of agencies and individuals responsible for policy, strategy, and decision making in emergency management and in a position to provide the information necessary to address the objectives of this research (Babbie, 2005).

The identification of potential respondents was based primarily on initial Internet searches regarding what agencies are typically involved during emergency management. The web sites of various agencies were first examined to ensure that their strategic plans and mandates covered the topic at hand. Once the agencies were identified, email correspondence

was made to personnel indicated as the principal experts in disaster services. If however, the contacted individual did not feel as though he/she was the most suitable candidate to participate in this research, the initial correspondence was forwarded to another individual in their office.

As a result of this approach 13 individuals ultimately agreed to participate in the interview process. These include local stakeholders and NGOs that provide information and assistance before, during, and immediately after a disaster. One obvious omission is the Army Corp of Engineers (USACE), the federal agency responsible for flood control of major waterways. I had difficulty finding an individual within the USACE who was able to address my questions regarding Richmond area flooding. A list of agencies and the type of interviewee is provided below. Since the construction of the Richmond floodwall in 1994, the James River flooding of the city has not been an issue for the USACE, as the floodwall gates are the responsibility of the City of Richmond Public Works Department.

Table 1: Agency and Type of Interviewee

Agency	**Abbreviation**	**Type of Interviewee**
Federal Emergency Management Agency	FEMA (A)	Disaster Recovery Director, Region III
Virginia Department of Emergency Management	VDEM (B)	City of Richmond Emergency Manager
Virginia Department of Emergency Management	VDEM I	Acting Director of Operations, Emergency Operations Center
Virginia Department of Emergency Management	VDEM (D)	Volunteer and Donations Coordinator
Virginia Department of Health	VDH (E)	Director of Emergency Preparedness
Richmond City Health District	RCHD (F)	District Emergency Planner
City of Richmond, Fire and Emergency Services	FES (G)	Public Information Officer/AFM
Richmond Ambulance Authority	RAA (H)	Director of Safety and Risk Management
Richmond Regional Planning District Commission	RRPDC (I)	Director of Information and Planning Systems
Richmond Regional Planning Commission District	RRPCD (J)	Principal Emergency Management Planner
American Red Cross Greater Richmond Chapter	RC (K)	Manager, Disaster Services
The Salvation Army of Central Virginia	SA (L)	Area Commander
Virginia Capital Area Regional Voluntary Organizations Active in Disaster	VOAD (M)	State Disaster Relief Coordinator

The in-depth interviews were conducted with an instrument containing open-ended questions that addressed data collection and sharing, inter-agency activity, agency purpose and history, and the extent to which the agency was involved during the aforementioned floods. The in-depth interviews consisted of 20 questions (sections B and C) for which participants were encouraged to speak openly and honestly about agency involvement during each phase of a disaster preparedness process and to share any concerns or solutions they may have had regarding public preparedness and budgetary constraints. The questionnaires were administered in the form of self-administered surveys (section A) or through face-to-face interviews or telephone interviews (Section B and C). The last four questions (section C) were designed to probe the historical aspects of the agency, particularly to probe how the agency's relief activities may have been influenced by prior experiences with flooding over the past decade. The initial questionnaire was designed with redundancies in the questions, in part as a validation tool, and to capture data that may have been missed in a prior question. There was also some randomness in the questions to avoid sequence bias. All interviewees were given a consent form and were asked to give permission to have the telephone or face-to-face interview recorded.

A Likert-style or summative scale was used for 10 questions that determine the level of involvement and/or activity by each agency during the four phases of emergency management. Distinguishing the answer choices separately for mitigation, preparedness, response, and recovery allows for determination of agency strengths and weaknesses, and the interviewees perception of the role of his/her agency. The scale is based on a 1-5 answer choice where the respondent determines the level of activity as no activity, low level of activity, moderately active, active or very active respectively. The questions sought to establish agency involvement in planning, operations, integration and/or interaction with other government agencies, NGOs, or

for-profit agencies, GIS and other software and/or database usage, FEMA's Response Partner Guide usage, and general public communication. The Likert-style initial questionnaire was employed because, "(a scale) takes advantages in differences of intensity among the attributes of the same variable to identify distinct patterns of response (Babbie, 2005, p.157)". Therefore, the mode for a particular question can be determined, resulting in identification of agency participation.

For the purpose of evaluation, the agencies were subsequently broken into representative groups. In total, 13 individuals were interviewed and administered questionnaires from ten separate agencies. The division included one federal agency, one state agency of which three individuals from different departments were interviewed, four local agencies of which two individuals from different departments were also interviewed from one agency, and one representative from each of three local and/or state departments of a national NGO. Respondents then filled out a 10-question survey identifying what level of activity each agency participates in during the four phases of emergency management. The questions consisted of identifying planning and operational activity, interaction with other agencies, means for data collection, use of FEMA's Partnership Guides, and communication with the public. Of the 13 individuals administered the survey, one person from VDEM failed to return the results and therefore is not included in the survey evaluation. In addition, some participants did not respond to specific questions for reasons unknown, therefore those results were not included.

The data collected from interviews is discussed by means of content analysis. Recurring themes were identified so limitations and recommendations could be made for emergency management. Regarding the survey questions, bar charts were created to illustrate the level of activity each agency presents for specific questions. For triangulation purposes, a content

analysis of archived Richmond-Times Dispatch articles was utilized to determine the effectiveness, through the media's representation, of preparedness, response, and recovery from the aforementioned three tropical storms. Based on the experiences of the 2003, 2004, and 2006 Richmond floods, shortcomings in disaster preparedness, response, and recovery were identified and attempts made to determine what has been learned by the responsible agencies to avoid similar mistakes in the future. Questionnaire responses were also compared with agency mission statements to identify if and what contradictions may exist between the mission and the actual work the agency performs.

A descriptive, a table was created to illustrate vulnerability variables for both the 2000 and 2010 census. For this study, the variables that were used when determining a vulnerable population include: poverty status, female households with children, non-English speakers, employment status of household members, number of children in the household, number of seniors in household, education status, vehicle accessibility, and the population with disabilities. Similarly, a GIS analysis of 2010 census data from the 2006-2010 estimations was performed in order to map areas of vulnerability that may be affected by flooding. The variables mapped include: African Americans as the minority group, accessibility to transportation, poverty status, persons 17 years and younger, persons 65 years and older, and lastly female household heads. A descriptive, a table was created to illustrate vulnerability variables for both the 2000 and 2010 census. Since the data requested in the 2010 census changed from prior decennial data, the 2006-2010 American Community Survey was used to access the results. A comparison of the vulnerability in relation to flood proximity was made if a similar storm occurred today. The critical variables will be based on data that constitutes a vulnerable population. All data will be

evaluated and mapped based on the census tracts where flooding has occurred in recent history (2003, 2004 and 2006) within the city.

IV. Results

Richmond Floods

In order to formalize recommendations for the field of emergency management as it relates to urban planning and vulnerability this study focuses on the City of Richmond, Virginia. Richmond has experienced devastating floods due in part to such hurricanes and tropical depressions as Isabel (2003), Gaston (2004), and more recently Ernesto (2006). In fact, according to the National Oceanic and Atmospheric Administration's National Weather Service, roughly sixty percent of Virginia river floods begin with flash floods from tropical systems passing over. A Major Disaster Declaration was made by FEMA for the City of Richmond as well as the surrounding region after both tropical depressions, Gaston and Ernesto. Therefore, since the James River passes through the city, Richmond is a good example to assess past disaster emergency management successes while identifying areas for improvement during future events.

The City of Richmond is a relatively small geographical area, roughly 60 square miles with an estimated population of approximately 197,790 according to the 2000 census. Even with such a relatively small area and concentrated population, the above mentioned three events that passed through the area caused significant financial damage and resulted in loss of life. Post-Isabel, Gaston, and definitively Katrina, Richmond officials began to evaluate the procedures in place so that they would be better prepared for the next disaster. Michael Cline, the state coordinator at the Virginia Department of Emergency Management (VDEM), identified that,' the biggest life-threat is water,' in Virginia's natural disasters (Booker, B., June 19, 2006, E-1). The following summary provides an overview of not only the costly, but also life-altering effects that Isabel, Gaston, and Ernesto produced for Richmond and its residents.

The first disaster in the area occurred when the remnants of hurricane Isabel hit Richmond on September 19, 2003. Strong wind gusts of upwards 60 mph and rain caused extensive damage leaving many without power or water due to downed trees. The cost to the City was estimated at $8.5 million for tree removal and other storm debris, with an estimated 10,000 trees fallen (Mack, A., www.helium.com). Roughly, 365,000 homes in the Richmond area were left without power for days after the event (Bacque, P. and Hostetler, A.J., September 19, 2003, p. A-1).

On August 30, 2004, flooding prompted by Tropical Storm Gaston devastated the historic Shockoe Bottom District, which lies along the James River. Nearly 15 inches of rain fell within ten hours, surpassing any predictions made by the city. "Much of the water ended up rushing into the steep-sided, three-branched valley that snakes between downtown, Church Hill and Barton Heights. Where those three branches converge, about a mile-and-a-half north of the 17th Street Farmers' Market, floodwaters were as deep as 8 feet. Frighteningly, that area is a half-mile outside the 500-year flood plain (Ress, D., September 5, 2004, p. A-1)." Some people were even trapped in buildings in Shockoe Bottom until rescue workers could reach them. As a result of the torrential downpour resulting in flash flooding, eight people were killed (Robertson, G., October 27, 2004, p. H-8). Additionally, at least 1,000 people were forced from their homes, and damages totaled over $20 million. The resulting flooding prompted Governor Mark Warner to declare a state of emergency. Surprisingly, even the state's underground Emergency Operations Center (EOC) was flooded by eight inches of water, forcing emergency personnel to move equipment and themselves to higher ground (Bacque, P., August 31, 2004, p. A-1).

After Gaston, city officials re-evaluated how to handle an emergency situation for the city and its residents. One step taken to notify the public of an emergency was the creation of a

reverse 911-system where residents who have registered with the city receive a call warning them of the impending emergency. Officials also identified 17 low-lying areas that are prone to excessive flooding when it was previously thought that only eight areas were susceptible (Nolan, J. and Ress, D., August 28, 2005, p. A-10). Finally, Richmond's river rescue team exercised training in launching boats not only in the James River, but also into Shockoe Bottom after rescues were necessary during Gaston (Martz, M., September 11, 2005, p. A-8).

The last and more recent catastrophe faced by Richmond, was that of Hurricane Ernesto on August 31, 2006. Ernesto moved through Richmond, causing damage particularly to Battery Park residents when a sewer line collapsed over an area that had once been a landfill. Residents were inundated with sewage filled water that ultimately resulted in the condemning of 57 apartments and 21 homes (Martz, M., September 28, 2006, p. A-1). While the devastation approached, but was not as significant as that of Gaston, over 1,000 people still had to be evacuated to metro-area shelters. As a result of the extensive and costly damage, the federal government approved more than $41 million to cover the city's cost of responding to the flooding and replacing the damaged sewer line (Ress, D. and Martz, M., September 26, 2006, p.A-1). However, The White House denied a $9 million request from the city, meaning that the city was still responsible for about $2 million in clean-up costs.

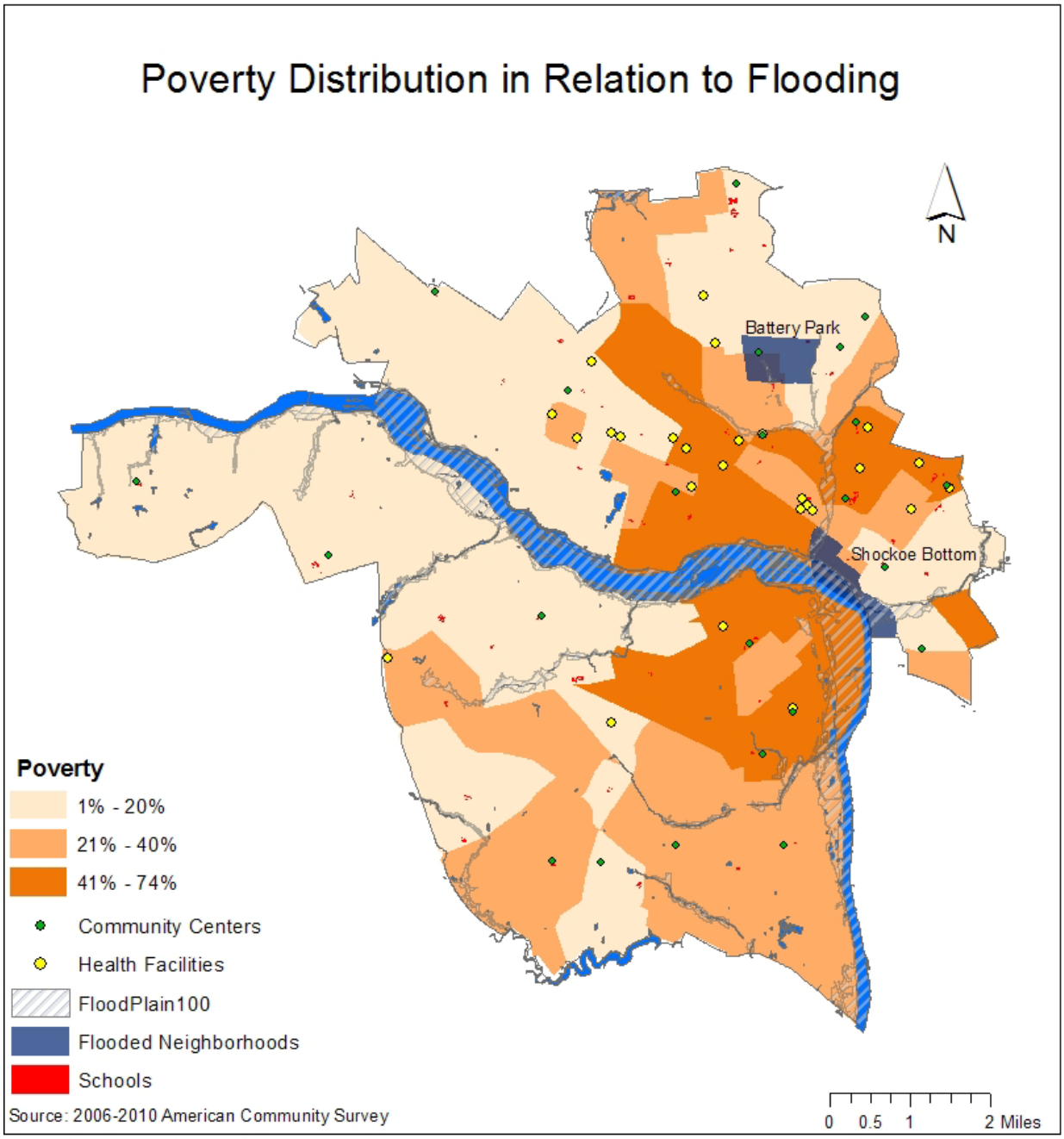
As natural disasters are known to indiscriminately affect the lives of those unfortunate enough to be in the path and/or location, socially vulnerable persons suffer more and for an extensive period once a disaster strikes. Although the historical facts for the events that took place in Richmond do not account for the socially vulnerable, it is important to note what those characteristics are and at the very least identify what that population looks like in Richmond. According to the Social Vulnerability Index (SVI), four domains form the basis that makes up

the index. First, socioeconomic variables comprising of individual income, poverty status, current employment, and educational attainment. Second, household composition and disability comprising of dependent children less than 18 years of age, persons ages 65 years and older, single parent households, and disabled individuals. Third, minority status and English language proficiency variables. Lastly, housing structure condition, overcrowding of housing structure, and vehicle accessibility variables (Flanagan, et al. 2011). Table 1, shows the Social Vulnerability Index (SVI) variables from the 2000 and 2010 census. The data provide an overview of the vulnerable population that exists in Richmond and identifies the need for who should therefore be considered during the phases of emergency management.

Table 2: SVI Variables Based on 2000 and 2010 Census Data

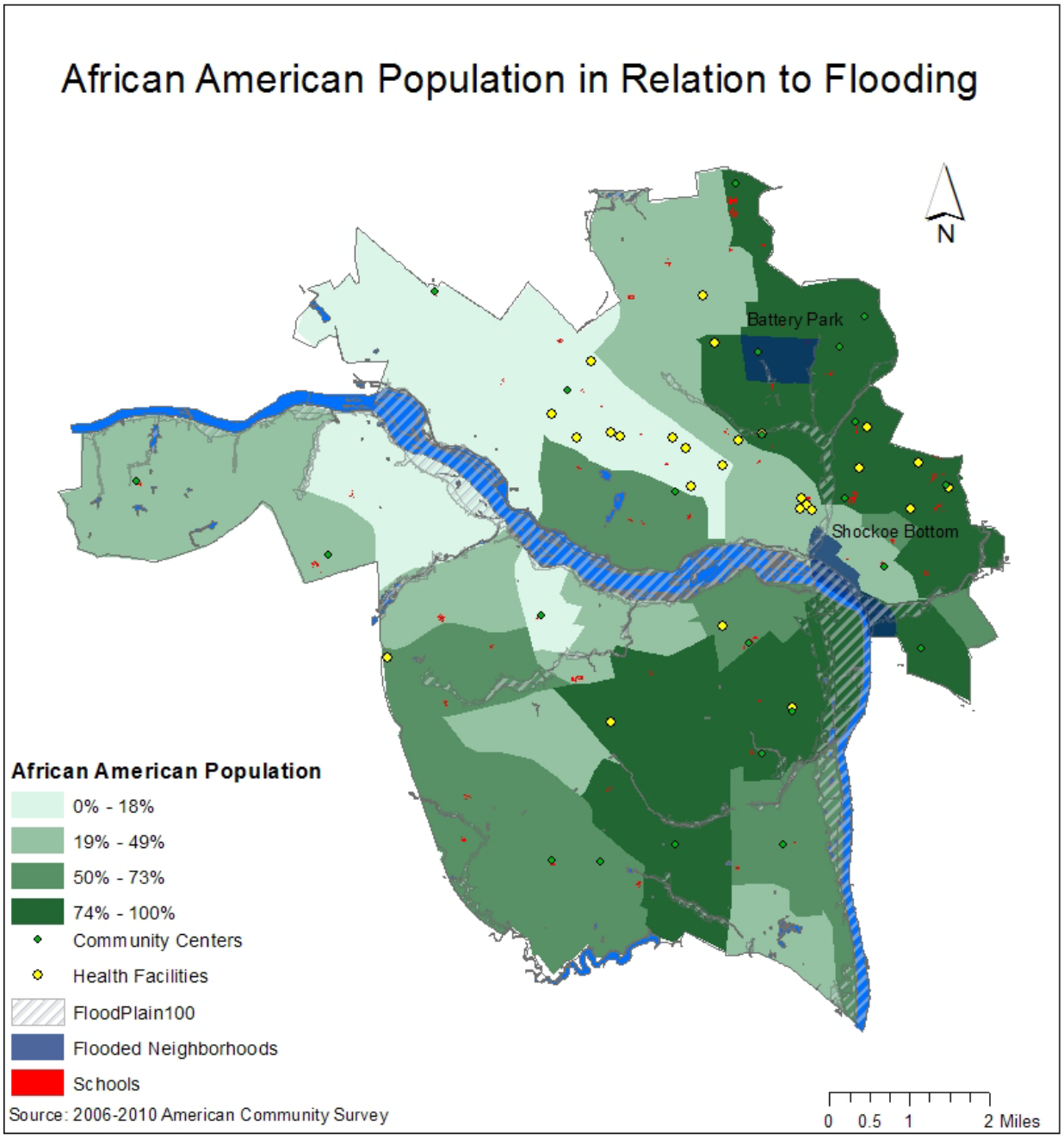
	2000	% of population	2010	% of population
Total Population	197790		204214	
African American	113108	57.19	103342	50.60
Hispanic or Latino	5074	2.57	12803	6.27
Asian	2471	1.25	4750	2.33
Population 17 years and under	43178	21.83	38009	18.61
Population 65 years and over	26129	13.21	22619	11.08
Households with individuals under 18	23459	27.75	21171	25.36
Households with Individuals 65 and over	19421	22.97	17678	21.17
Female householder with children under 18	10046	11.88	9323	11.17
Population over 5 years with disability	44227	23.85	X	X
Population 25 years and over without high school diploma	31907	24.82	25292	19.84
Population 5 years and over who speak language other than English	12503	6.74	18200	9.64
Unemployed population 16 years and over in civilian labor force	7943	8.05	11356	6.83
Population without vehicle available	18284	9.24	15152	7.42
Individual poverty status in 1999	40185	20.32	X	X
Source: U.S. Census Bureau, 2000 SF1 SF3				
Source: U.S. Bureau, 2006-2010 American Community Survey				
(X) Indicates the estimate is not available				

Map 1: Poverty Distribution in Relation to Flooding



The above map illustrates the SVI variable of poverty that exists in the City of Richmond. Above 40% constitutes extreme poverty and such areas should be considered when addressing the needs of vulnerable populations during a disastrous event in relation to impoverished persons. The map also identifies where flooding occurred during both Hurricane Gaston and Ernesto. Further flooding may occur in areas identified by the 100 year flood plain while community centers, healthcare facilities, and schools are mapped as they may be utilized for sheltering during an event.

Map 2: African American Population in Relation to Flooding



The above map illustrates the SVI variable of race for the African American population in Richmond, VA. The significant flooding that occurred in Battery Park due to Ernesto emphasizes the need for vulnerability assessments related to minority populations. Additional maps illustrating the SVI variables of age as it pertains to persons 17 years and under as well as persons aged 65 years and older, female household heads, and the lack of vehicle accessibility can be found in Appendix C. Concentrations of vulnerable populations are located in or near historical flooding

Research Findings

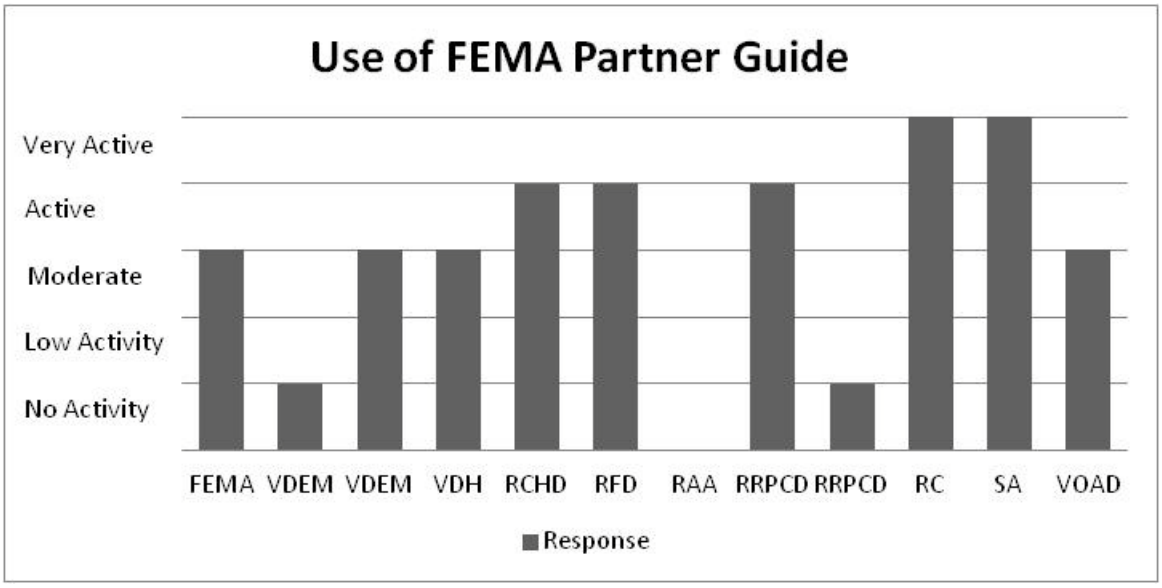
The following research analysis is based on semi-structured interviews with agencies representing the federal, state, local, and NGOS that work in emergency management in the City of Richmond. In contrast with the author's expectations, the findings of this research suggest that the public's general views as to what agency is perceived as being heavily involved in the emergency management process, and as to which agency was the leading agency are misguided. According to the NRF, "Incidents must be managed at the lowest possible jurisdictional level and supported by additional capabilities when needed (http://www.fema.gov/pdf/emergency/nrf/nrf-core.pdf, p.10)." In the Commonwealth of Virginia, jurisdictional autonomy is apparent in Richmond according to the Code of Virginia 44-146.18, where 'each jurisdiction has ownership of its locality' (B) (http://leg1.state.va.us/cgi-bin/legp504.exe?000+cod+44-146.18). The agencies involved in disaster management take on the role of emergency management locally, and if in need of additional assistance they request services from the state, which in turn may request federal assistance. The extent of coordination, collaboration, and information sharing amongst such agencies is dependent on the type and scale of disaster that occurs.

According to the NRF, principles, roles, and structures are defined to establish a coordinated, effective national response in the event of a disaster and/or emergency (FEMA). "It is built upon scalable, flexible, and adaptable coordinating structures to align key roles and responsibilities across the Nation, linking all levels of government, nongovernmental organizations, and the private sector. It describes how communities, tribes, States, the Federal Government, and private-sector and nongovernmental partners apply these principles for a coordinated, effective national response…The *Framework* enables first responders, decision-

makers, and supporting entities to provide a unified national response (http://www.fema.gov/pdf/emergency/nrf/about_nrf.pdf)." All agencies involved in emergency management abide by the principles illustrated in the NRF to coordinate efforts in an efficient way. The agencies selected represent federal, state, local, and NGOs. Agency missions and interview responses indicate that the agencies' involvement in operational work or specific planning practices ranged dependent upon the agency mission (Appendix D). The majority of agencies represented work both in planning for a disaster and in subsequently reacting to the disaster. The RRPDC is merely a planning agency while the SA and VOAD only have the capacity to work operationally once a disaster occurs. This level of agency involvement among the other agencies in both planning and operational activity provides an excellent representation for the four phases of emergency management.

However, when analyzing the initial questionnaire results, it was rather unusual to note that many agencies did not utilize the FEMA Response Partner Guides that are designed to provide a ready reference of key roles and actions. The figure below illustrates the level of use regarding the guide. Unfortunately, it is unclear why usage is not higher during the response phase.

Figure 1: Use of FEMAs Response Partner Guides during Response



Agency Hierarchy during Emergency Management

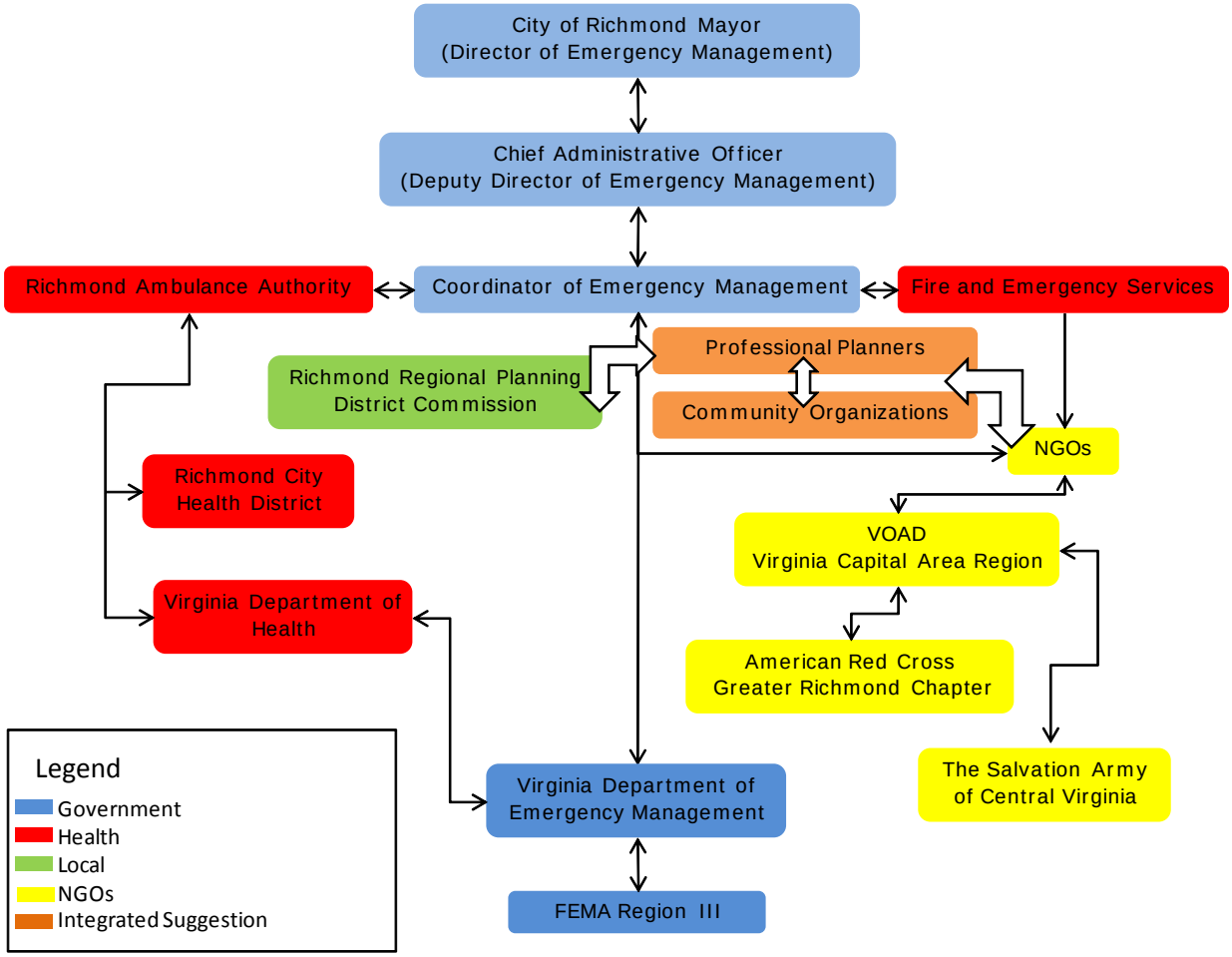


Figure 2: Agency Hierarchy during Emergency Management

The above flow chart identifies the agencies involved and what agencies communicate with each other essentially on a regular basis. The hierarchy was established in part, by the legislative order as well as from interviewee response perception. The role of planners and community organizations is suggested to interact with agencies such as the RRPDC and NGOs to further foster capacity building for the local level. In this regard, information can be easily shared closely with the local emergency manager.

Agency Interaction and Methods used for Interagency Information Sharing

Regarding agency interaction and integration to promote coordination and collaboration, all agencies stressed the importance of working together. Locally, mutual-aid agreements are in place so that one jurisdiction can provide resources, facilities, services, personnel, and other support to another jurisdiction (Gallant, 2008). The federal and state agencies display these principles by coordinating plans and strategies of hazard assessment, resource mobilization, and operations with other entities (Col, 2007). FEMA stated that the enabling legislation requires them to take on a coordination role. "Another key aspect of the legislation is that we supplement the efforts of local and state governments… when it gets so overwhelming, like say as it did in Hurricane Isabel, then the Governor and VDEM state coordinator would make the decision to call us in and ask us for assistance (FEMA)." Locally, the RCHD works with the Medical Reserve Corps, which is part of Citizen Corps Council and the RAA. Regarding NGOs, VDEMs volunteer and donations department works closely with VOAD, Community Emergency Response Teams (CERT), and 'to some degree the business community is a partner (D).'

Methods for promoting information sharing to build collaboration within the city include disaster preparedness committee meetings held monthly between representatives from all city departments. Parties involved include Richmond's emergency manager, local NGOs, local colleges and universities, and state representation from VDEM and VDH. The RCHD leads quarterly meetings involving hospitals, community clinics, the Red Cross, and the Department of Social Services (DSS), utilizing NIMS and Incident Command System (ICS). At the federal level, meetings are conducted twice annually, at a minimum, by the Regional Interagency Steering Committee (RISC). The committee is comprised of various other federal agencies in region III and also state representatives. Regarding NGOS, VOAD members meet three times

per year. Besides meetings, conference calls, email, and webinars were cited as an economical way of maintaining relationships between agencies.

In the event of an actual disaster, communication is increased at the state level through situation reports provided daily via WebEOC, a crisis information management system that provides secure, real-time information sharing. The Emergency Operations Center (EOC) is centrally located in the RAA, providing a quick response time for emergency medical services. Once activated the EOC hosts an array of agency representatives including, but not limited to public works and utilities, public health, law enforcement, EMS, emergency management, and the mayor's office so that an emergency plan can be devised quickly. Conference calls and situation reports are then conducted and distributed so that information can be available and up-to-date. Similarly, the Virginia Interoperability Picture for Emergency Response (VIPER) allows the Virginia Emergency Operations Center to display information that relates to each other spatially in order to drastically improve the situational awareness of response, recovery coordinators, and local emergency managers (https://cop.vdem.virginia.gov/viper). However, this software is for registered users only in the emergency management profession. FESs data collection is used to evaluate assistance: 'when fire and police are on the street along with Public Utilities and Works, they report back their findings and we collect and share that information to develop a plan (FES)."

At the federal level, once an operation is in effect, 'we establish an operation center working command post through the joint federal and state field office process… located somewhere in or near the impacted area (FEMA).' Parties involved include VDEM: 'We may have other commonwealth agencies in there, maybe the small business administration, The Army Corps of Engineers (FEMA).' FEMA also provides a platform for registered users to

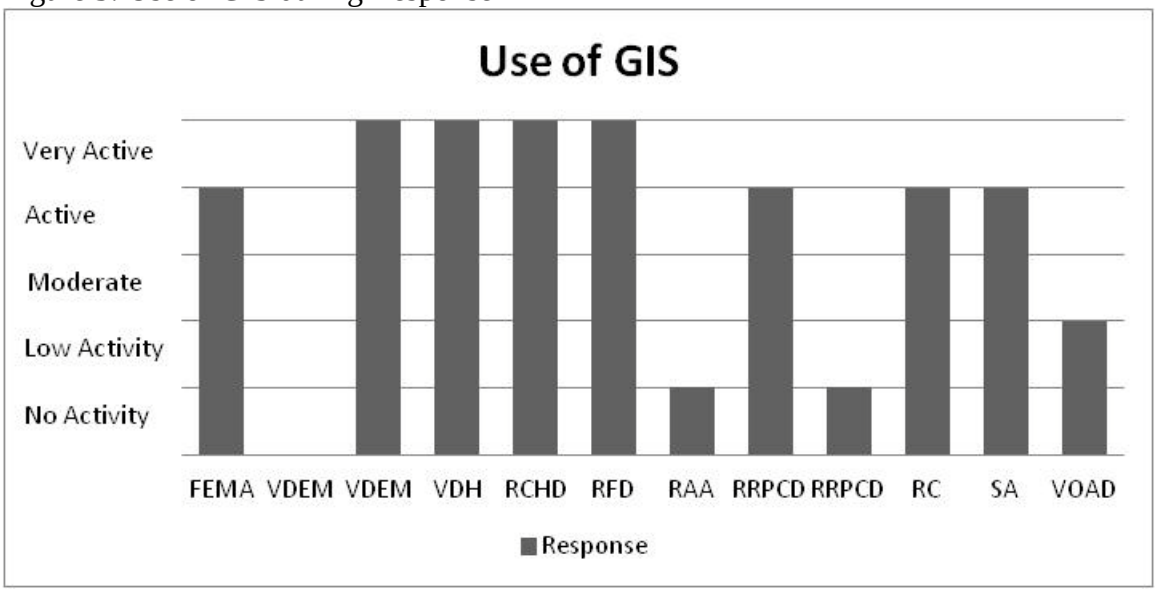
communicate about lessons learned from past disasters through the Lessons Learned Information Sharing (LLIS) website.

Regarding NGOs, the Coordinated Network Assistance (CAN) is a partnership that works with national, regional, and local relief organizations. "CAN provides assistance to nonprofits in developing, enhancing, and maintaining technological competency in the administration and delivery of services in order to maximize effectiveness and leverage resources. CAN harnesses the power of the Internet through a centralized database, resulting in shared, secure, up-to-date information about disaster victims and their needs and the timely delivery of services without duplication of efforts (http://www.can.org/our-mission/about-can)." Also, volunteers do an assessment on the ground and call central locations back to determine the need for help. VOAD is useful because, 'you may run into redundancy when providing assistance if the information is not shared (VOAD).'

Other tools used by the agencies during an emergency include GIS. FEMA states, 'we use GIS in damage assessment, but also in conducting actual disaster operations (FEMA).' The RCHD utilizes GIS in their mass operations dispensing plan because of a mandate with the CDC. "GIS is used to map out population concentrations, where pods need to be, in part because of transportation needs… For epidemiology measures (which is the agency's 'bread and butter') GIS is used quite a bit (RCHD)." According to VDEM, only a handful of voluntary organizations do have GIS capabilities for tracking their assets, response units, and similar resources (D). For example, some mass feeding units with national volunteer organizations do have GIS tracking devices so that equipment location can easily be identified and deployed elsewhere if necessary. On the other hand, VOAD itself does not use GIS because the organization discovered that Google maps earth was sufficient to meet their needs.

An unexpected result regarding the use of GIS by the RAA was that it was not readily used during any of the four phases of emergency management, particularly response. However, the agency is known globally for the sophisticated system they employ. The following figure illustrates the use of GIS for all agencies, most notably the RAA.

Figure 3: Use of GIS during Response



Tools for Communicating with the Public

Tools currently in place to inform not only emergency managers, but also business associations regarding the status of an event include the EOC's joint information center that produces a daily document called the Virginia briefing report. The report goes directly to an estimated 2,500 people who, in turn, forward the information others in their field to the public? Once the EOC is activated, the public can view the situation reports online. Informing the public regarding the aid available after an event are somewhat heavily web based. As noted, "the external affairs element is a very standing and significant part of any disaster operation (FEMA)." However, FEMA's accessibility to information regarding assistance is available online, by telephone, or in-person at a Disaster Recovery Center (DRC). FEMA has a very comprehensive external affairs group that provides press releases, conducts media interviews,

and performs other forms of outreach work. Additionally, FEMA may conduct town meetings for specific populations and, "are getting more and more involved in social media now, recognizing that a lot of people get their information from sources like Facebook and Twitter (FEMA)." An Information and Referral system, such as Virginia 2-1-1 is also available for victims to call and be connected to an agency or organization with the capability of fulfilling their needs. The free phone assistance is a service of the Virginia Department of Social Services in collaboration with United Way, among other organizations. However, according to VDEM a substantial portion of the population is not familiar with 2-1-1 unless they have some connection to social services. VDEM (D) believes that television and radio seem to be the best means for getting information out. Similarly, the RCHD communicates to the public through their website, radio, television, in-house clinics and are, "one of the very few districts with a full time public information officer (RCHD)." Do they use any text message system?

Considering that an event may damage property, public utilities, and other types of infrastructure, victims may experience a lack of phone service or transportation to a DRC or NGO facility. Unfortunately, vulnerable populations may also not have access to or knowledge about the use of computers. Most significantly, many of the agencies spoke of the public's complacency regarding preparedness and their expectations post-disaster. Individuals are encouraged to prepare themselves for at least a 72 hour period without any formal assistance. One site in place to raise public awareness is Ready Virginia, but it seems unlikely that people visit VDEMs website specifically for preparedness tips.

Addressing Social Vulnerability

As natural disasters are known to indiscriminately affect the lives of those unfortunate enough to be in the path and/or location, socially vulnerable persons suffer more and for an

extensive period once a disaster strikes. Although the historical facts for the events that took place in Richmond do not account for the socially vulnerable, it is important to note what those characteristics are and at the very least identify what that population looks like in Richmond.

Identifying who are vulnerable and where they reside is a challenging task for emergency managers. When asked, VDEM stated that a regional registry of special needs individuals was in working order until funding for the project was lost. The local emergency manager was working with the RRPCD, RCHD, and the RAA to establish such a document identifying those in need. The project was to be funded by a federal grant from the Urban Area Security Initiative (UASI), but the grant was ultimately lost. The RCHD said the region has tried for several years, beginning in roughly 2004, to create a document where people could report their special needs and register with the locality. The need to identify vulnerable populations in case of a disaster was not necessarily to identify what an individual's condition is, but that they exist in case of functional needs sheltering. Besides funding, additional problems included legal issues and technology issues. The privacy of patient and social services information is protected by The Health Insurance Portability and Accountability Act (HIPAA).

Federally, FEMA does have disability coordinators in each of the 10 regional offices. It is a full-time job to address the need of vulnerable people and any other special population that comes to their attention. "We recognize for example, that in urban areas we have a lot of people that don't own automobiles. So we know that in servicing that population in things like an evacuation, we may have to bring in buses or some other form of transportation. We can work through the state and local (agencies) in identifying the special needs and then we revise our operation accordingly to address those needs (FEMA)." However, if the localities are not even

able to identify that portion of the population, how do they expect to share that information that simply does not exist?

NGOs face a similar problem, but may be able to more readily gather such information because of the individuals they already serve. VDEMs planning department reaches out to voluntary organizations to help them gather the information about where vulnerable populations are so that a general idea exists (D). For example when the planning department is trying to identify where pockets of senior adults are, they can reach out to the council of aging or the Red Cross. However VOAD stated that not a lot is being done and honestly (he) doesn't know what can be done other than education (phone list). "People rely on the government rather than taking personal responsibility (VOAD)." Currently, there seems little hope of gathering and documenting where vulnerability exists, not only due to funding constraints and privacy mandates, but because it is a continuous process trying to identify the variables and maintain specific statistics.

Problems Faced in Emergency Management

A significant problem that was identified by nearly all agencies was current or pending budget cuts. At the local level, the department of emergency management for the RRPDC has only secured funding through 2013. The representative from that agency is unsure if the small department of three personnel will exist beyond that year. The RCHD, which is funded by the CDC, is facing a 7% cut for the fiscal year along with reductions over the past several years. Citing that, "public health has a role in any disaster (RCHD)," the importance of trained professionals to assist during an event is vital. Unfortunately, the Medical Reserve Corps (MRC), a volunteer based organization working with the RCHD and funded by the Metropolitan

Medical Response System (MMRS), "has seen dramatic cuts in the last couple of years with more cuts projected for the next year (RCHD)."

At the state level, the VDH reported a 15% decrease in federal grants although the agency is funded by the Centers for Disease Control (CDC) in addition to federal grants. Not only are federally funded agencies experiencing budget cuts, but NGOs have seen a significant decrease in donations that help to cover administrative costs. The Salvation Army of Central Virginia eliminated the Emergency Services Director (ESD) last October. The ESD was responsible for building and maintaining relationships with other agency emergency managers. Therefore, the SA's ability to plan and prepare for disasters has been hampered. Other NGOs that are primarily run through public donations have experienced significant decreases since the economic recession as well. "Any event that has occurred since 2005, has not received nearly the donations that were received, say from, Hurricane Andrew through Hurricane Katrina (D)."

Budget constraints not only affected localities and state governments, but federal agencies have had similar setbacks. "We certainly have, of particularly over the last year and the outlook going into the next several years is not very good. We, in fact expect to take more budget cuts, as most federal agencies are, so that is something that we are struggling with at this time (FEMA)." FEMA has two major funding sources, a regular funding source like most federal agencies that establishes the typical operating budget for any given fiscal year and then for actual disaster operations there is the President's disaster relief fund. That separate funding source typically is fed on an as needed basis. Referencing the numerous disaster declarations of 2011, FEMA stated that, "if we have a year like we are having this year… we end up spending a lot money in assistance then Congress has the opportunity to supplement that fund (FEMA)."

V. Conclusions

Recommendations

As urban areas increase in density, the risk for extensive property damage and potential loss of life intensifies during a natural disaster. How agencies ultimately prepare the public for an event and how they subsequently handle the response and recovery is vital. Through communication, collaborative networks can be developed to pool resources that may otherwise be scarce. Federal, State, local and nongovernmental organizations are responsible for the four phases of emergency management as doctrine by the NRF.

The research conducted sought to answer the three following objectives.

1) Illustrate the problem that may currently exist in emergency management following flooding in Richmond, Virginia and the impact this may have on vulnerable populations.

2) Examine preparedness and response by Federal, State, local agencies, and NGOs in order to identify missing links that might prevent hardship in already vulnerable areas.

3) Provide recommendations for future emergency management practices so that minimal effects to communities may occur.

Upon data analysis of the interviewee responses representing 10 agencies, it was found that communication and collaboration are encouraged. However, since the agencies work at different levels of government the hierarchy determined who was ultimately in charge.

The results of this study suggest that communication and collaboration exists between all agencies, but the extent to which well devised plans in emergency management are successful is undeterminable until the next catastrophe. Although budget constraints exist, the agencies work together to pool resources and build capacity. One of the most significant findings was the lack of documentation representing vulnerable populations who are typically in the most need of assistance post disaster.

The role of planners should be considered and developed so that professional knowledge of existing vulnerable populations can be shared with appropriate agencies. Since planning heavily involves the public, local planners should work alongside key community organizations to foster lines of communication between local governments and NGOs. The need for public involvement in emergency management has yet to be encouraged. Public complacency will only compound an already futile effort. Therefore, fostering a relationship with community networks will only help to create a more sustainably resilient community after any disaster.

Limitations and Potential Problems

For most communities, emergency management is similarly constructed and/or handled similarly. Suggestions made can be applicable not only to localities, but regionally as well. The research suggests that emergencies are considered local events, and therefore, should be handled locally with state and/or federal guidance and assistance when needed. Strengthening the lines of communication between the local, state, and federal government will foster relationships that produce resourceful community members in the event of an emergency.

By conducting in-person interviews, it was observed that the respondents were willing to provide more information than initially requested. However, it is unclear if respondents were answering the questions in a manner that was politically expedient. Therefore, possible responses could have intentionally been undisclosed. Although additional responses were insightful, a couple of interviewees did not specifically answer the questions asked. In comparison, however, it was apparent that the phone interviews did not support probing for further responses. The phone interviews conducted seemed impersonal and did not produce the breadth of data obtained by the face-to-face interviews. Regarding survey results, missing data is

also a consideration. Only two respondents did not fully complete the initial questionnaire for reasons unknown. Missing data does present a problem in index construction. Handling the missing data is resolved by treating it as one of the available responses (Babbie, 2005). For instance, the missing data will be considered as a 'not active' response. Although this solution will possibly alter the data analysis results, the effects are minuscule.

One potential shortcoming of the technique used in the current study is that it relies on self-reporting by the involved parties and the data gathered are not subject to independent verification. Thus, while this type of study may evaluate the inter-organizational structure of the planning process and response to a natural disaster it does not allow one to determine their overall effectiveness in a real-life situation. There are many examples of disaster plans that seem good on paper but which are found to have numerous problems when subjected to a test scenario or to the real event. Additionally, the questions asked might have been different had the interviewees been involved in their development. This potential issue was addressed by allowing the interviewees to respond to rather open-ended questions (Appendix A)

A major perturbation was encountered during the interviews that must impact the implementation of any planning, and in some cases impact the planning process itself. Virtually all agency interviews, with the possible exception of FEMA, reported draconian budget cuts that had either taken place or were about to take place. These will undoubtedly affect the outcome of any disaster planning.

Future studies that may enhance the research currently available regarding emergency management successes and shortfalls, may include working with local community organizations to evaluate the level of preparedness and the resiliency during recovery. Particularly, looking back at events such as Hurricane Katrina or disasters that occurred on a much smaller scale will

provide insight as to change needed. Lessons learned will be applicable to an extent if a much more severe disaster were to occur. Unfortunately, only time will tell what needs to be in place in order to lessen the effects of the next major natural disaster.

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Appendix A

Interview Questions

Release Authorization

I hereby give consent for release of the following information obtained from the questionnaire administered and the interview conducted by Jocelyn Leitch.

All information obtained is strictly for Virginia Commonwealth University student research purposes in partial fulfillment for a Master's in Urban and Regional Planning.

Signature _____

Date _____

Date_____ **Agency _____**

The purpose of the following questionnaire and interview is specifically for student research regarding the extent to which data sharing is conducted between government agencies and non-governmental organizations in the metropolitan area of the City of Richmond before, during, and immediately after a major natural disaster.

Questionnaire and interview format

-Cluster question types.
-Randomize question types to prevent order bias.
-Use of Likert-type scale where appropriate (1-5).
-Some redundancy employed for validation purposes and to capture missed information using different formats.

Initial Questionnaire:

Agency:
Address:
Website:

Type of agency: Federal. State, Local, NGO

Representative (interviewee)
Name:
Title:

A. For the following questions, use the scale (1-5) to rate the level of involvement/activity of your agency: (1) No Activity (2) Low Level of Activity (3) Moderately Active (4) Active (5) Very Active

1. Planning activity of your agency for each of the following phases.
    a. Mitigation. _____
    b. Preparedness. _____
    c. Response. _____
    d. Recovery. _____

2. Operational work of your agency within the community during each of the following phases.
    a. Mitigation. _____
    b. Preparedness. _____
    c. Response. _____
    d. Recovery. _____

3. Integration/interaction with (other) governmental agencies during each of the following phases.
    a. Mitigation. _____
    b. Preparedness. _____
    c. Response. _____
    d. Recovery, _____

4. Integration/interaction with NGOs during each of the following phases.
    a. Mitigation. ____
    b. Preparedness. ____
    c. Response. _____
    d. Recovery. _____

5. Integration/interaction with the for-profit sector (e.g. Chamber of Commerce, insurance industry) during each of the following phases.
    a. Mitigation. ____
    b. Preparedness. ____
    c. Response. ____
    d. Recovery. ____

6. Geographic Information Systems (GIS) capacity of your agency. _____

7. Use of GIS in the planning activity of your agency for each of the following phases.
    a. Mitigation. _____
    b. Preparedness. _____
    c. Response. _____
    d. Recovery. _____

8. Use of other databases in the planning activity of your agency for each of the following phases. (Please indicate database resources used)
    a. Mitigation. ____
    b. Preparedness. _____
    c. Response. _____
    d. Recovery. _____
    Database(s) used: _____

9. Utilization of FEMA's Response Partner Guide during each of the following phases.
    a. Mitigation. ____
    b. Preparedness. ____
    c. Response. ____
    d. Recovery. ____

10. Communication with the general public during each of the following phases.
    a. Mitigation. ____
    b. Preparedness. ____
    c. Response. ____
    d. Recovery. ____

Agency _____

B. Initial Interview Questions

1. Is your agency involved merely in planning, or does your agency work operationally within the community?

2. Is this agency a government entity, an NGO, or a private for-profit organization?

3. What tools beyond website links are currently in place to provide information regarding the availability of assistance to those affected by a disaster?

4. What steps are being taken to promote data sharing in the event of a disaster and with what other agencies is your agency communicating?

5. Is such interagency data sharing during the four phases of emergency management continuous or intermittent? If intermittent please provide information on the triggers for, and frequency of such communication.

6. What discrete efforts have been made since the last disaster to improve services if such a disaster were to occur again?

7. From your perspective**,** what lines of communication exist between the City of Richmond and the various emergency management services?

8. What data collection methods and tools are used to evaluate the need for and provide assistance to affected populations during a disaster?

9. Do these collection methods include Geographic Information Systems (GIS)?

10**.** How does the agency relay pertinent information and with whom does it share such information?

11. What, if any, provisions are made for identifying the short and long-term needs of vulnerable populations?

12. What is the availability of information, given out by your agency, regarding the status of disaster response to the general public?

13. What means of communication are used to promote public awareness during the four phases of emergency management (public media, reverse 911, social media, 211 Virginia- a phone number connecting people with free information on available community services, etc.)?

14. During which phase of emergency management does your agency figure most prominently?

15. Which agency do you consider the lead agency during each phase of emergency management?

16. With what agencies, if any, do you share disaster-related meeting minutes and reports?

Agency _____

C. Historical Questions

1. When was your agency originally founded, and what was the primary purpose or mission at that time?

2. How has your agency evolved from its original purpose to the mission and services it now provides?

3. Was your agency involved during the flooding associated with the hurricanes and tropical depressions Isabel (2003), Gaston (2004), and more recently Ernesto (2006)?

4. Are disaster related services the primary function of your agency?

Appendix B

Questionnaire Raw Data

Table 3: Planning Activity during Emergency Management

Question 1	Planning Activity	Mitigation	Preparedness	Response	Recovery
FEMA	RecoveryDirector Region III	5	5	5	5
VDEM	Emergency Manager	3	5	5	4
VDEM	Operations Director	5	5	5	5
VDH	Preparedness Director	5	5	5	5
RCHD	Emergency Planner	4	5	5	4
EFS	Public Information Officer	4	5	5	5
RAA	Director of Safety and Risk Management	3	2	1	1
RRPCD	Director of Information and Planning Systems	5	5	1	2
RRPCD	Emergency Management Planner	4	5	3	3
RC	Manager, Disaster Services	3	5	4	4
SA	Area Commander	3	4	5	4
VOAD	State Disaster Relief Coordinator	3	5	5	5

Table 4: Operational Activity during Emergency Management

Question 2	Operational Activity	Mitigation	Preparedness	Response	Recovery
FEMA	RecoveryDirector Region III	5	5	5	5
VDEM	Emergency Manager	2	5	5	2
VDEM	Operations Director	5	5	5	5
VDH	Preparedness Director	5	5	5	5
RCHD	Emergency Planner	3	5	5	3
EFS	Public Information Officer	5	5	5	5
RAA	Director of Safety and Risk Management	3	2	1	1
RRPCD	Director of Information and Planning Systems	1	1	1	1
RRPCD	Emergency Management Planner	1	1	1	1
RC	Manager, Disaster Services	3	5	5	5
SA	Area Commander	3	4	5	5
VOAD	State Disaster Relief Coordinator	3	4	5	5

Table 5: Interaction with Government Agencies during Emergency Management

Question 3	Interaction w/govt	Mitigation	Preparedness	Response	Recovery
FEMA	Recovery Director Region III	4	5	5	5
VDEM	Emergency Manager	3	5	5	4
VDEM	Operations Director	5	5	5	5
VDH	Preparedness Director	5	5	5	5
RCHD	Emergency Planner	5	5	5	5
EFS	Public Information Officer	5	5	5	5
RAA	Director of Safety and Risk Management	3	2	1	1
RRPCD	Director of Information and Planning Systems	5	5	1	2
RRPCD	Emergency Management Planner	5	5	1	2
RC	Manager, Disaster Services	3	4	5	5
SA	Area Commander	3	5	5	5
VOAD	State Disaster Relief Coordinator	3	5	5	5

Table 6: Interaction with NGOS during Emergency Management

Question 4	Interaction w/NGOs	Mitigation	Preparedness	Response	Recovery
FEMA	Recovery Director Region III	2	4	3	5
VDEM	Emergency Manager	2	2	3	2
VDEM	Operations Director	4	5	5	4
VDH	Preparedness Director	4	4	4	4
RCHD	Emergency Planner	5	5	5	5
EFS	Public Information Officer	5	5	5	5
RAA	Director of Safety and Risk Management	4	4	1	1
RRPCD	Director of Information and Planning Systems	4	4	1	1
RRPCD	Emergency Management Planner	3	4	1	2
RC	Manager, Disaster Services	2	4	4	4
SA	Area Commander	4	5	5	5
VOAD	State Disaster Relief Coordinator	3	5	5	5

Table 7: Interaction with Private Sector during Emergency Management

Question 5	Interaction w/Private	Mitigation	Preparedness	Response	Recovery
FEMA	Recovery Director Region III	3	3	2	3
VDEM	Emergency Manager				
VDEM	Operations Director	3	4	4	4
VDH	Preparedness Director	4	4	4	4
RCHD	Emergency Planner	4	4	4	4
EFS	Public Information Officer	4	5	5	4
RAA	Director of Safety and Risk Management	4	4	4	4
RRPCD	Director of Information and Planning Systems	2	2	1	1
RRPCD	Emergency Management Planner	2	2	1	2
RC	Manager, Disaster Services	1	4	3	3
SA	Area Commander	2	2	4	4
VOAD	State Disaster Relief Coordinator	2	4	4	4

Table 8: GIS Capacity during Emergency Management

Question 6	GIS Capacity	
FEMA	Recovery Director Region III	4
VDEM	Emergency Manager	
VDEM	Operations Director	
VDH	Preparedness Director	4
RCHD	Emergency Planner	5
EFS	Public Information Officer	5
RAA	Director of Safety and Risk Management	1
RRPCD	Director of Information and Planning Systems	5
RRPCD	Emergency Management Planner	5
RC	Manager, Disaster Services	
SA	Area Commander	3
VOAD	State Disaster Relief Coordinator	2

Table 9: Use of GIS during Emergency Management

Question 7	Use of GIS in Planning	Mitigation	Preparedness	Response	Recovery
FEMA	Recovery Director Region III	3	1	4	4
VDEM	Emergency Manager				
VDEM	Operations Director	5	5	5	5
VDH	Preparedness Director	4	4	5	4
RCHD	Emergency Planner	5	5	5	5
EFS	Public Information Officer	5	5	5	5
RAA	Director of Safety and Risk Management	1	1	1	1
RRPCD	Director of Information and Planning Systems	5	5	4	2
RRPCD	Emergency Management Planner	5	4	1	3
RC	Manager, Disaster Services	1	4	4	2
SA	Area Commander	2	2	4	4
VOAD	State Disaster Relief Coordinator	1	1	2	2

Table 10: Use of other Databases during Emergency Management

Question 8	Use of other databases	Mitigation	Preparedness	Response	Recovery
FEMA	Recovery Director Region III	5	4	5	5
VDEM	Emergency Manager				
VDEM	Operations Director				
VDH	Preparedness Director	5	5	4	4
RCHD	Emergency Planner	5	5	4	3
EFS	Public Information Officer	5	5	5	5
RAA	Director of Safety and Risk Management	2	2	1	1
RRPCD	Director of Information and Planning Systems	5	5	5	1
RRPCD	Emergency Management Planner				
RC	Manager, Disaster Services				
SA	Area Commander	2	4	5	5
VOAD	State Disaster Relief Coordinator	2	3	3	3

Table 11: Use of FEMA Partner Guide during Emergency Management

Question 9	FEMA Partner Guide	Mitigation	Preparedness	Response	Recovery
FEMA	Recovery Director Region III	2	4	3	3
VDEM	Emergency Manager	1	1	1	1
VDEM	Operations Director	5	5	3	4
VDH	Preparedness Director	3	3	3	3
RCHD	Emergency Planner	4	4	4	4
EFS	Public Information Officer	4	4	4	4
RAA	Director of Safety and Risk Management				
RRPCD	Director of Information and Planning Systems	4	4	4	1
RRPCD	Emergency Management Planner	4	4	1	2
RC	Manager, Disaster Services	1	3	5	4
SA	Area Commander	4	5	5	5
VOAD	State Disaster Relief Coordinator	1	2	3	3

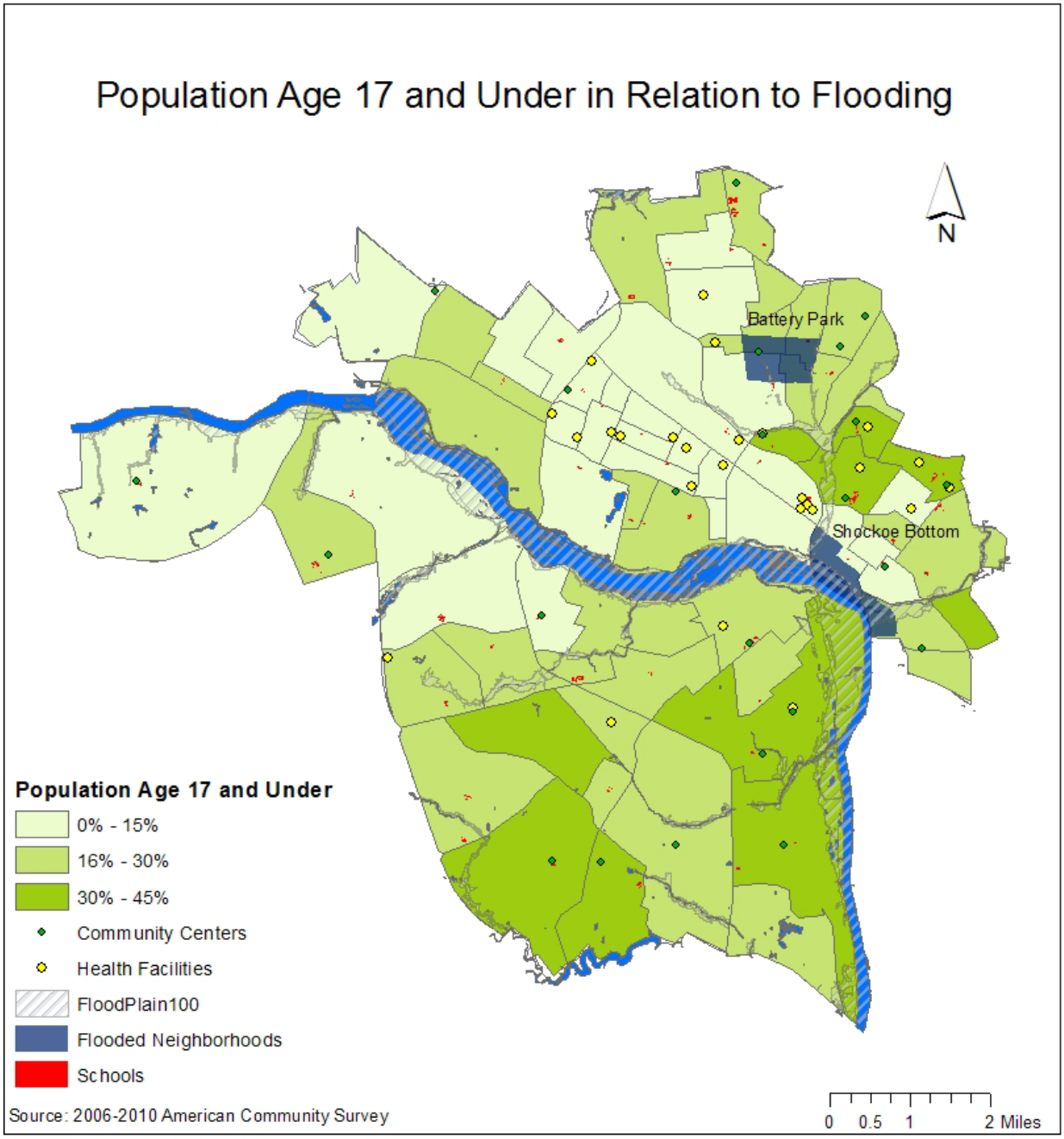
Table 12: Communication with Public during Emergency Management

Question 10	Communication	Mitigation	Preparedness	Response	Recovery
FEMA	Recovery Director Region III	4	3	3	5
VDEM	Emergency Manager				
VDEM	Operations Director	4	5	5	5
VDH	Preparedness Director	5	5	5	5
RCHD	Emergency Planner	5	5	5	5
EFS	Public Information Officer	5	5	5	5
RAA	Director of Safety and Risk Management	2	3	1	1
RRPCD	Director of Information and Planning Systems	5	5	1	1
RRPCD	Emergency Management Planner	1	1	1	1
RC	Manager, Disaster Services	1	5	5	4
SA	Area Commander	3	4	4	4
VOAD	State Disaster Relief Coordinator	2	2	3	3

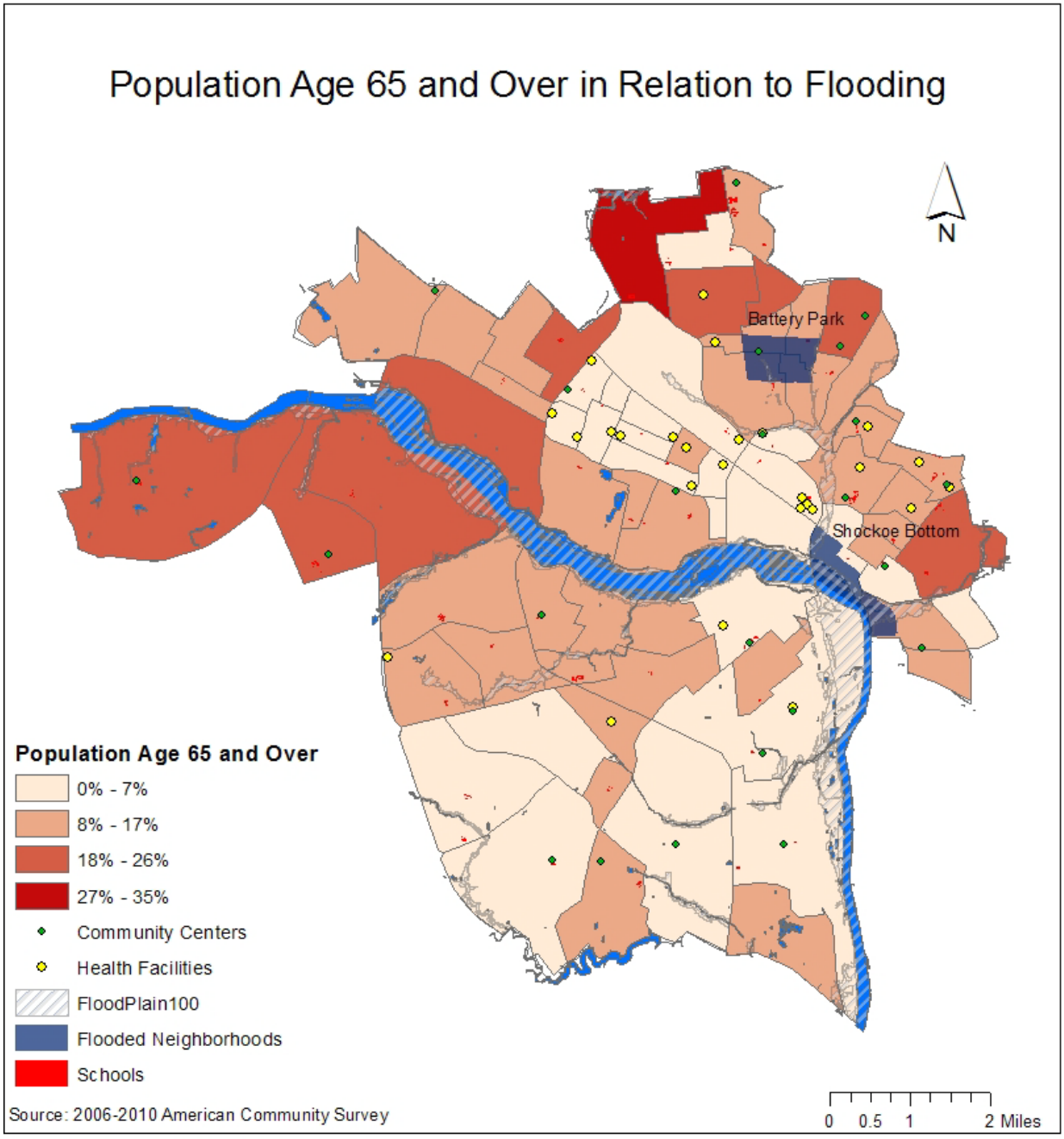
Appendix C

The following maps illustrate SVI variables in relation to historical flooding and the location of facilities such as community centers, healthcare facilities, and schools that may be used as shelters in the event of a disaster declaration.

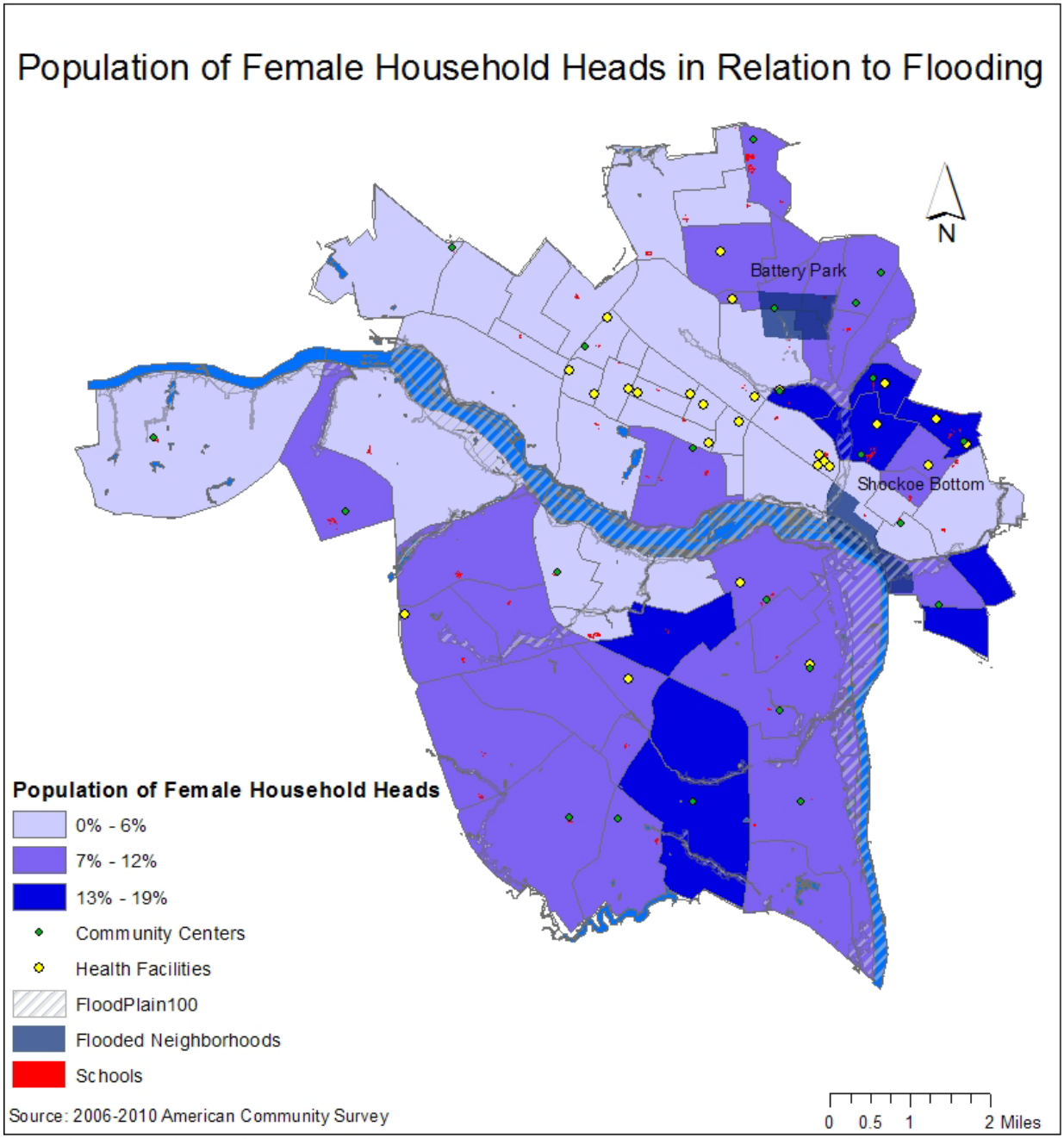
Map 3: Population Age 17 and Under in Relation to Flooding



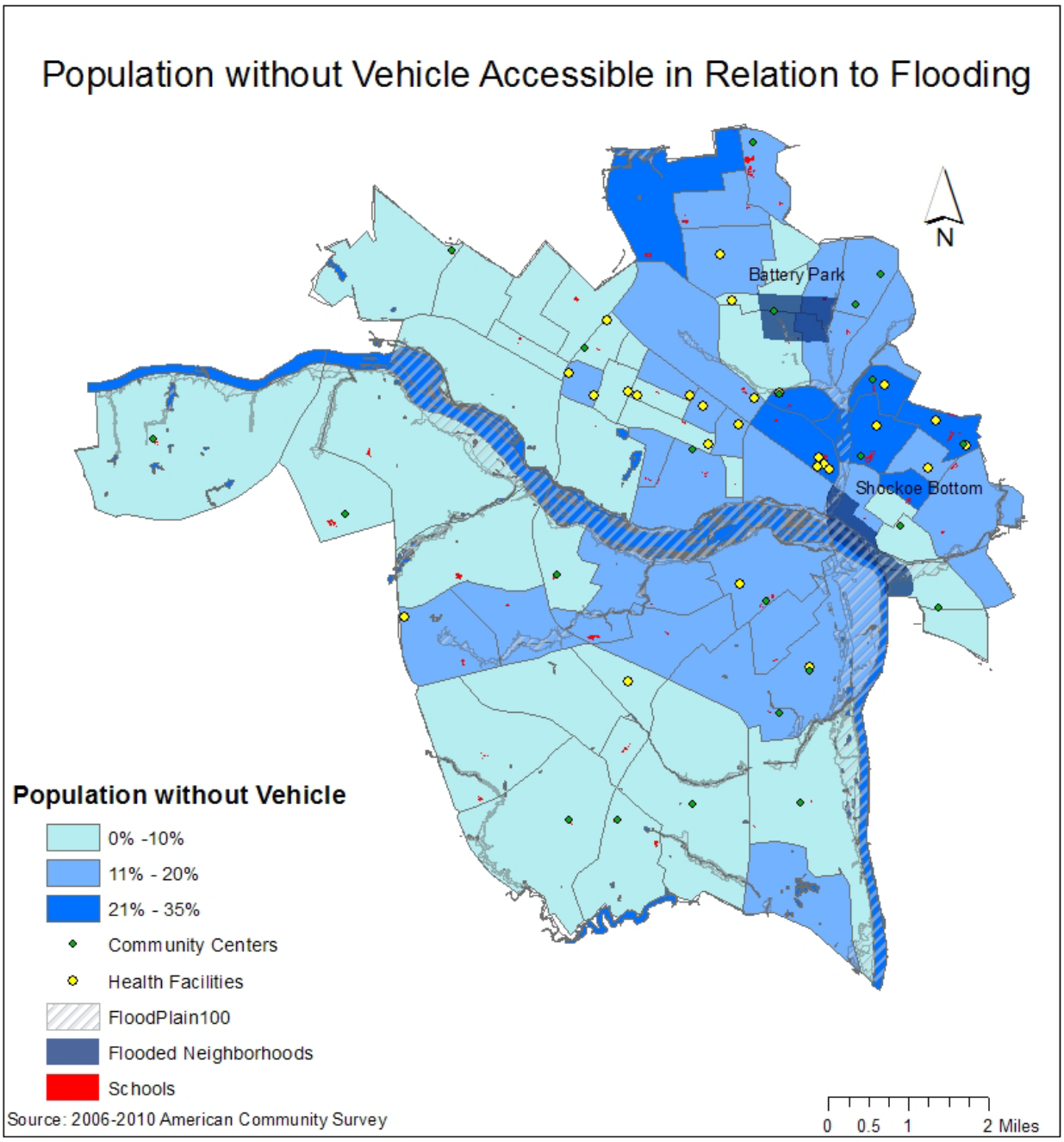
Map 4: Population Age 65 and Over in Relation to Flooding



Map 5: Population of Female Household Heads in Relation to Flooding



Map 6: Population without a Vehicle Accessible in Relation to Flooding



The following figures represent a graphical representation of the initial survey questionnaire

A. For the following questions, use the scale (1-5) to rate the level of involvement/activity of your agency: (1) No Activity (2) Low Level of Activity (3) Moderately Active (4) Active (5) Very Active

1. Planning activity of your agency for each of the following phases.
    a. Mitigation. _____
    b. Preparedness. _____
    c. Response. _____
    d. Recovery. _____

Figure 4: Planning Activity of Agency during Mitigation

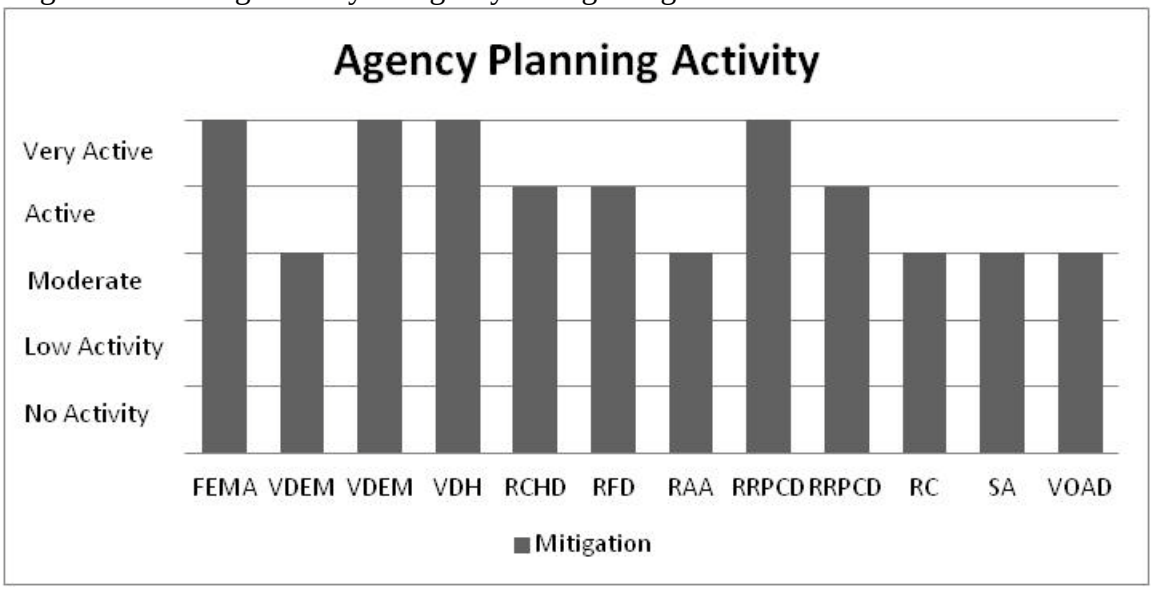


Figure 5: Planning Activity of Agency during Preparedness

Figure 6: Planning Activity of Agency during Response

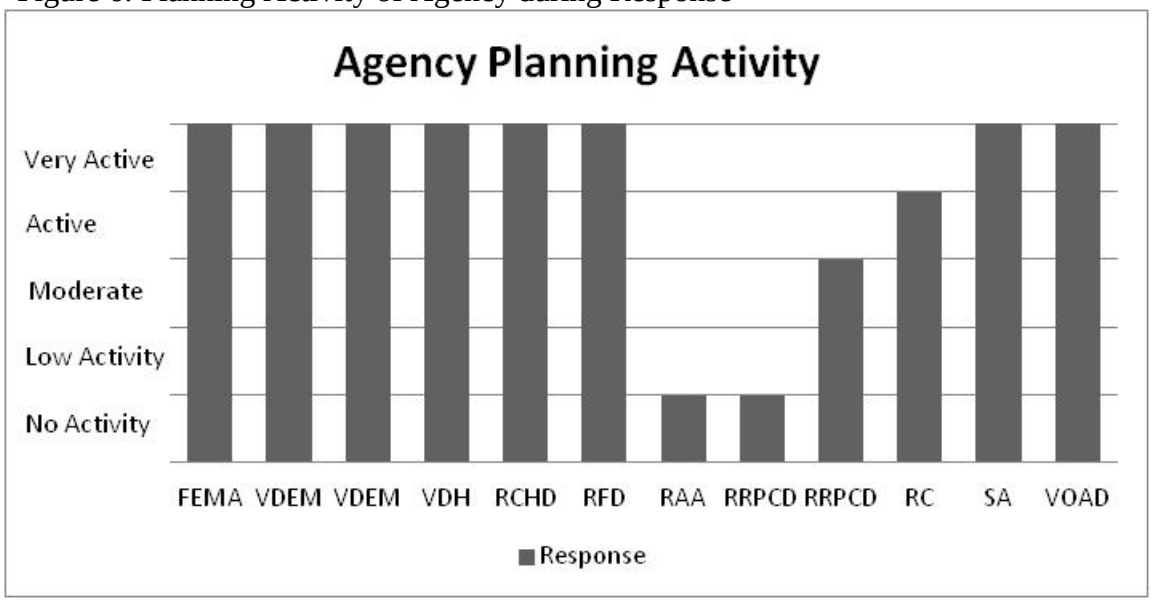
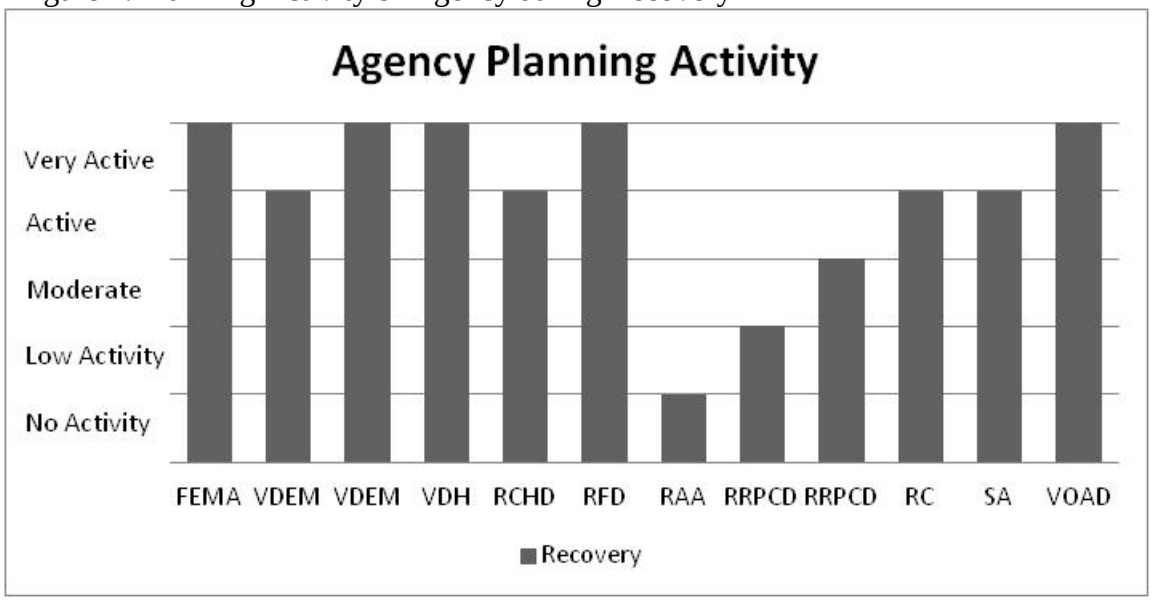


Figure 7: Planning Activity of Agency during Recovery



2. Operational work of your agency within the community during each of the following phases.
    a. Mitigation. _____
    b. Preparedness. _____
    c. Response. _____
    d. Recovery. _____

Figure 8: Operational Activity of Agency during Mitigation

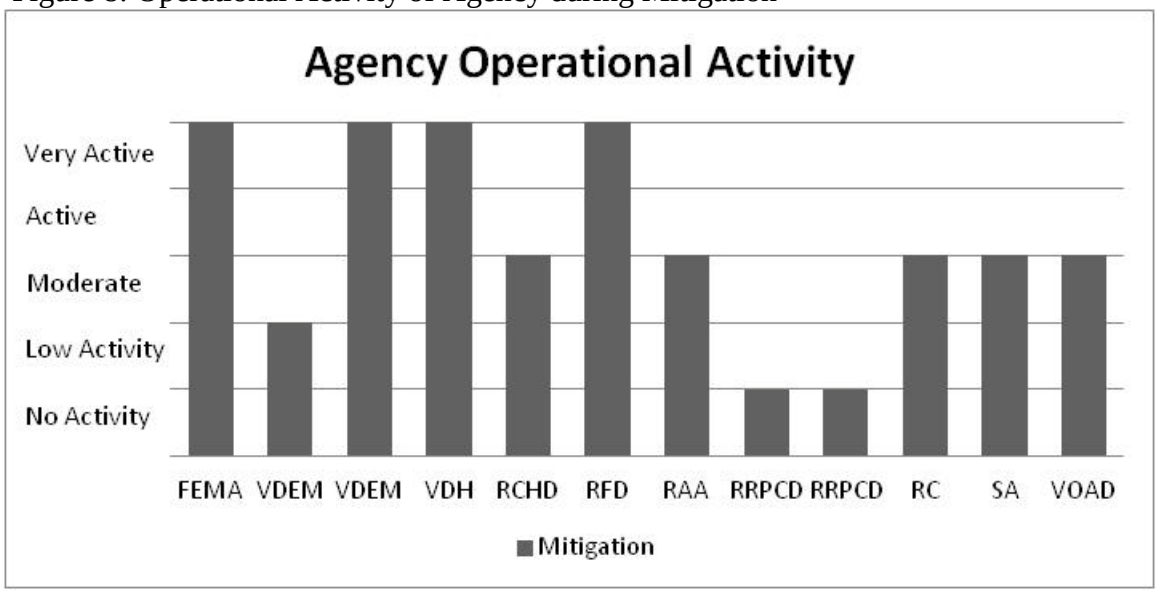


Figure 9: Planning Activity of Agency during Preparedness

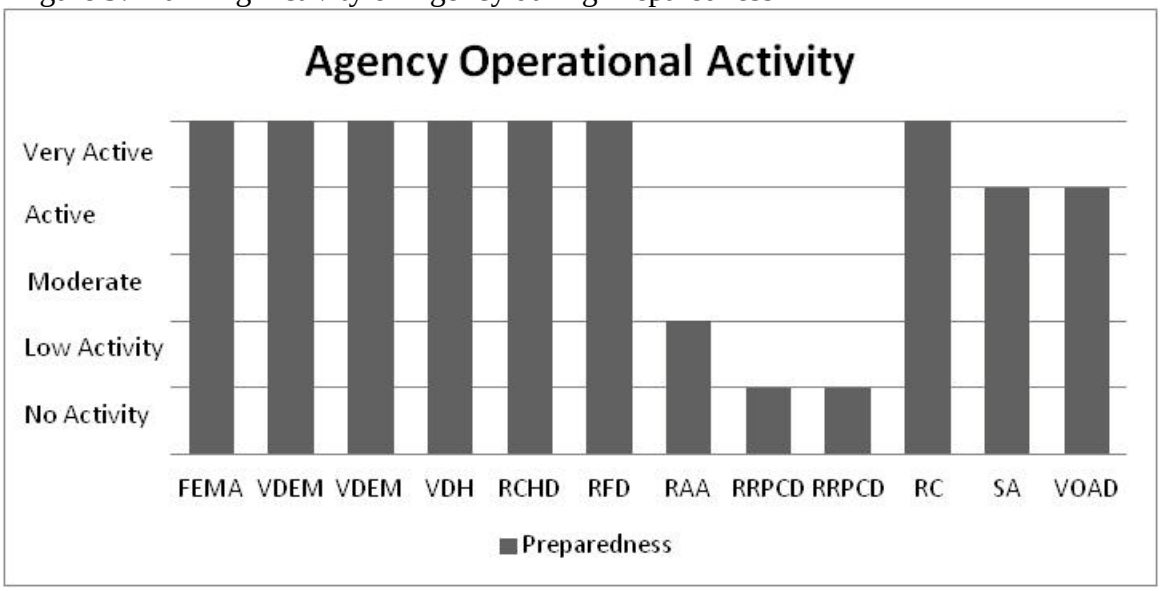


Figure 10: Planning Activity of Agency during Response

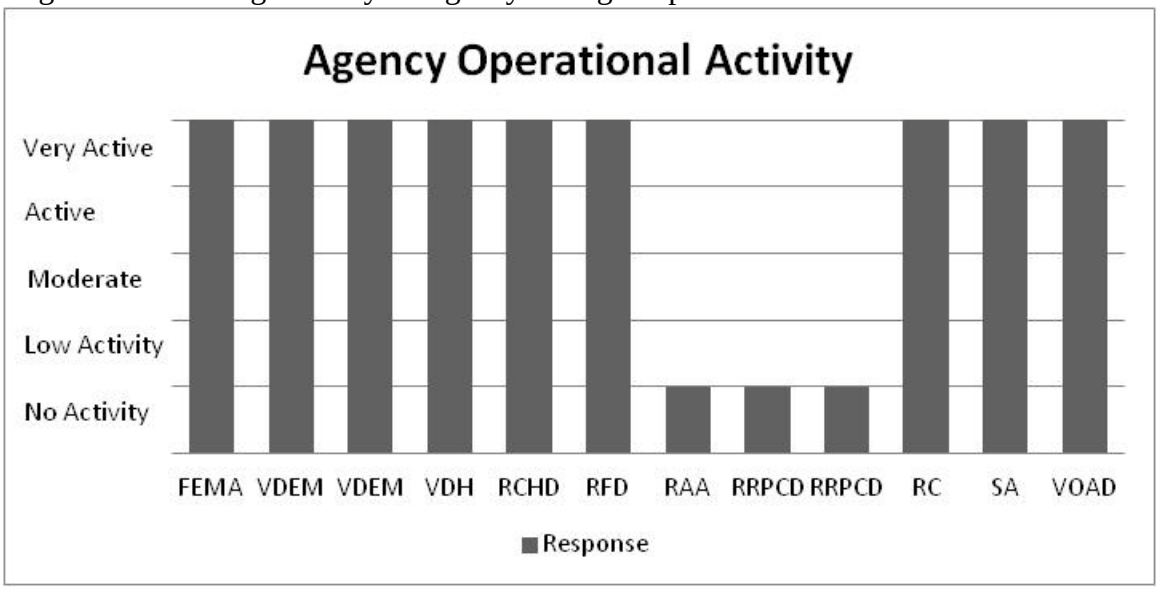
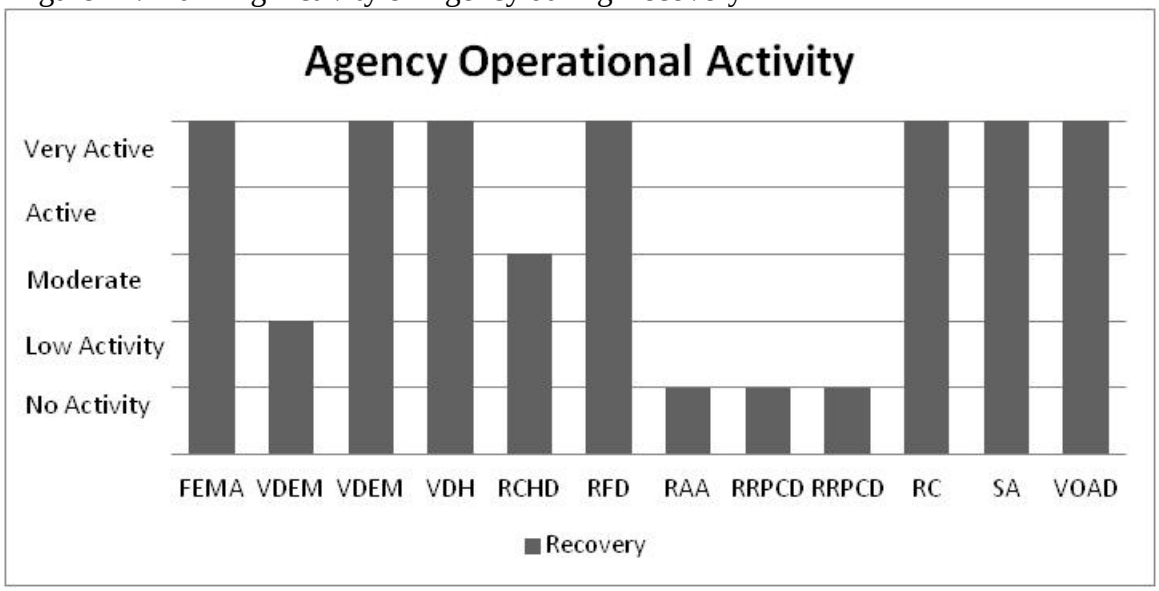


Figure 11: Planning Activity of Agency during Recovery



3. Integration/interaction with (other) governmental agencies during each of the following phases.
    a. Mitigation. _____
    b. Preparedness. _____
    c. Response. _____
    d. Recovery, _____

Figure 12: Integration/Interaction with (other) Governmental Agencies during Mitigation

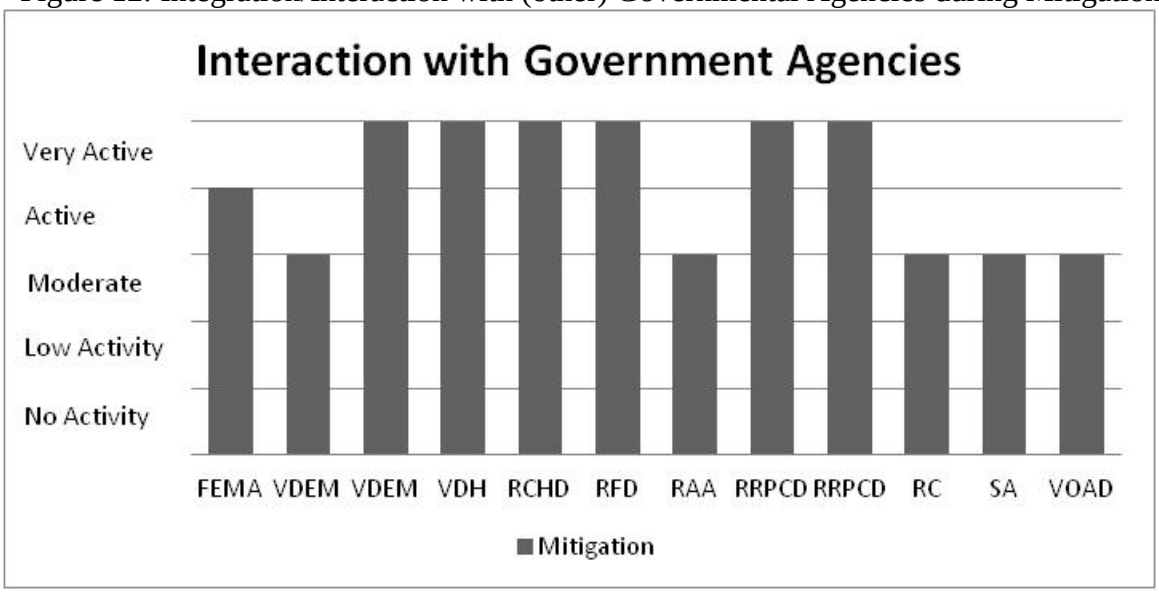


Figure 13: Integration/Interaction with (other) Governmental Agencies during Preparedness

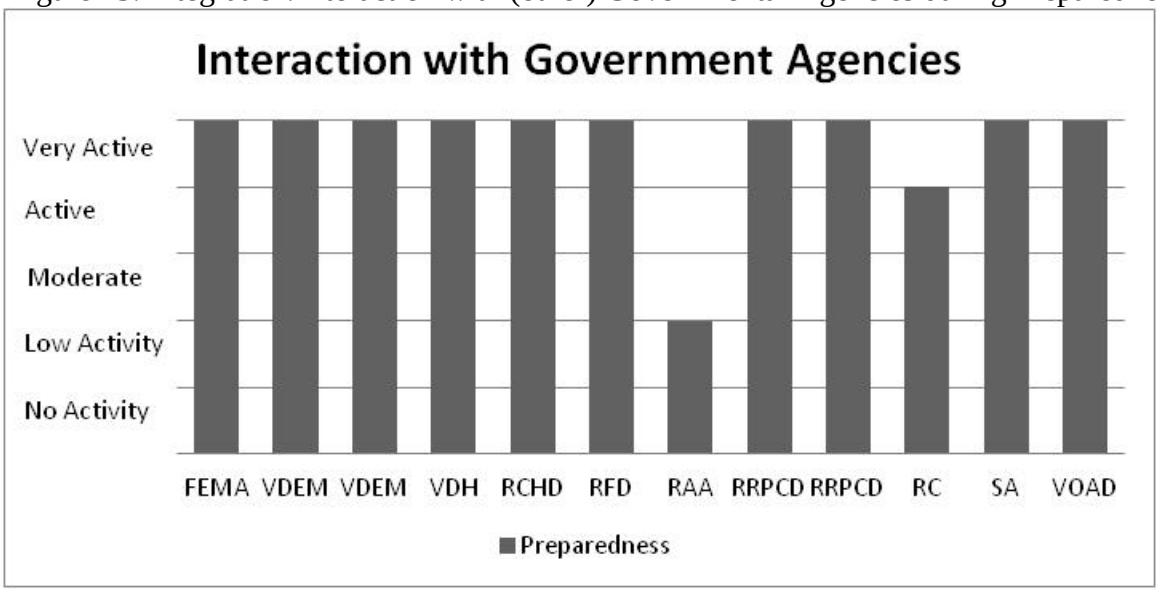


Figure 14: Integration/Interaction with (other) Governmental Agencies during Response

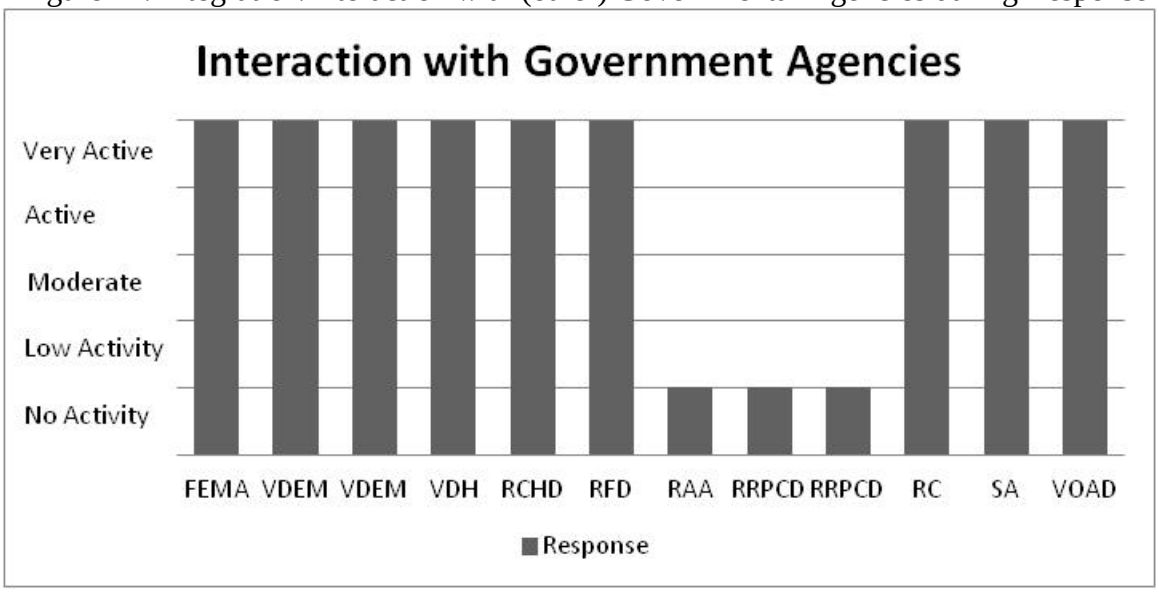
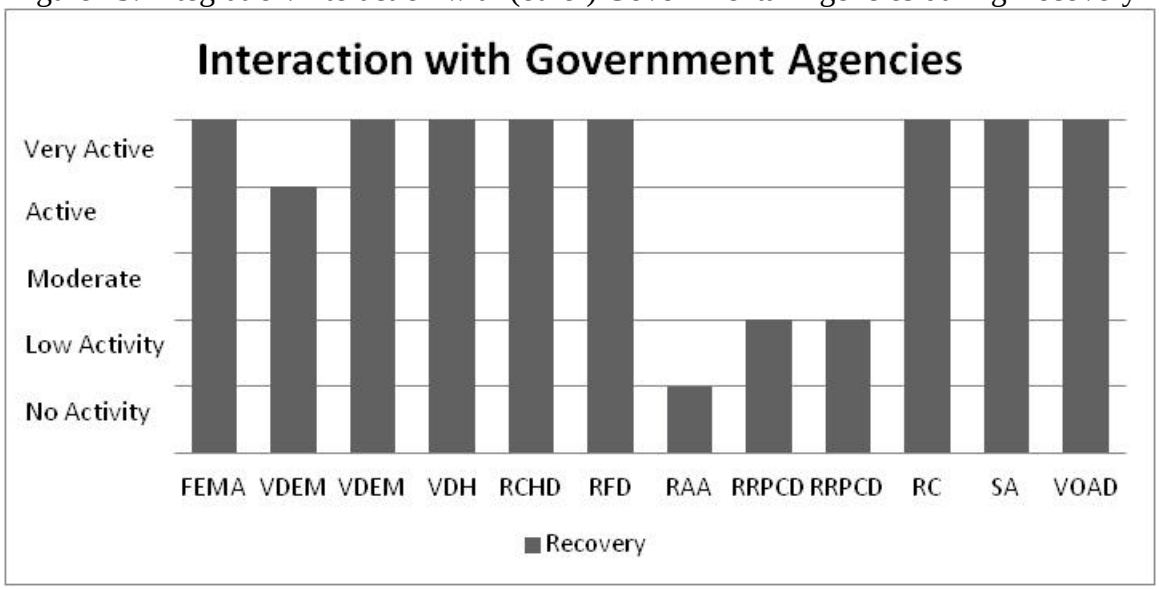


Figure 15: Integration/Interaction with (other) Governmental Agencies during Recovery



4. Integration/interaction with NGOs during each of the following phases.
    a. Mitigation. ____
    b. Preparedness. ____
    c. Response. _____
    d. Recovery. _____

Figure 16: Agency Integration/Interaction with NGOs during Mitigation

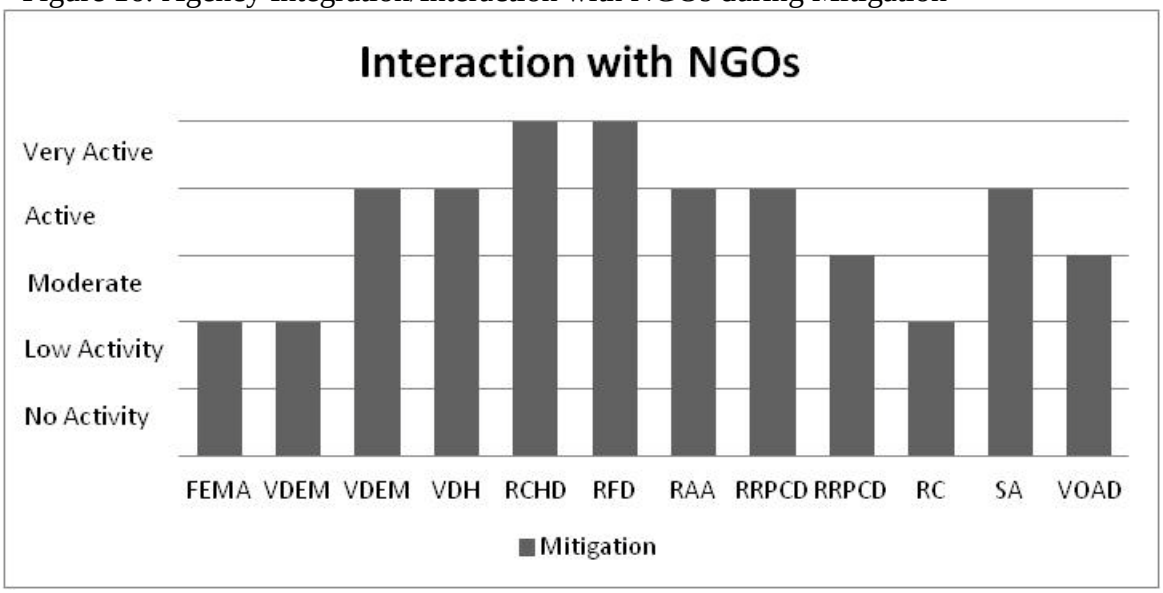


Figure 17: Agency Integration/Interaction with NGOs during Preparedness

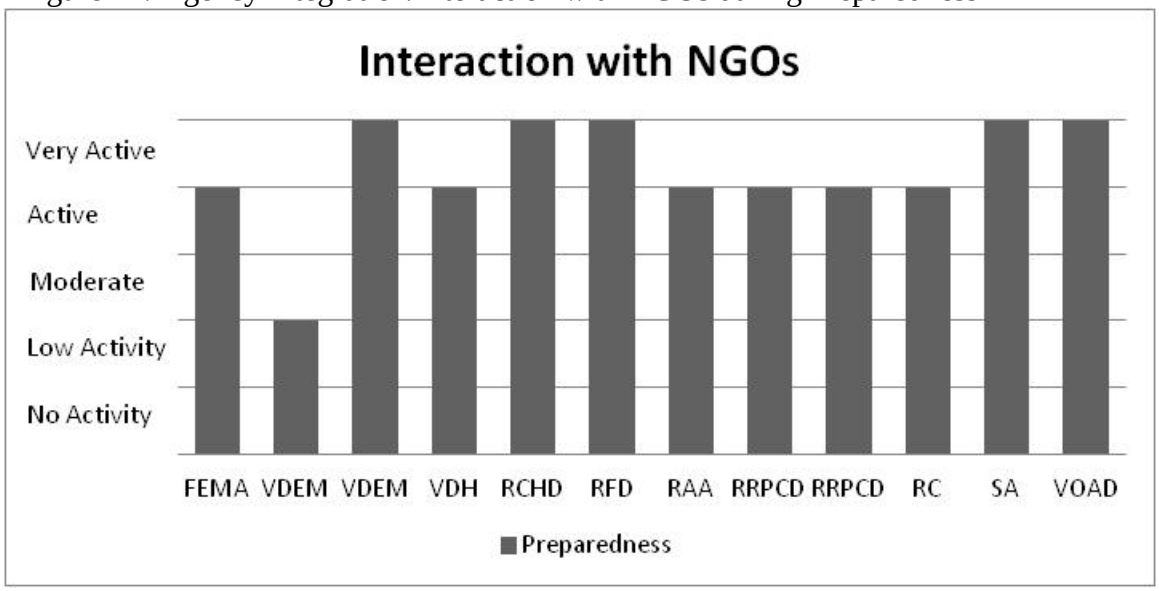


Figure 18: Agency Integration/Interaction with NGOs during Response

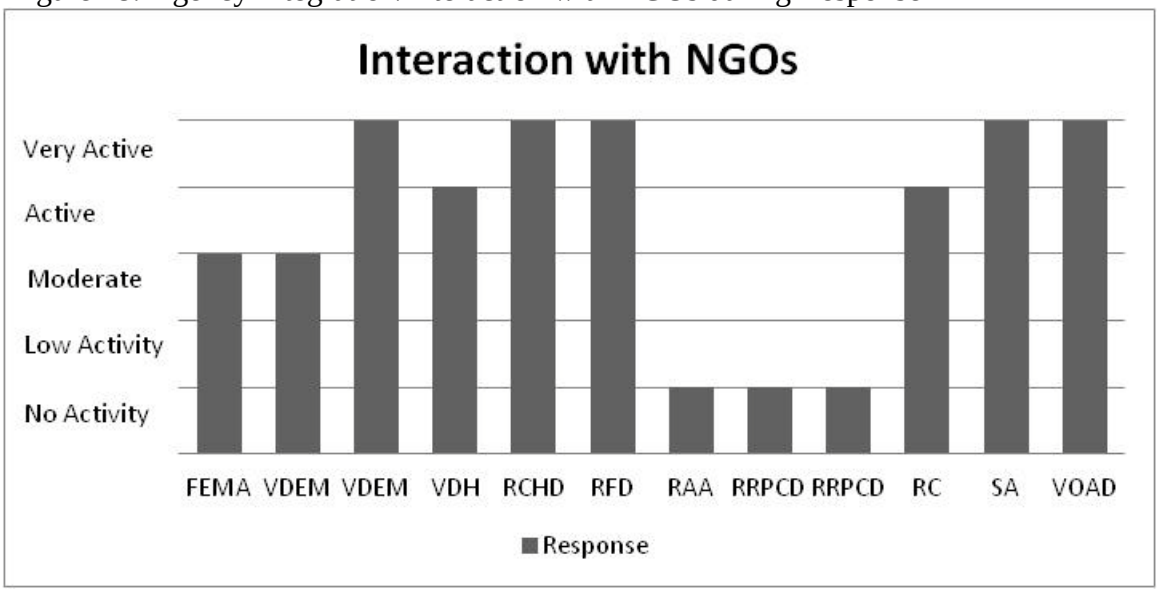
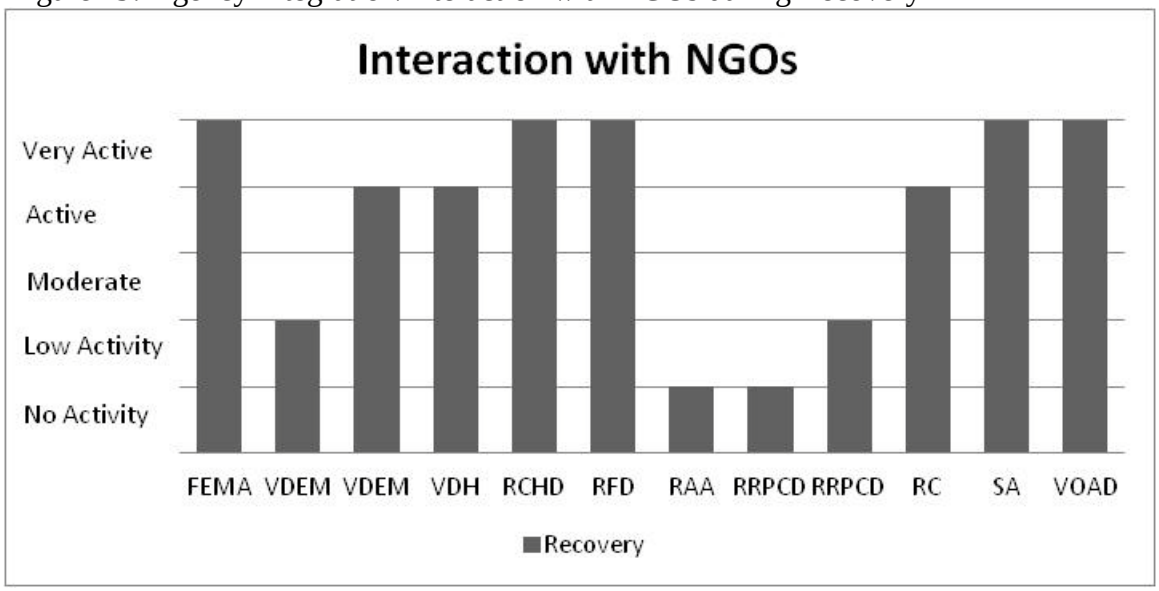


Figure 19: Agency Integration/Interaction with NGOs during Recovery



5. Integration/interaction with the for-profit sector (e.g. Chamber of Commerce, insurance industry) during each of the following phases.
    a. Mitigation. ____
    b. Preparedness. ____
    c. Response. ____
    d. Recovery. ____

Figure 20: Integration/interaction with the for-profit sector during Mitigation

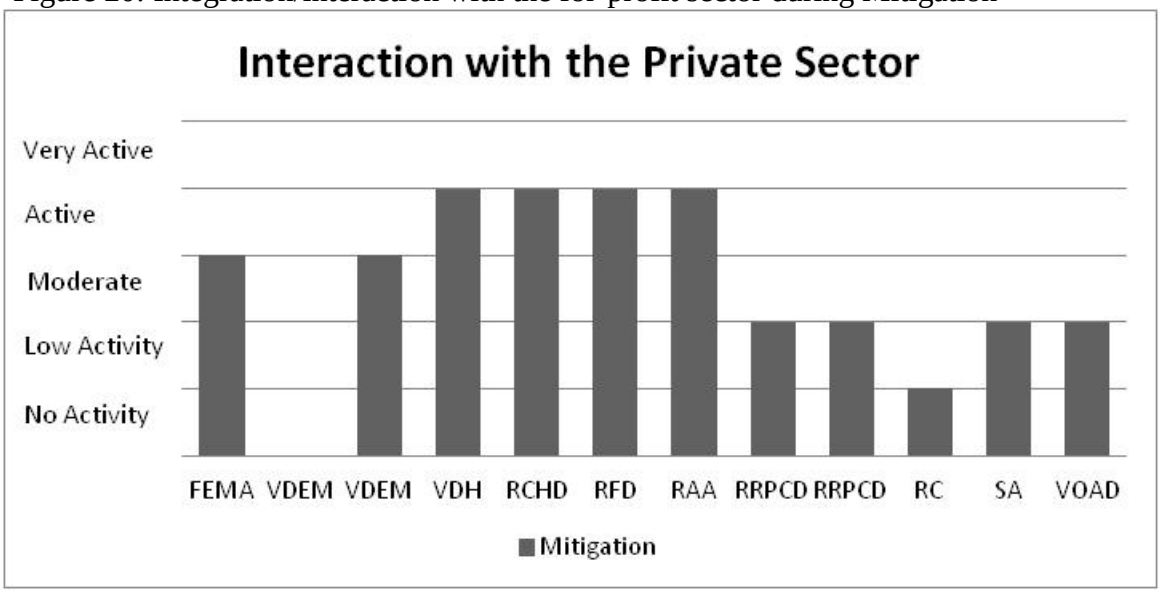


Figure 21: Integration/interaction with the for-profit sector during Preparedness

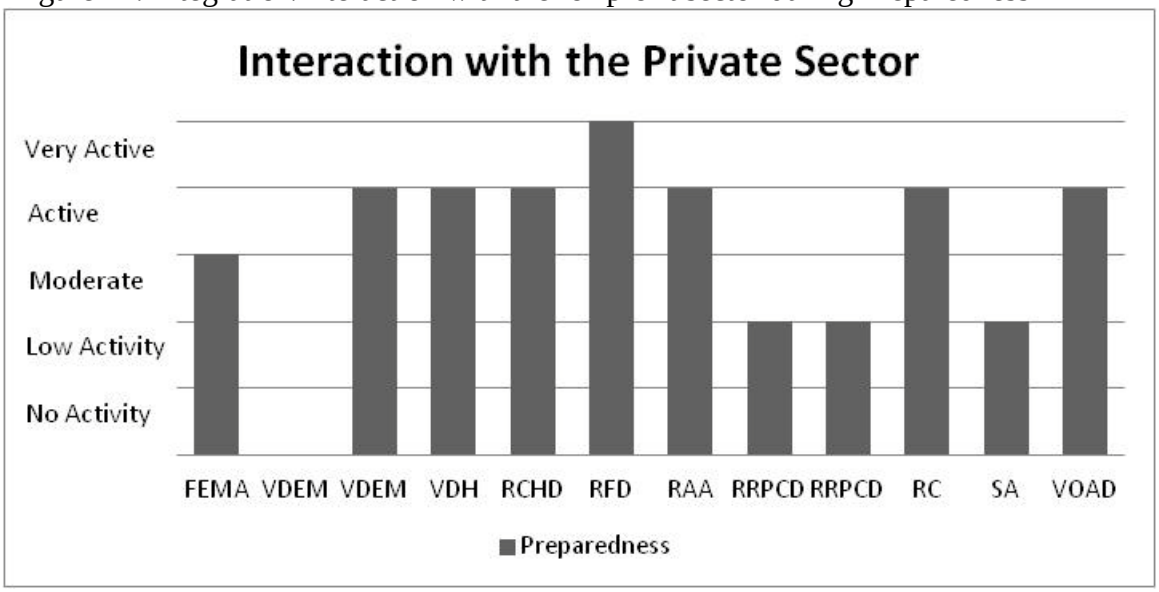


Figure 22: Integration/interaction with the for-profit sector during Response

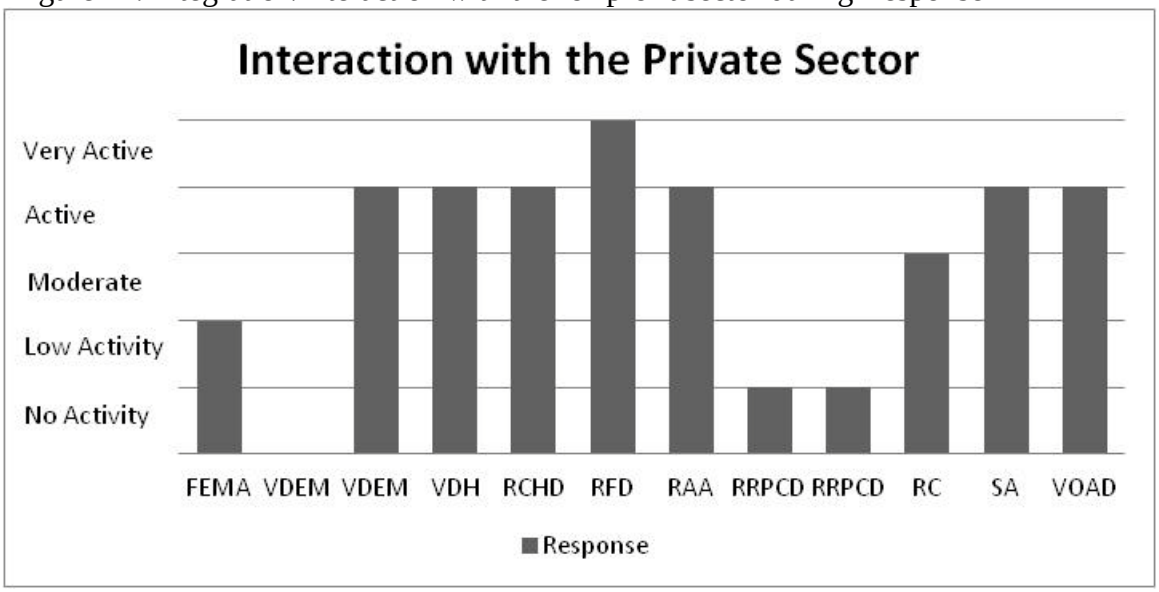
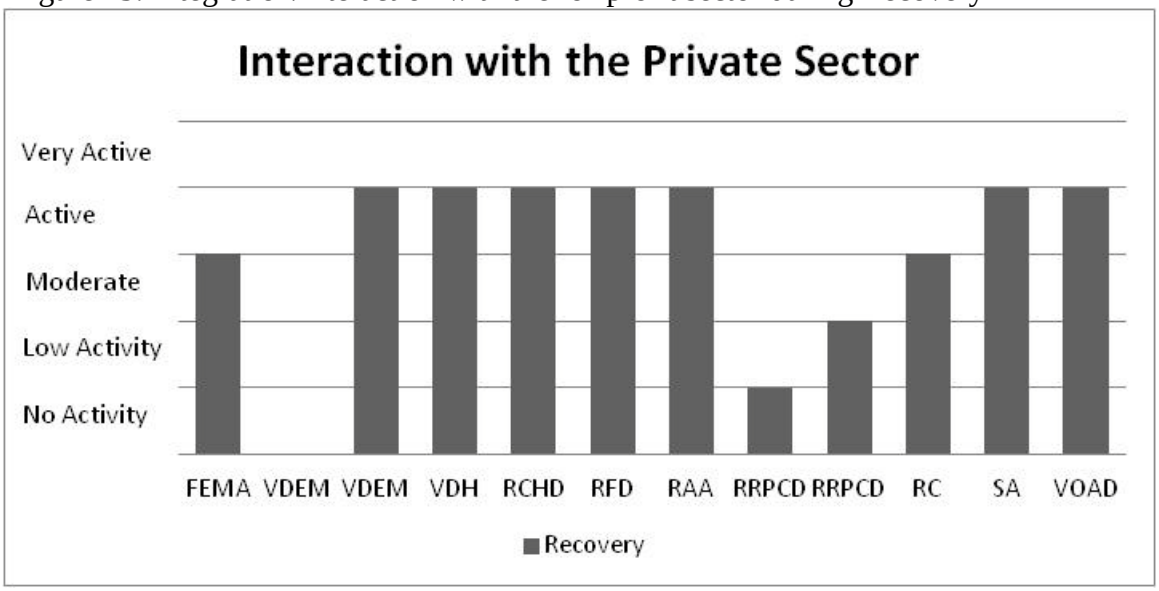


Figure 23: Integration/interaction with the for-profit sector during Recovery



6. Use of GIS in the planning activity of your agency for each of the following phases.
    a. Mitigation. _____
    b. Preparedness. _____
    c. Response. _____
    d. Recovery. _____

Figure 24: Use of GIS in the Planning Activity during Mitigation

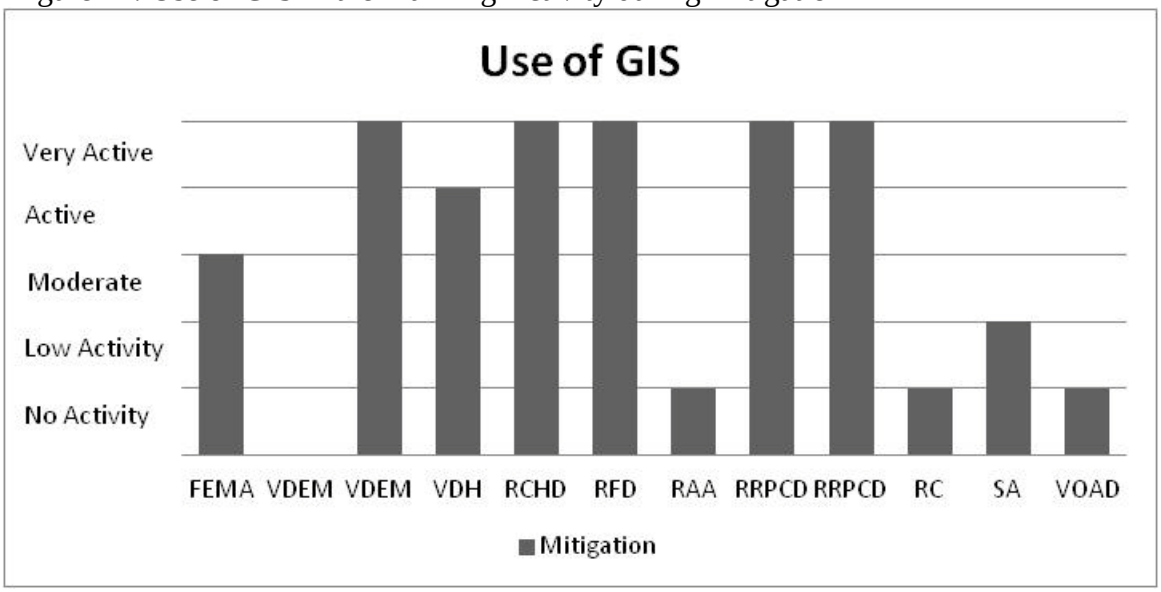


Figure 25: Use of GIS in the Planning Activity during Preparedness

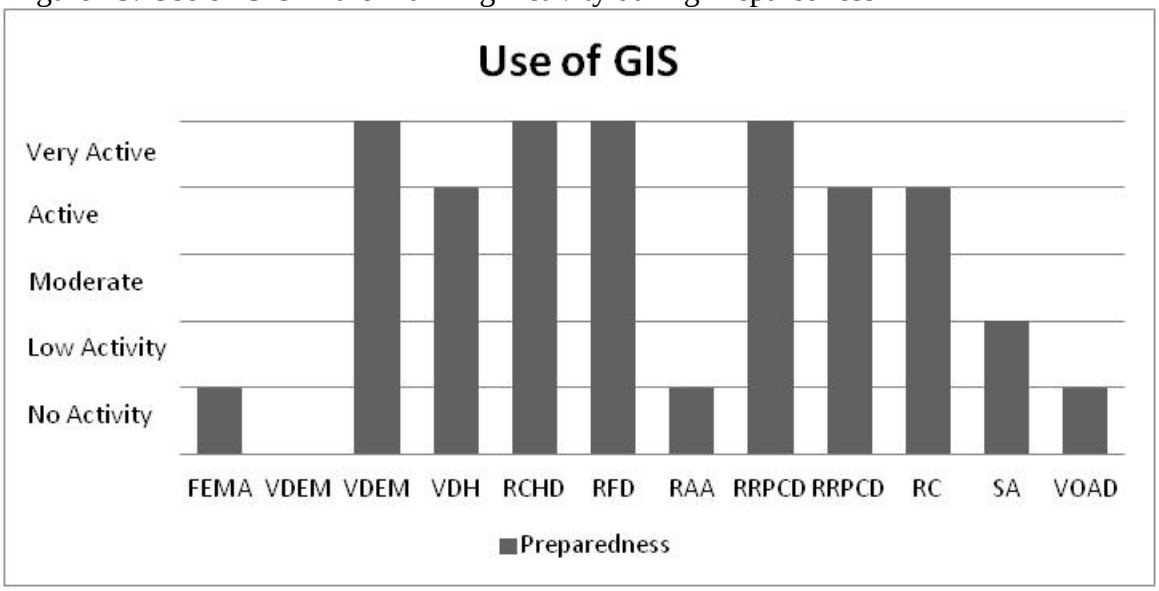
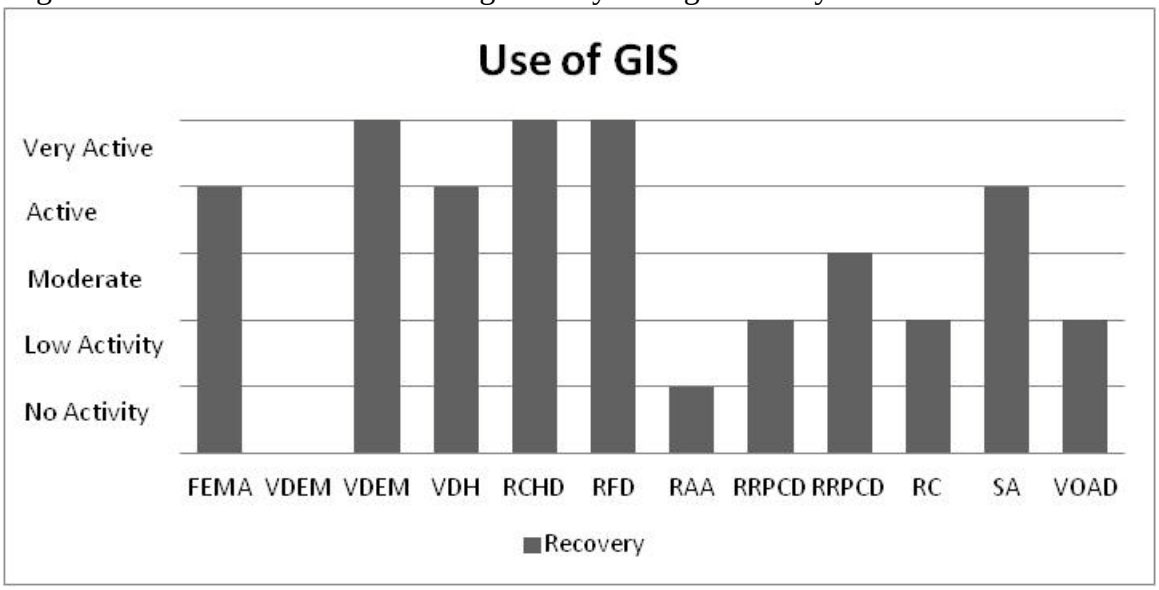


Figure 26: Use of GIS in the Planning Activity during Recovery



7. Utilization of FEMA's Response Partner Guide during each of the following phases.
    a. Mitigation. ____
    b. Preparedness. ____
    c. Response. ____
    d. Recovery. ____

Figure 27: Use of FEMA Partner Guide during Mitigation

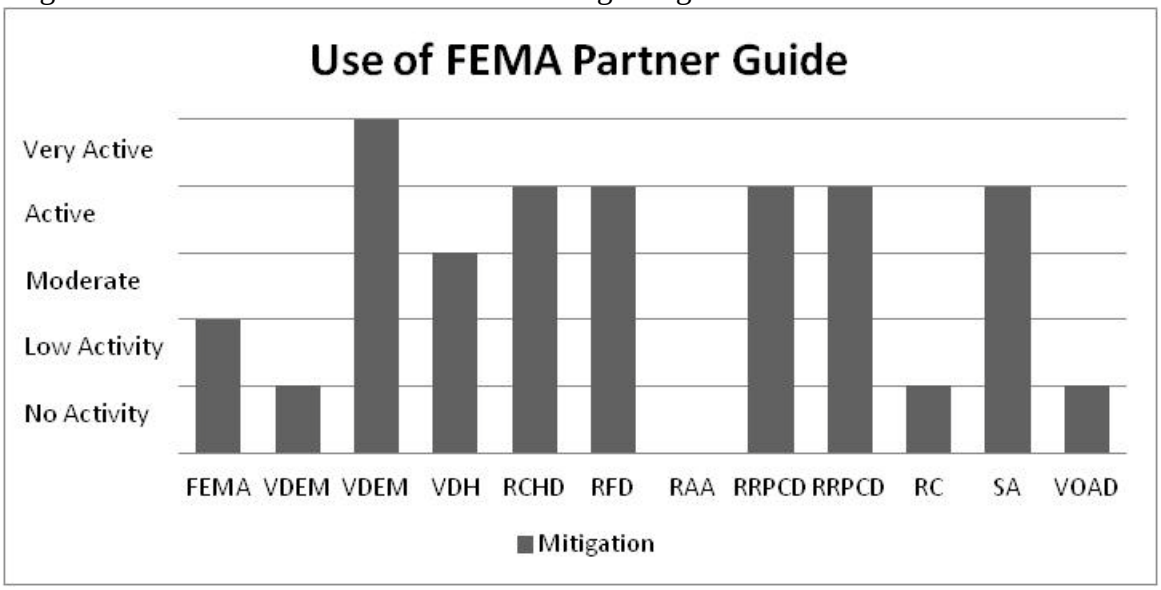


Figure 28: Use of FEMA Partner Guide during Preparedness

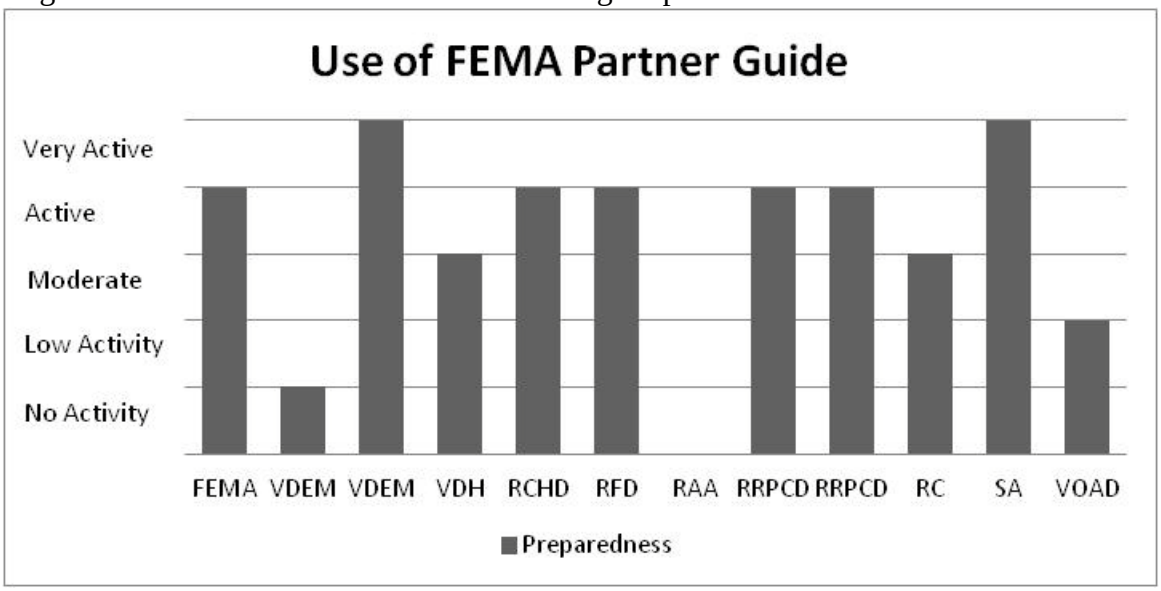
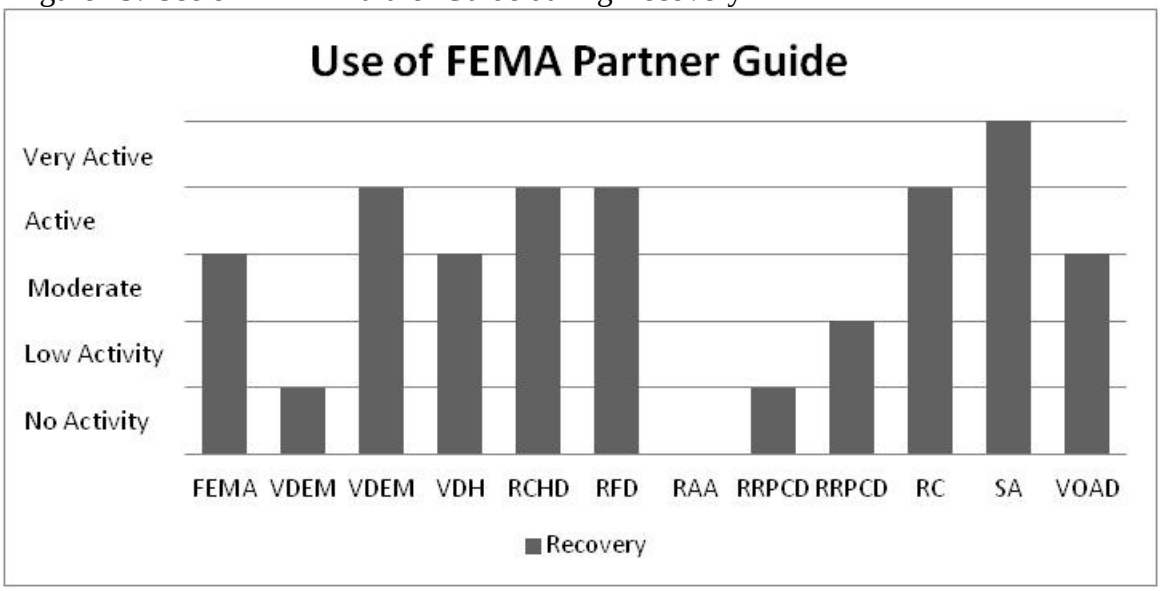


Figure 29: Use of FEMA Partner Guide during Recovery



8. Communication with the general public during each of the following phases.
    a. Mitigation. ____
    b. Preparedness. ____
    c. Response. ____
    d. Recovery. ____

Figure 30: Communication with Public during Mitigation

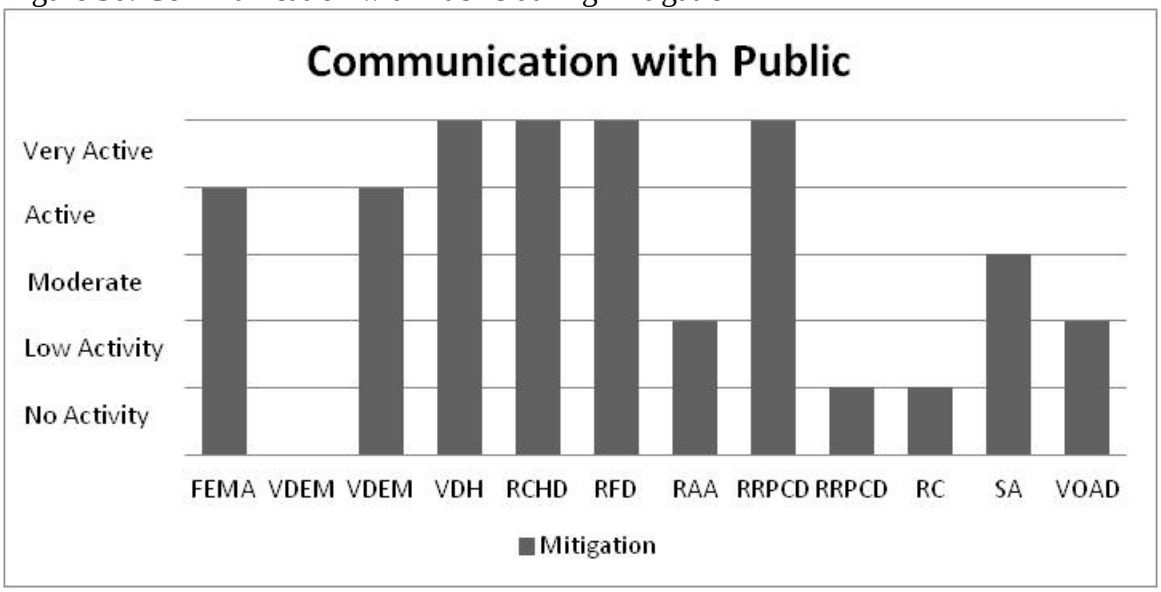


Figure 31: Communication with Public during Preparedness

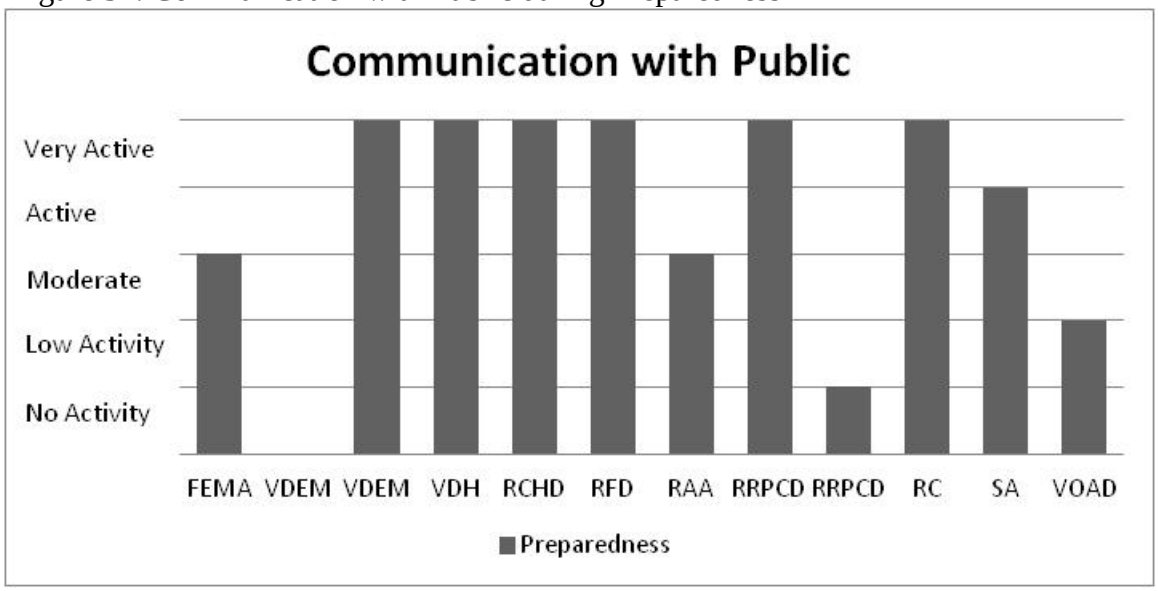


Figure 32: Communication with Public during Response

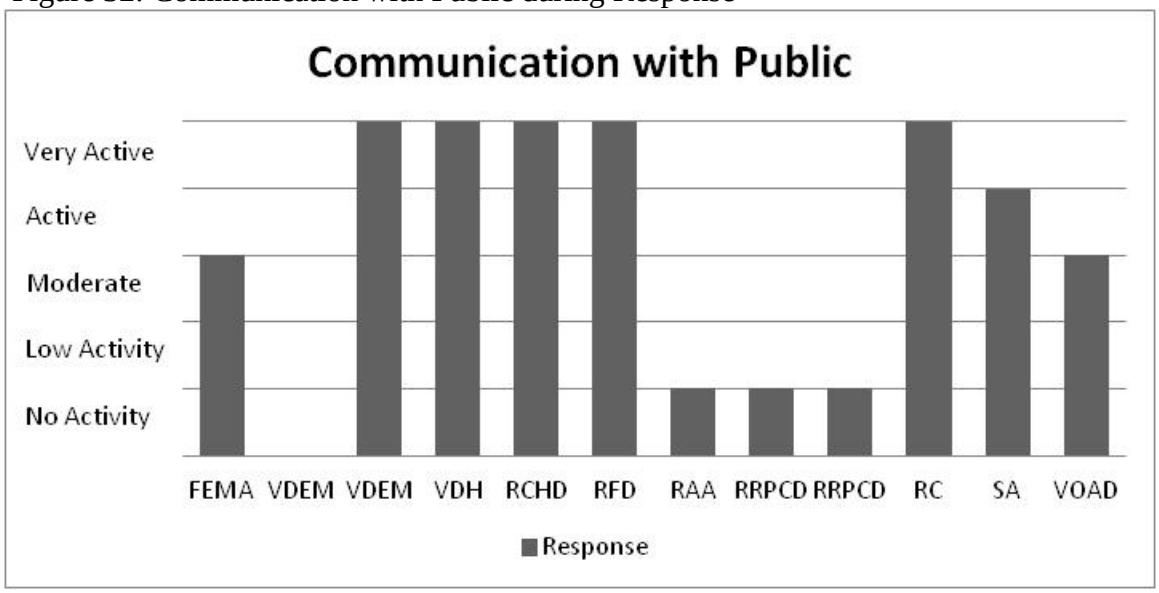
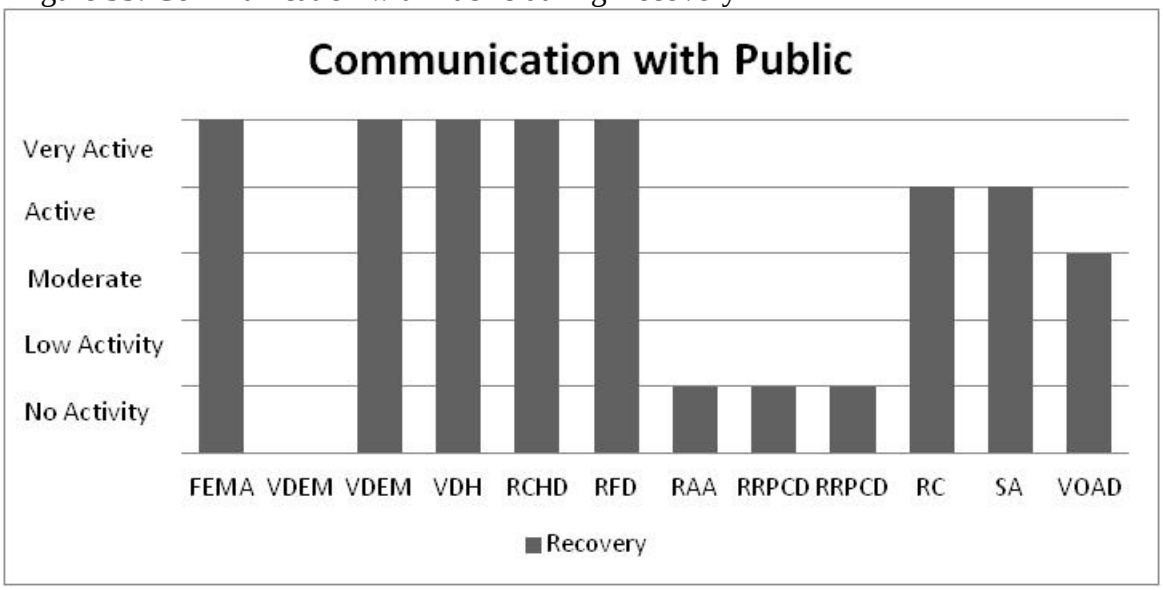


Figure 33: Communication with Public during Recovery



Appendix D

Acronyms

CDC	Centers for Disease Control
CVUASI	Central Virginia Urban Areas Security Initiative
CART	Citizens Advisory Recovery Team
CRFES	City of Richmond Fire and Emergency Services
CERT	Community Emergency Response Team
COOP	Continuity of Operations
CAN	Coordinated Network Assistance
DHS	Department of Homeland Security
DRC	Disaster Recovery Center
EMMA	Emergency Management Mapping Application
EOC	Emergency Operation Center
ESF	Emergency Support Function
FEMA	Federal Emergency Management Agency
GIS	Geographic Information Systems
LLIS	Lessons Learned Information Sharing
MRC	Medical Reserve Corps
MMRS	Metropolitan Medical Response System
NIMS	National Incident Management System
NRF	National Response Framework
RISC	Regional Interagency Steering Committee
RAA	Richmond Ambulance Authority
RAA	Richmond Ambulance Authority
RCHD	Richmond City Health District
REPC	Richmond Emergency Planning Committee
RRPDC	Richmond Regional Planning District Commission
SA	Salvation Army
SVI	Social Vulnerability Index
SHELDUS	Spatial Hazard Events and Losses Database for the United States
UASI	Urban Area Security Initiative
VDEM	Virginia Department of Emergency Management
VDH	Virginia Department of Health
VIPER	Virginia Interoperability Picture for Emergency Response
VOAD	Voluntary Organizations Active in Disaster

Agency Mission Statements

Federal Emergency Management Agency (FEMA Region III)
(Delaware, District of Columbia, Maryland, Pennsylvania, Virginia and W. Virginia) "FEMA's mission is to support our citizens and first responders to ensure that as a nation we work together to build, sustain, and improve our capability to prepare for, protect against, respond to, recover from, and mitigate all hazards (http://www.fema.gov/about/index.shtm#0, accessed 3/21/11)."

Virginia Department of Emergency Management (VDEM)
"The Virginia Department of Emergency Management works with local government, state and federal agencies and voluntary organizations to provide resources and expertise through the four phases of emergency management (http://www.vaemergency.com/aboutus/what-we-do, accessed 3/21/11)."

Virginia Department of Health (VDH), Emergency Preparedness Program
"Our mission is to effectively respond to any emergency impacting public health through preparation, collaboration, education and rapid intervention. VDH Emergency Preparedness involves state, regional and local emergency response partners working together to enhance readiness to respond to all hazards, including bioterrorism, infectious disease outbreaks and other public health emergencies (http://www.vdh.virginia.gov/oep/, accessed 4/14/11)."

Richmond City Health District (RCHD), Emergency Preparedness Program
"The RCHD Emergency Preparedness Program develops plans and coordinates activities to ensure that the Richmond City Health District is prepared to respond rapidly and effectively to public health emergencies. Our emergency preparedness coordinator works closely with city, state, and federal emergency planners to plan and implement responses to threats such as disease outbreaks or natural disasters (http://www.vdh.state.va.us/LHD/richmondcity/programs.htm, accessed 4/14/11)."

City of Richmond Fire and Emergency Services
The Office of Emergency Management
"The Office of Emergency Management's mission is to plan, prepare for and mitigate emergencies; educate the public on preparedness; coordinate and support responses to and recovery from emergencies; collect and disseminate critical information; and seek and obtain funding and other aid in support of overall preparedness for the City of Richmond. The Office of Emergency Management provides resources and knowledge in four major areas: Preparedness, Response, Recovery and Mitigation (http://www.richmondgov.com/fire/EmergencyManagement.aspx, accessed 3/21/11)."

Richmond Ambulance Authority
The mission of the Richmond Ambulance Authority is, "to provide the patients it serves and the residents of Richmond with emergency and non-emergency ambulance service by practicing clinical excellence with superb response time performance while maintaining its commitment to economic efficiency and minimal tax subsidization (http://www.raaems.org/, accessed 3/21/11)."

Richmond Regional Planning District Commission (RRPDC)
The RRPDC is a regional planning agency whose mission is, "to strengthen the quality of life throughout the Richmond region by serving as a regional forum of member local governments to address issues of regional significance, providing technical assistance to localities, and promoting and enhancing the collective consensus on the economic, transportation, social, environmental, and demographic interests of the region (http://www.richmondregional.org/About_Us/about_us.htm, accessed 4/14/11)."

American Red Cross
"The American Red Cross has been the nation's premier emergency response organization. As part of a worldwide movement that offers neutral humanitarian care to the victims of war, the American Red Cross distinguishes itself by also aiding victims of devastating natural disasters. Over the years, the organization has expanded its services, always with the aim of preventing and relieving suffering (http://www.redcross.org, accessed 2/27/11)."

The Salvation Army, Disaster Relief Services Program
"The Salvation Army, an international movement, is an evangelical part of the universal Christian Church. The core of The Salvation Army's disaster program consists of several basic services. And while these services address many of the typical needs of a disaster survivor, Salvation Army disaster relief is also flexible. Our services are adapted to the specific needs of individuals and communities and scalable according to the magnitude of the disaster (http://disaster.salvationarmyusa.org/, accessed 2/27/11)."

Virginia Voluntary Organizations Active in Disaster (VOAD)
"VA VOAD was formed in order to enhance and support the response of non-governmental agencies during an event within the Commonwealth of Virginia.
VOAD connects faith-based and non-profit agencies that respond during disasters and emergencies with the Department of Emergency Management, the EOC and FEMA in order to better coordinate response and recovery during an event. This coordination allows agencies to better communicate as well as manage assets and resources.
http://vavoad.org/index.html, 2/27/11)."

Emergency Support Functions (ESF)

ESF #	Scope of Activity	
1	Transportation	Aviation/airspace management and control, Transpotation safety, Restoration/recovery of infrastructure, Movement restrictions, Damage and impact assessment
2	Communications	Coordination with telecommunications and information technology industries, Restoration and repair of telecommunications infrastructure, Protection/restoration/sustainment of national cyber and information technology resources, Oversight of communications within the Federal incident management and response structures
3	Public Works and Engineering	Infrastructure protection and emergency repair, Infrastructure restoration, Engineering services and construction management, Emergency contracting support for life-saving and life-sustaining services
4	Firefighting	Coordination of Federal firefighting activities, Support to wildland/rural/urban firefighting operations
5	Emergency Management	Coordination of incident management and response efforts, Issuance of mission assignments, Resource and human capital, Incident action planning, Financial management
6	Mass Care, Emergency Assistance, Housing, and Human Services	Mass care, Emergency assistance, Disaster housing, Human services
7	Logistics Management and Resource Support	Comprehensive, national incident logistics planning/management/sustainment capability, Resource support (facility space, office equipment and supplies, contracting services, etc.)
8	Public Health and Medical Services	Public health, Medical, Mental health services, Mass fatality management
9	Search and Rescue	Life-saving assistance, Search and rescue operations
10	Oil and Hazardous Materials Response	Oil and hazardous materials (chemical, biological, radiological, etc.) response, Environmental short- and long-term cleanup
11	Agriculture and Natural Resources	Nutrition assistance, Animal/plant disease/pest response, Food safety and security, Natural/cultural resources and historic properties protection/restoration, Safety and well-being of household pets
12	Energy	Energy infrastructure assessment/repair/restoration, Energy industry utilities coordination, Energy forecast
13	Public Safety and Security	Facility/resource security, Security planning/technical resource assistance, Public safety/security support, Support to access/traffic/crowd control
14	Long-Term Community Recovery	Social/economic community impact assessment, Long-term community recovery assistance to States/local government/private sector, Analysis/review of mitigation program implementation
15	External Affairs	Emergency public information/protective action guidance, Media/community relations, Congressional/international affairs, Tribal/insular affairs

Source: http://www.fema.gov/pdf/emergency/nrf/nrf-esf-intro.pdf